November 7, 2024

Via Email (epahrfo@outlook.com)

Gary Klawinski, Director
EPA Region 2, Hudson River Office
187 Wolf Road, Suite 303
Albany, NY 12205

Re: Comments from Friends of a Clean Hudson on the Draft Third Five-Year Review Report for the Hudson River PCBs Superfund Site

Dear Director Klawinski:

On behalf of the Friends of a Clean Hudson ("FOCH") coalition, we respectfully submit the attached technical comments on the Environmental Protection Agency's ("EPA's") Draft Third Five-Year Review of the cleanup of polychlorinated biphenyls ("PCBs") in the Upper Hudson River. Unfortunately, the EPA's review irresponsibly concludes that a protectiveness determination cannot be made at this time and that more data is required to assess whether the cleanup of PCBs in the Upper Hudson meets the expectations of EPA's 2002 cleanup plan. The EPA argues that eight or more years of post-dredging data are required to identify meaningful trends in PCB concentrations for water column and fish data; however, existing data indicate that neither fish nor sediment are recovering at the necessary rates to achieve the goals EPA established in 2002.

The FOCH urges the EPA issue a "not protective determination" in the Final Third Five-Year Review and to initiate a Remedy Optimization, following EPA guidelines, to address the delay in achieving the anticipated declines in PCB concentrations in fish, sediment, and water. A remedy that will take generations to safeguard public health and the environment is not protective. It is also not what the people of the State of New York were promised when the EPA selected its remedial decision for the Upper Hudson River. At that time, the EPA predicted that the dredging remedy would result in rapid reductions in PCB levels in fish so that fish consumption restrictions could be relaxed in five to ten years, as opposed to many decades as is now predicted.

PCB levels in the Hudson continue to pose unacceptable risks to human health and the environment, with only fish consumption advisories and restrictions in place to protect the public. These advisories, which recommend that women under age fifty and children avoid consuming any fish from the 200-mile Hudson River PCBs Superfund Site, are ineffective, particularly among low-income and non-English speaking populations. People along the Hudson are exposed to toxic levels of PCBs through fish consumption and other exposure pathways and they will remain at risk from General Electric's PCBs until the goals of EPA's 2002 cleanup plan are met.

As described in our enclosed technical comments, the FOCH disagrees with the conclusions presented in the EPA's Draft Third Five-Year Review. The selected cleanup remedy for the Upper Hudson River has not succeeded in achieving the necessary reductions in PCB levels within the timeframes set to protect public health and the environment. The data are clear: the remedy is "not protective of human health and the environment." Therefore, we call on the EPA to issue a "not protective" determination in the Final Third Five-Year Review and take steps to reevaluate the Upper Hudson River cleanup remedy to ensure the protection of human health and the environment. An official finding by the EPA that the remedy is "not protective" is the only step that can place the Hudson River on a genuine path to recovery.

Respectfully Submitted,

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U.S.EPA PROPOSED THIRD FIVE YEAR REVIEW OF THE HUDSON RIVER PCBS SUPERFUND SITE

UPPER HUDSON Operable Unit 2

COMMENTS OF:

The Friends of a Clean Hudson

Arbor Hill Economic Development,
Hudson Fishermen's Association,
Hudson River Sloop Clearwater,
Hudson Riverkeeper,
Scenic Hudson,
Sierra Club-Atlantic Chapter

November 2024

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TABLE OF ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Certificate	Certificate of Completion of the Remedial Action
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
GE	General Electric
ICs	Institutional Controls
IRIS	Integrated Risk Information System
MNR	Monitored Natural Recovery
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OU	Operable Unit
PCB	Polychlorinated Biphenyl
ppm	parts per million
PRG	Preliminary Remediation Goal
RA	Remedial Action
RD	Remedial Design
RAO	Remedial Action Objective
RI/FS	Remedial Investigation Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decisionupper hudson
The Site	Hudson River PCBs Superfund Site
UHR	Upper Hudson River

I. Abstract

Point 1: The 2002 Record of Decision ("ROD") for the Hudson River PCBs Superfund Site determined that natural recovery alone would take decades to achieve a significant reduction in human health or ecological risks. Instead, the 2002 ROD determined that an active remediation strategy was needed to remove contaminated sediment and allow for more rapid recovery and risk reduction. To this end, the United States Environmental Protection Agency ("EPA") implemented a dredging remedy and set anticipated time frames in the 2002 ROD for rates of fish recovery after dredging.

Point 2: EPA should not abandon the interim targets outlined in the 2002 ROD, which specified the time to reach target polychlorinated biphenyl ("PCB") concentrations in Upper Hudson River fish. Although EPA states in the Draft Third Five-Year Review ("FYR") that it expects gradual improvement over the next five decades, the 2002 ROD itself does not describe such a vague decrease over an indefinite timespan. Instead, the 2002 ROD specifically identified two interim target fish PCB concentrations, intended to represent levels at which the State would consider relaxing fish consumption advisories, and predicted when those targets would be reached if the remedy functioned as expected.

Point 3: The data available since 2015 (the last year of dredging) for Upper Hudson River sediment and fish indicate that PCB concentrations are not decreasing at the rates needed to achieve the interim target concentrations set in the 2002 ROD. The first target was to achieve average concentrations of 0.4 mg/kg of PCB in fish fillet from the Upper Hudson River within five years after the completion of dredging, or by 2020. As of the time of writing, this target has still not been met.

Point 4: The appropriate protectiveness determination in the Third FYR is "not protective." The first interim target concentration of 0.4 mg/kg (or parts per million ("ppm")) of PCB in fish fillet has not been met, and recovery rates post-dredging are thus far insufficient to reach the second interim target of 0.2 mg/kg (ppm) of PCBs in fish filet within the timeframe predicted by the 2002 ROD. Sediment data for the uppermost layer of sediment since likewise shows little recovery. Human health and ecological risks remain well above the "acceptable risk range" and will likely remain so for the foreseeable future, if these trends in sediment and fish concentrations remain constant.

Point 5: EPA established a cleanup level based on the anticipated risk reduction associated with the selected remedy. However, the understanding of site risks may be understated, as the risks of PCB exposure to humans and wildlife are based on outdated assumptions which EPA is still in the process of evaluating on a national basis. EPA should update its understanding of the relationship between sediment and fish

PCB concentrations, and determine if, and how much, further active remediation is required to meet the risk reduction targets within the time frames established by the 2002 ROD.

Point 6: EPA has avoided acknowledging the 0.4 and 0.2 ppm fish targets identified in the 2002 ROD, and is instead focusing on the ultimate remediation goal of 0.05 ppm. This approach is unacceptable based on EPA's own criteria for remedy selection. The time to reach the 0.05 ppm goal was the same regardless of which remedy EPA selected, inclusive of both the No Action alternative and the most aggressive active remediation plan evaluated in the ROD. EPA chose the selected remedy principally based on the time to reach the 0.4 and 0.2 ppm targets. If EPA no longer believes that time to reach these interim target concentrations is important, then it will be very difficult to justify any future active remediation should EPA determine that such action is necessary. This sets a dangerous precedent for the future remediation of Superfund sites across the country.

Point 7: The public and environmental health threats posed by PCBs in the Hudson River have been borne by generations of people living along its shores. These health effects—including cancers, birth defects, and neurological impacts—are long-term and cumulative. Without a robust natural recovery, the current elevated human health and ecological risks posed by fish consumption will likely persist for the foreseeable future. Relying on fish consumption advisories is neither an effective nor a just solution to mitigate human health risks, particularly for environmental justice communities who rely on subsistence fishing. Such advisories place the burden on impacted communities to avoid the risk of PCB exposure posed by consuming contaminated fish, rather than on the polluter to reduce the risk it created, producing a greater generational burden than ever before.

II. Executive Summary

Beginning in 1947 and continuing for three decades, General Electric ("GE") dumped toxic PCBs into the Hudson River. PCBs are known carcinogens that have also been linked to neurological damage, asthma, and diabetes. One of the original "forever chemicals" (persistent organic pollutants), PCBs do not readily break down once in the environment and can easily cycle between air, water, and soil. GE's waste turned the Hudson—home to diverse fish and other wildlife species, world-class views, treasured parks, and fertile farmland—into one of the largest Superfund sites in the nation.

EPA is charged with protecting people and the natural environment from toxic pollution at our country's most contaminated sites. At Superfund sites like the Hudson River, where EPA identifies pollution that "may present an imminent and substantial danger to the public health or welfare,"[1] the agency must select an appropriate remedy that will attain a degree of cleanup that at a minimum "assures protection of human health and the environment."[2] The cleanup remedy selected by EPA in its 2002 ROD called for targeted environmental dredging in the Upper Hudson River, a forty-mile stretch between Hudson Falls, New York and the Federal Dam at Troy, followed by a period of monitored natural recovery ("MNR"). EPA's two-part cleanup plan, referred to as the Upper Hudson River ("UHR") cleanup remedy, was designed to address contaminated sediments in the Upper Hudson River and rapidly reduce risks to people and wildlife. Today, forty years after the Hudson River was identified as a Superfund site and eight years after GE completed dredging, hazardous levels of PCBs remain in the river. As a result, human health and ecological risks are well above EPA's acceptable risk range and will remain so for the foreseeable future.

Under the federal Superfund law, EPA is required to review implemented remedial actions every five years to ensure its Superfund cleanups are working as intended and are protective of human health and the environment. To date, EPA has performed two five-year reviews of the Upper Hudson River cleanup remedy. In both reviews, EPA essentially ignored the warning signs the data trends showed. Even as GE was completing its six-year dredging project in 2015, analysis of project data warned that a significant amount of contaminated sediment would remain in the Hudson River at levels that likely would not allow for unlimited use and unrestricted exposure after cleanup. EPA must continue to conduct five-year reviews until the site meets this exposure standard.

EPA's Draft Third FYR, released in July 2024, irresponsibly concludes that a protectiveness determination cannot be made at this time and that more data are

[1] 42 U.S.C. § 9604(a)(1).
[2] 42 U.S.C. § 9621(d)(1).

needed to determine if the cleanup of PCBs in the Upper Hudson is meeting the expectations of the original cleanup plan. EPA argues that it requires eight or more years of post-dredging data to determine a meaningful time trend in PCB concentrations for water column and fish data. However, the data available to date indicate that neither fish nor sediment are recovering at the rates needed to achieve the goals established in the 2002 ROD.

Since fish consumption is the major exposure pathway of concern for both people and wildlife, EPA determined in the 2002 ROD that the primary factor in selecting a remedy for the Hudson River would be the time to reach target PCB concentrations in fish. **EPA also concluded that remedial alternatives that would take ten to twenty years longer than the selected remedy to achieve target reductions in fish tissue PCB concentrations were not sufficiently protective.** A rapid reduction in PCB concentrations in fish—and therefore a rapid reduction in risks to people and wildlife—was the principle that drove the selection of the active dredging remedy in the Upper Hudson River.

Modeling results presented in the 2002 ROD estimated that the first target for protection of human health (0.4 mg/kg of PCBs in species-weighted Upper Hudson average) would be reached five years after the completion of dredging, or by 2020. Similarly, model results also estimated that the second target PCB tissue concentration (0.2 mg/kg of PCBs in species-weighted Upper Hudson average) would be reached sixteen years after the completion of dredging, or by 2031. The post-dredging data collected reveal that PCB concentrations in fish remain well above the first target and, at the current rate of decline, that this target will likely not be reached for another fifteen to forty years. According to EPA's statements in the 2002 ROD, such a delay renders the remedy not protective.

By dismissing the importance of the clearly defined interim PCB fish tissue concentration targets, EPA in effect contends that the cleanup will be protective if it achieves the numeric remediation goals set forth in the 2002 ROD at some unknown point more than fifty-five years in the future. This presumption is unacceptable, as it endorses essentially the same performance standard of the passive remediation alternatives EPA evaluated and rejected in the 2002 ROD because they were not sufficiently protective of human health or the environment.

PCB levels in the Hudson continue to present unacceptable risks to human health and the environment, but the only measures protecting the public are the institutional controls for the site—specifically, the fish consumption advisories established by the New York State Department of Health ("NYSDOH"). These advisories, which recommend that women under age fifty and children entirely avoid consumption of fish from the 200-mile Hudson River PCBs Superfund Site, are ineffective, especially among low-income and non-English speaking populations. People all along the Hudson are exposed to toxic levels of GE's PCBs through consumption of fish and other exposure pathways, and they will continue to be unprotected from PCBs until the goals of the 2002 ROD are reached.

The five-year review process allows and encourages EPA to address potential problems with remedies as they become apparent. However, until EPA acknowledges the failure of the remedy to meet the goals and objectives set forth in the original cleanup plan, the opportunities to adjust the remedy and take additional steps to address PCB contamination in the Hudson River will be lost. The continued delay by EPA has placed the burden of "protection of human health" squarely on the low-income families and disadvantaged communities who survive on the river's tainted fish—by essentially implementing a "risk-avoidance" remedy that is neither acceptable nor just. EPA's position in the Draft Third FYR contradicts environmental justice policies intended to ensure cleanups at polluted sites like the Hudson River address decades-old environmental injustices in overburdened communities.

EPA's Upper Hudson River cleanup remedy has failed to achieve rapid reductions of PCBs within the specific timeframes established to protect human health and the environment. At this point, the data are clear: the remedy is "not protective of human health and the environment." PCB concentrations in Upper Hudson sediment and fish are much higher than EPA predicted in the 2002 ROD. Therefore, EPA must issue a "not protective" determination in the final third five-year review of the Hudson River PCBs Superfund Site and take steps to reevaluate the Upper Hudson River cleanup remedy to protect human health and the environment.

III. Site Background

A. General Electric Discharged Toxic PCBs into the Hudson River for Decades Creating Unacceptable Risks to Human Health and the Environment

From 1947 to 1977, GE discharged millions of pounds of highly toxic PCB waste from two capacitor plants into the waters of the Upper Hudson River near Fort Edward and Hudson Falls, New York.

> Estimates indicate that in excess of 1,500,000 lbs. of PCB per year were non-reusable scrap or waste. Approximately 1,400,000 lbs/yr. of the waste PCB were in liquid form… About 500,000 lbs/yr. of the 1,400,000 lbs/yr. of liquid PCB were discharged directly to bodies of water. The Hudson River has been the major receiving stream.[3]

Identified as one of the original "forever chemicals" or "persistent organic pollutants,"[4] PCBs do not readily break down once in the environment, and they easily cycle between air, water, and soil. Such chemicals are also extremely resistant to decay—destruction by chemical, thermal, and biochemical processes is incredibly difficult and costly.

The cumulative negative impacts of PCB contamination on public health and the environmental wellbeing of the riverine ecosystem have been ongoing for almost eighty years. Through air, water, and sediment, i.e. "exposure pathways," animals and humans can accumulate PCB toxins in their bodies, especially in fatty tissues.[5] Due to their poor degradability, "biomagnification" of PCB contamination increases as it moves along the trophic levels of the food chain. Since PCBs are "bioaccumulative"[6] and slow to metabolize, exposure to even low amounts of PCB toxins can cause people and animals to accumulate a much higher body burden concentration of PCBs than exist in the immediate environment. It is the PCB concentration in fish or the amount of contaminated fish consumed that actually drives the body burden of the receptor, human or animal.

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[3] *See* Letter from Dr. K.R. Murphy, Engineer, Gen. Elec., to Pyranol Task Force (June 5, 1970), https://sites.berry.edu/kingdomcome/wp-content/uploads/sites/68/2019/04/kenneth_r._murphy_pcb_report_1970.pdf.

[4] *See* Bianca Yaghoobi, *The Original Forever Chemicals,* UC DAVIS (Mar. 03, 2021), https://biotech.ucdavis.edu/news/original-forever-chemicals ("Long before PFAS were even developed, however, another class of compounds belonging to POPs, polychlorinated biphenyls (PCBs), made headlines as the original 'forever chemicals.'").

[5] U.S. DEP'T OF HEALTH AND HUMAN SERV., ATSDR CASE STUDIES IN ENVIRONMENTAL MEDICINE POLYCHLORINATED BIPHENYLS (PCBS) TOXICITY (May 2014), https://www.atsdr.cdc.gov/csem/pcb/docs/pcb.pdf.

[6] The "bio-accumulative" effect for both people and animals means that when a person or animal eats a contaminated fish (especially older, larger ones), the chemicals that fish accumulated over its lifetime are added to the body burden of the consumer.

For people, PCBs have been identified as known carcinogens,[7] endocrine disruptors, and can damage the skin, liver, pancreas, and cardiovascular system. It should be noted for this review and for the Hudson River PCBs Superfund Site, PCBs are still classified as a "probable" carcinogen from the last cancer-dose reassessment in 1996.[8] PCBs can also impair the development of the brain and neurological system.[9] Prenatal PCB exposure has been linked to low birth weight babies and, as these children age, to reproductive, developmental, and neurobehavioral disorders that continue for several years.[10] For animals—fish, invertebrates, birds, and mammals—PCBs are carcinogenic and can bring about reproductive failures, developmental impairments, and mortality, causing declines in wildlife populations.[11]

Because of the threats posed to human health and the environment, in 1984, much of the Hudson River was recommended for placement on EPA's National Priorities List ("NPL"). The Hudson River PCBs Superfund Site (the "Site") includes a nearly 200-mile stretch of the Hudson River from the Village of Hudson Falls, New York, to the Battery in New York City—affecting twelve counties in New York and two counties in New Jersey. The following events occurred after the Site was placed on the NPL:

- In 1984, EPA issued a ROD for the Site with an "Interim No-Action" decision for PCB-contaminated sediment in the river bottom, and a limited "in-place capping, containment and monitoring of exposed Remnant Deposits" remedy for areas of former river bottom in the Upper Hudson that had been exposed by removal of the Fort Edward Dam.[12]

- In 1989, as part of the subsequent five-year review of the 1984 Record of Decision (as required by the Comprehensive Environmental Response,

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[7] *See generally* World Health Org. Int'l Agency for Rsch. on Cancer, Polychlorinated Biphenyls and Polybrominated Biphenyls: IARC Monographs on the Evaluation of Carcinogenic Risks to Humans Vol. 107 (2015), http://monographs.iarc.fr/ENG/Monographs/vol107/mono107.pdf.
[8] *See generally Learn about Polychlorinated Biphenyls,* EPA (last updated Oct. 17, 2024), https://www.epa.gov/pcbs/learn-about-polychlorinated-biphenyls#healtheffects.
[9] Jonathan Chevrier et al., *Associations between Prenatal Exposure to Polychlorinated Biphenyls and Neonatal Thyroid-Stimulating Hormone Levels in a Mexican-American Population, Salinas Valley, California*, 115(10) Env't Health Perspectives 1490 (2007).
[10] *Id.*
[11] *See* Hudson River Trustee Council, Hudson River Natural Resource Damage Assessment Plan 20-21 (Sept. 2002), https://extapps.dec.ny.gov/docs/wildlife_pdf/hudsonrivernrdaplan.pdf.
[12] EPA, Superfund Record of Decision: Hudson River PCBs Site, NY (Sept. 1984), https://nepis.epa.gov/Exe/ZyNET.exe/9100PYDY.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1981+Thru+1985&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C81thru85%5CTxt%5C00000019%5C9100PYDY.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL#.

Compensation, and Liability Act ("CERCLA")), EPA ordered a reassessment of the no-action remedy.

- In 2002, EPA issued a ROD to address the ongoing environmental and human health risks posed by the discharge of millions of pounds of PCBs by GE from its capacitor production facilities in Hudson Falls and Fort Edward, New York. The cleanup plan selected in the 2002 ROD called for targeted environmental dredging in the Upper Hudson River followed by a period of monitored natural recovery.

EPA divided the Hudson River PCBs Superfund Site into separate parts or operable units ("OU") for the purpose of developing a remedial plan for each distinct portion of the Site. EPA concluded that active remediation in the Hudson River was "necessary to protect the public health or welfare and the environment" due to the "health hazards associated with human ingestion of fish, as well as the ecological risks associated with ingestion of [Hudson River] fish by birds, fish and mammals."[13]

The Upper Hudson River portion of the Site, labeled OU 2, includes forty miles of the river between Hudson Falls, New York and the Federal Dam at Troy. The Upper Hudson River was further divided into three river sections with three different target cleanup levels of contaminated sediment. The Upper Hudson River was also divided into eight river reaches or "pools." Each reach represents an isolated ecosphere which could offer potentially different results than those found through aggregating the data by river section.

River Section 1 extends from the former location of the Fort Edward Dam to Thompson Island Dam (approximately 6.3 river miles); River Section 2 extends from the Thompson Island Dam to the Northumberland Dam near Schuylerville (approximately 5.1 river miles); and River Section 3 extends from below the Northumberland Dam to the Federal Dam at Troy (approximately 29.5 river miles).

From 2009 to 2015, GE actively remediated the upper portion of the Site. GE ceased targeted dredging operations by 2015 and finished dismantling dewatering facilities and removal equipment by June of 2016—after dredging a previously untargeted Phase 1 area of River Section 1 in the Fort Edward Yacht Basin in May of 2016.

GE was given a certificate of completion for the active portion of the Upper Hudson remedial action in 2019.

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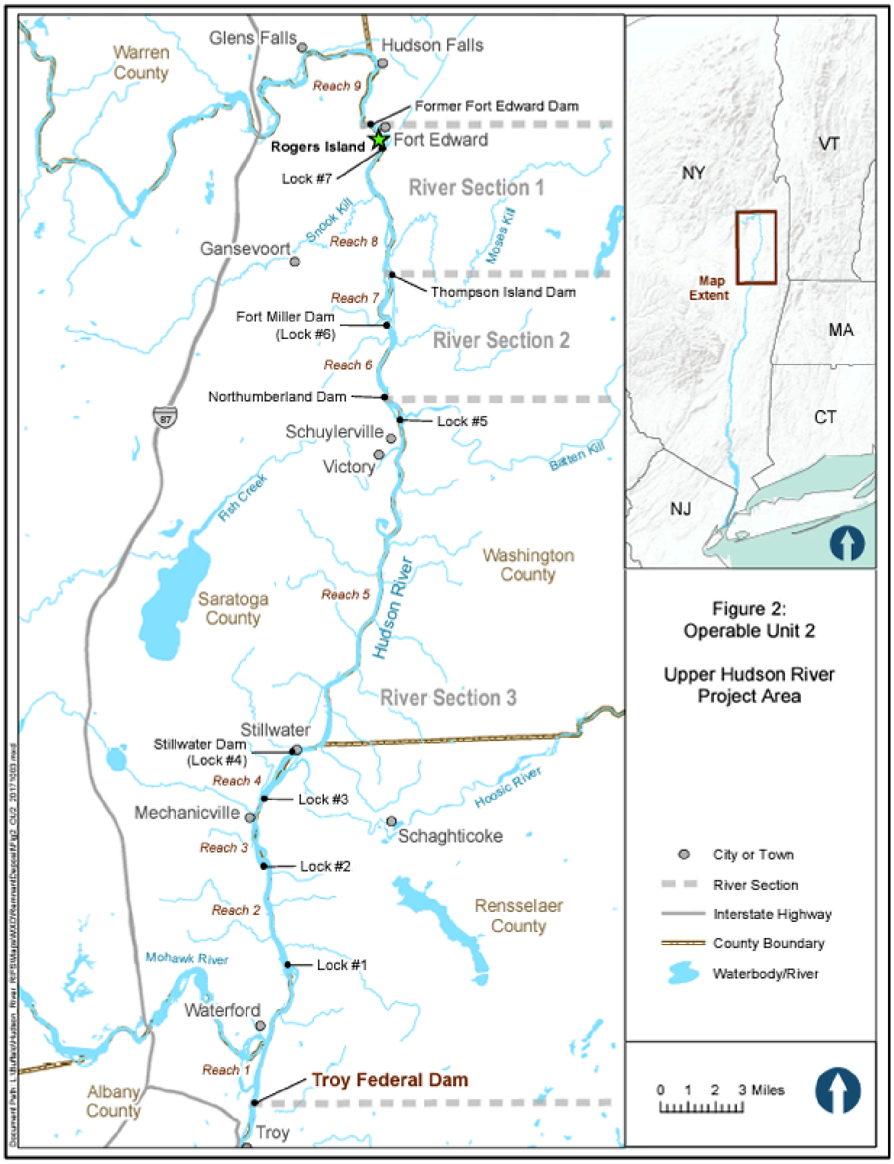
[13] EPA, Hudson River PCBs Site New York Record of Decision 49 (Jan. 2002), https://www3.epa.gov/region2/superfund/hudson/RecordofDecision-text.pdf [hereinafter 2002 ROD].

MAP 1

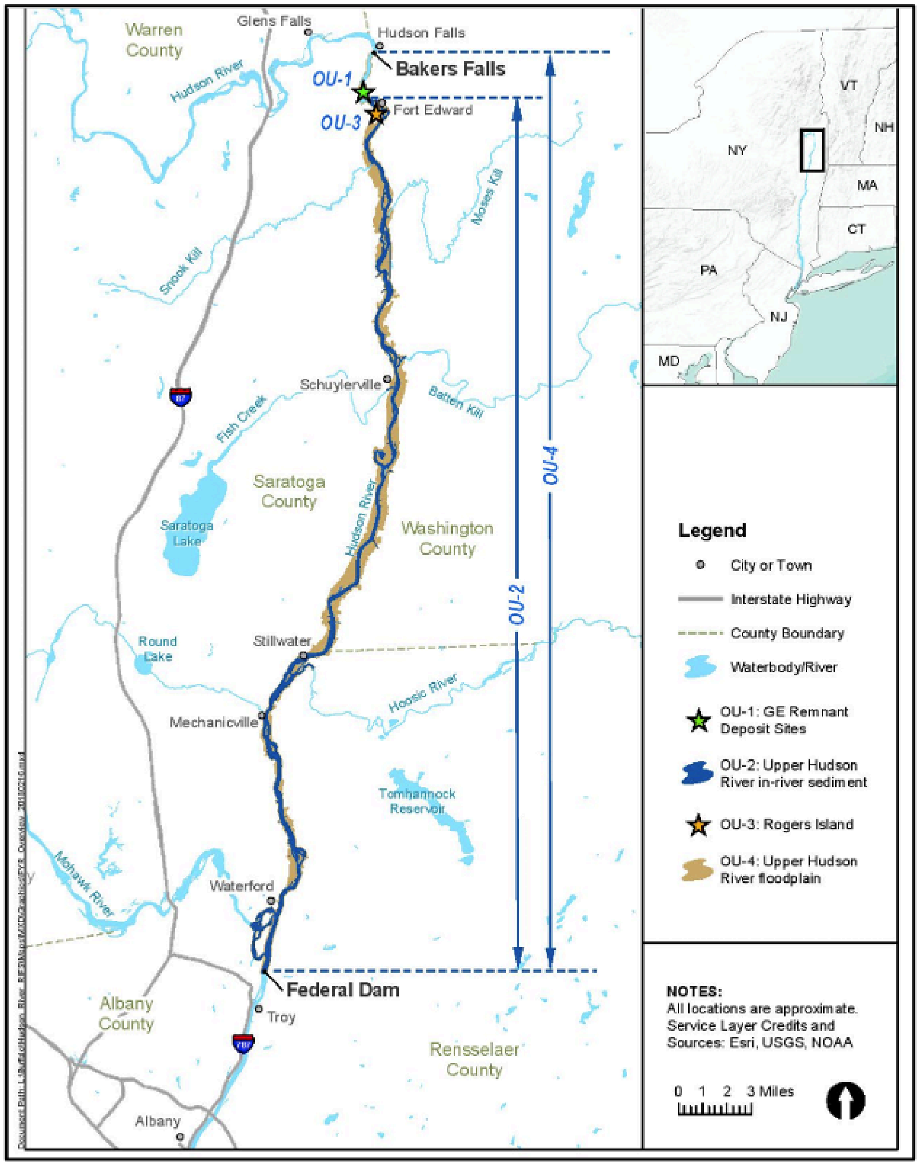
RIVER SECTIONS OF THE UPPER HUDSON SUPERFUND SITE



Note: EPA divided the Upper Hudson River area into three main sections known as River Section 1, River Section 2, and River Section 3. River Section 1 consists of the Thompson Island ("TI") Pool. This River Section extends about 6.3 miles from the former Fort Edward Dam to the TI Dam. The area between the former Fort Edward Dam and the northern end of Rogers Island, a distance of about 0.2 miles, contains minimal PCB contamination and was not considered for remediation under this decision document. River Section 2 extends from the TI Dam to the Northumberland Dam near Schuylerville, an extent of 5.1 river miles. River Section 3 extends from below the Northumberland Dam to the Federal Dam at Troy, an extent of 29.5 river miles.

MAP 2

OPERABLE UNITS OF THE UPPER HUDSON SUPERFUND SITE



Note: EPA is addressing the Site in discrete phases or components known as operable units. The 1984 Record of Decision for OU1 addresses areas, known as the Remnant Deposits, and in addition called for a treatability study of the Waterford Water Works to determine whether upgrades or alterations of that facility were needed. The 2002 ROD for OU2 selected dredging to address PCB-contaminated sediments of the Upper Hudson River, as well as monitored natural attenuation of PCB contamination that remains in the river after dredging. OU3 is a removal action taken on Rogers Island by EPA in 1999 to address soil contamination with PCBs and metals. OU4 pertains to the Upper Hudson River floodplain areas, currently the subject of an ongoing remedial investigation. In 2022, the Lower Hudson River, the portion of the Hudson River from the Federal Dam at Troy to the Battery in New York City, was designated as OU5. This report focuses only on OU2.

B. *The 2002 Record of Decision for the Hudson River Superfund Site Contains Remedial Action Objectives Necessary to Protect Human Health and the Environment*

The remedy selected in the 2002 ROD called for dredging to remove PCB-contaminated in-place sediments of the Upper Hudson River, from Hudson Falls, New York to the Federal Dam at Troy, and MNR of PCB contamination remaining in the river after dredging. The selected remedy was designed to reduce the dangerous health risks to humans and ecological receptors living in and near the Upper Hudson and the Lower Hudson (from the Federal Dam at Troy to the Battery in New York City). As the active remedial action (dredging) was finished by 2015, EPA is now relying solely on monitored natural recovery and institutional controls (i.e., fish consumption advisories) to achieve the remedial goals set forth in the ROD and protect human health.

The 2002 ROD includes five Remedial Action Objectives ("RAOs") for the protection of human health and the environment:

1. Reduce the cancer risks and non-cancer health hazards for people eating fish from the Hudson River by reducing the concentration of PCBs in fish;[14]
2. Reduce PCB levels in sediment in order to meet the applicable or relevant and appropriate requirements for surface water;[15]
3. Reduce the inventory (mass) of PCBs in sediments that are or may be bioavailable;[16]
4. Minimize the long-term flow of PCBs that run over the Federal Dam and downstream through the Lower Hudson River;[17] and
5. Reduce the risks to ecological receptors by reducing the concentration of PCBs in fish.[18]

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[14] *Id.* at 50.
[15] *Id.* at 50-51. For the Hudson River Superfund Site, the federal Applicable Requirements are: 0.5 µg/L total PCBs for drinking water (maximum contaminant level under the Safe Drinking Water Act); 1 ng/L for the Ambient Water Quality Criterion; and 0.014 µg/L for the criteria continuous concentration Federal Water Quality Criterion in freshwater and 0.03 µg/L in saltwater. *Id*. The New York State Applicable Requirements are: 0.09 µg/L total PCBs for protection of human health and drinking water sources; and 0.12 ng/L for protection of wildlife; 1.1 ng/L for the protection of the health of human consumers of fish. *Id.*
[16] *Id.* at 51.
[17] *Id.*
[18] *Id.* at 50. The selected remedy in the ROD will achieve this in three ways: by (1) a "relative reduction in toxicity quotients for the river otter and the mink," measured in the same manner as was done for reduction in risk to human health; (2) reducing the "time that it would take . . . to reach the Remediation Goal for protection of ecological receptors, which is a range of PCB concentrations in largemouth bass based on the river otter, and a target range of PCB concentrations in spottail shiner based on the mink"; and (3) "[r]educ[ing] PCB loading from the Upper Hudson into the Lower Hudson [to] ultimately reduce the

In the 2002 ROD, EPA also identified two interim targets for fish PCB concentrations. The first interim target concentration was 0.4 mg/kg PCBs in fish fillet, which is safe for an average angler to consume one half-pound meal every two months, and the second was 0.2 mg/kg PCBs in fish fillet, which is safe for the average angler to consume one half-pound meal per month.[19] EPA's models projected that these interim targets would be attained within five and sixteen years of the completion of dredging, or by 2020 and 2031, respectively.[20] EPA had hoped that attaining such levels would facilitate the relaxation of the fish consumption advisories and fishing restrictions.[21] Comparatively, the risk-based Preliminary Remediation Goal ("PRG") for the protection of human health is 0.05 mg/kg PCBs in fish fillet based on non-cancer hazard indices for the reasonable maximum exposure fish consumption rate of one half-pound meal per week for the average adult angler.[22] This PRG will not be reached for decades to come.

With respect to sediment, the EPA expected that, after dredging, PCB concentrations in surface sediment would decrease annually by about seven to nine percent, following historical trends.[23] Similar declines were anticipated in water and fish tissue, though the rate was expected to slow as concentrations decreased over time.

Since dredging was completed in 2015, the anticipated decline in PCB concentrations in sediment has not occurred. Inexplicably, in the Draft Third FYR, EPA now states that:

> It is EPA's expectation that short-term post-dredging rates will be at least 5 percent per year in all three media and has designed the long-term monitoring program for fish, water and sediment to [be] able to detect a 5 percent annual rate of decline with 80 percent power and 95 percent confidence in 10 years.[24]

In effect, EPA has changed their expectation of remedy performance from seven to nine percent decline per year to five percent decline per year without modifying the ROD.

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concentrations of PCBs in sediment, water and fish and thereby reduce risk to . . . ecological receptors in the Lower Hudson." *Id.* at 73-75.

[19] *Id.* at 50.

[20] *Id.* at 103.

[21] *Id.* at 50.

[22] *Id.*

[23] EPA, Draft Third Five-Year Review for the Hudson River PCBs Superfund Site E-3 (July 2024), https://www.epa.gov/system/files/documents/2024-07/third-five-year-review-report-for-the-hudson-river-pcbs-superfund-site.pdf [hereinafter Draft Third FYR].

[24] *Id.* at E-3-E-4.

C. *EPA Selected the Remedy for the Hudson River Superfund Site Primarily Due to the Expedited Time Frame to Meet Interim and Final Remedial Targets*

The length of time needed to achieve the PRGs, the interim fish PCB targets, and the RAOs set forth in the 2002 ROD was an important factor considered by EPA in comparing remedial alternatives. EPA's models estimated that it would take decades longer to reach the 0.2 mg/kg and 0.4 mg/kg PCB target levels under either the No Action alternative or the MNR-only alternative (involving no dredging). As a result, EPA concluded that active remediation was necessary to protect human health and the environment.

EPA evaluated five remedial alternatives in the 2002 ROD. In doing so, EPA stated that "[t]he time to reach target PCB concentrations in fish was a primary factor in comparing remedial alternatives."[25] Alternatives that included active remediation (i.e., dredging or capping) met the interim and final targets more quickly than the No Action and MNR alternatives.[26] Table 1 below, reproduced from the 2002 ROD,[27] illustrates the differences among the alternatives in meeting the targets.

[25] 2002 ROD, *supra* note 13, at 66.
[26] *Id.* at 66-67, 71-72.
[27] *Id.* at 73.

Table 1

Year to Reach Human Health Risk-based PCB Concentrations in Species-weighted Fish Fillet Upper Hudson River[1]

Alternative	**Remediation Goal (0.05 mg/kg)**	**0.2 mg/kg**	**0.4 mg/kg**
No Action[2]	> 2067	> 2067	> 2067
MNA[3]	> 2067	2035 to > 2067	2024 to > 2067
CAP-3/10/Select	> 2067	2024	2013
REM-3/10/Select	> 2067	2024	2012
REM-0/0/3	> 2067	2018	2010

1 Upper Hudson River average is weighted by river section length. River Section 1: 6.3 miles = 15.4%; River Sect ion 2: 5.1 miles = 12 .5%; and River Sect ion 3: 29 .5 miles = 72 .1%.
2 "> 2067" means that the level will not be achieved within the model forecast period (*i.e.*, by 2067).
3 Higher value is upper bound.

The modeling for the 2002 ROD projected that the interim targets of 0.2 mg/kg and 0.4 mg/kg would be met, on a river section average basis, in 2012 and 2024, respectively.[28] Since the dredging was not completed until 2015, it is reasonable to assume that the remedy would meet the interim targets in 2020 and 2031, respectively. Based on EPA's own rationale for selecting an active remedy, it is clear that delays of ten or more years in reaching the interim and final targets are not protective of human health.

EPA believed that implementation of the selected active remedy would greatly reduce the mass of PCBs in river sediments and lower the average PCB concentration in surface sediments, which would in turn reduce PCB levels in the water column, fish, and other biota, and thereby rapidly reduce the level of risk to human and ecological receptors.

While it is true the 2002 ROD did not expect the remedy to be protective ten years after the completion of dredging, EPA continues to ignore what the 2002 ROD did expect in the near term—that within five years of dredging, average fish tissue

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[28] *See* EPA, HUDSON RIVER PCBS SITE RECORD OF DECISION TABLES Table 11-2 (2002), https://www3.epa.gov/hudson/ROD-tables.pdf.

concentrations would be at or below 0.4 mg/kg. While certain kinds of data sampling may be necessary to fully understand why the remedial action has not yet reached the interim and final targets, the fact remains the cleanup may not meet the five-year target of 0.4 mg/kg for a generation or more if current expectations about recovery rates are correct.[29] Demonstrable accomplishment of the remediation goals contained in the ROD's remedial objectives principally drives whether a remedy is "protective" or "not protective."[30] Where RAOs and/or remedial goals may not be met, EPA must determine what additional review or action is needed.[31]

EPA cannot dismiss the clearly defined interim fish tissue targets at this key juncture as unimportant or meaningless. Although the remedy will not be protective until the ultimate fish tissue goal of 0.05 mg/kg is met, the interim targets of 0.4 mg/kg within five years post-dredging and 0.2 mg/kg within sixteen years post dredging are important benchmarks in evaluating whether the remedy is making adequate progress. EPA's new stance contradicts the fundamental goals of the 2002 ROD, which found "consumption of fish [to be] the major pathway of concern" for exposure to and harm from PCBs.[32] Indeed, the primary factors EPA used to select an appropriate remedy were the "ability to reduce PCB concentrations in fish" and "[t]he time to reach target PCB concentrations in fish."[33]

EPA's claim that more data are needed to make a protectiveness statement simply pushes the recovery of the Hudson River to some unknown and undetermined point in the future. The need for "eight or more years" of post dredging fish data to evaluate the performance of the remedy is predicated on EPA's decision to use a specific statistical test which was not included in the ROD. The current test being used by EPA requires that sufficient data be obtained to show that a statistically significant percentage of annual decline in fish PCB concentrations can be shown with 95% confidence and 80% power. Unfortunately, if the performance of the remedy is such that if a lesser, or no, decline in fish PCB concentrations is observed, use of this test will never result in EPA having enough data. EPA should use an array of evaluation strategies in this FYR to assess if the remedy is protective of human health.

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[29] *See infra* Section VIII.
[30] EPA, COMPREHENSIVE FIVE-YEAR REVIEW GUIDANCE 3-4 (July 2001), https://semspub.epa.gov/work/HQ/128607.pdf [hereinafter COMPREHENSIVE FYR GUIDANCE] (review should include "[d]ata supporting the effectiveness of the remedy in meeting cleanup levels and remedial action objectives" identified in ROD); DEP'T OF ENERGY, GUIDE TO GROUND WATER REMEDIATION AT CERCLA RESPONSE ACTION AND RCRA CORRECTIVE ACTION SITES 7-10 (Oct. 1995), https://www.osti.gov/biblio/179227 [hereinafter DOE GROUNDWATER GUIDANCE] ("The suitability and performance of any completed or ongoing ground water remedial action should be evaluated with respect to the objectives of those actions (e.g., . . . attainment of cleanup levels)."). Thus, where quantifiable remediation goals are not met, EPA may not determine that the remedy is "protective."
[31] COMPREHENSIVE FYR GUIDANCE, *supra* note 30, at 4-9, 4-12.
[32] *Id.* at 54.
[33] *Id.* at 54, 66.

EPA states that "[t]he remedial action was implemented consistent with the expectations of the ROD, and while human health and ecological remedial goals have not yet been achieved, progress is being made toward RAOs presented in the ROD."[34] Progress "towards" is not the measure of quantifiable success criteria outlined in the ROD, and is completely inconsistent with the risk reduction mandate in the Superfund program. **EPA's primary support for the conclusion that the remedy is making "progress toward" is a simple comparison of average fish PCB concentrations[35] without the statistical power cited by EPA as necessary to make a protectiveness determination**. If EPA believes that simple comparisons between fish data from year to year is an appropriate basis for significant conclusions in this FYR, then EPA should look at all of the fish data, species by species, location by location, perform comparisons of the fish PCB concentrations immediately after dredging to the most recent data, and evaluate the performance (or lack thereof) of monitored natural recovery.

The human health and ecological risks remaining from fish consumption are still well in excess of EPA's acceptable risk range used in the Superfund program for both cancer risk and non-cancer health impacts, and with the current post dredging data trends, these unacceptable risks will remain for the foreseeable future. The expectation at the time of remedy selection was that the first interim target of 0.4 parts per million in fish (species and river section length weighted average) would be achieved five years after dredging. This target should have been reached in 2020, and has yet to be achieved.

Given the lengthy and uncertain timeline to reach the remedial goal of 0.05 mg/kg, EPA must be willing to measure the effectiveness of the cleanup against the interim targets, and, importantly, admit when the cleanup is falling short. The failure to address the shortcomings of the remedy to meet the goals within the expected time frames in effect brings the same result that would have occurred if EPA had undertaken no active remediation at all. If EPA does not hold the remedy to the interim fish tissue targets, then it will be impossible to evaluate protectiveness until the MNR period is over, some fifty-five or more years into the future. This is entirely inconsistent with the purpose and requirements of CERCLA, and with the remedy set forth in the 2002 ROD.

[34] DRAFT THIRD FYR, *supra* note 23, at E-3.

[35] *Id.* Progress is being made toward RAOs presented in the 2002 ROD. *See id.* at 46-50.The fish species-weighted average TPCB concentration for the UHR as of 2021 was 0.71 mg/kg. The preliminary 2022 average was 0.58 mg/kg.

D. *The Hudson River Superfund Site Reflects a Legacy of Environmental Injustice*

i. In recent years, EPA has been provided with a mandate and specific tools to address environmental justice issues at Superfund sites

Environmental justice is central to the White House's environmental agenda, guiding its approach to climate change,[36] clean energy,[37] infrastructure,[38] and more.[39] EPA in particular has emphasized its commitment to environmental justice. In September 2022, EPA launched a national Office of Environmental Justice and Civil Rights, with over 200 dedicated staff working to incorporate environmental justice into agency programs, and administering funding to invest in environmental justice.[40]

Not only have the White House and EPA committed to prioritizing environmental justice across the board, but EPA has also specifically provided tools and guidance for cleanup actions such as the Hudson River PCBs Superfund Cleanup. In a July 1, 2021 memo, Regional Superfund Directors were instructed to "protect overburdened communities by requiring responsible parties to take early and expedited cleanup actions, developing more robust enforcement instruments, ensuring the oversight of those enforcement instruments, and building trust and capacity through community engagement."[41] The memo went on to provide specific tools to implement those goals. Regional Superfund Directors were encouraged to take numerous steps to protect overburdened communities, including but not limited to the following:

- Continue to expedite remedial design/remedial action ("RD/RA") negotiations, elevate the focus on completing negotiations within one year, and bifurcate Remedial Design ("RD") and Remedial Action ("RA") where needed to achieve this goal.

- Use CERCLA Section 106(a) to seek judicial action (e.g., an injunction) when a hazardous substance or waste may present an imminent and substantial endangerment to public health or welfare or the environment.

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[36] Exec. Order No. 14,008, 86 Fed. Reg. 7,619 (Jan. 27, 2021).
[37] Exec. Order No. 14,057, 86 Fed. Reg. 70,935 (Dec. 8, 2021).
[38] Exec. Order No. 14,052, 86 Fed. Reg. 64,335 (Nov. 15, 2021).
[39] Exec. Order No. 14,096, 88 Fed. Reg. 25,251 (Apr. 26, 2023).
[40] *EPA Launches New National Office Dedicated to Advancing Environmental Justice and Civil Rights*, EPA, https://www.epa.gov/newsreleases/epa-launches-new-national-office-dedicated-advancing-environmental-justice-and-civil (last updated Sept. 5, 2023).
[41] Memorandum from Lawrence E. Starfield, Acting Assistant Adm'r, Off. of Enforcement and Compliance Assurance to Off. of Site Remediation Enforcement Managers, Regional Superfund Div. Dirs. and Deputies, Regional Counsels and Deputies (July 1, 2021), https://www.epa.gov/system/files/documents/2021-07/strengtheningenvirjustice-cleanupenfaction070121.pdf.

- Utilize unilateral executive orders to compel potentially responsible parties to perform response actions and/or provide resources when negotiations fail or do not result in a timely settlement.

- Review Potentially Responsible Party-led sites designated as "human exposure not under control" to determine if enforcement actions can effectively reduce human exposure.

- Conduct compliance reviews at sites in communities with environmental justice concerns to ensure that remedial requirements in consent decrees, federal facility agreements, and other enforcement instruments are being implemented consistent with the enforcement instrument's schedule, work, and quality expectations.

- Ensure that institutional controls ("ICs") are in place and are monitored for compliance on a regular basis and review ICs to determine if they are having the intended effect or if new ICs are needed.

ii. <u>EPA is not prioritizing environmental justice in the Hudson River Superfund cleanup</u>

Generations of residents of communities along the Hudson River have been exposed to dangerous levels of toxic PCBs, which are linked to numerous severe health problems. Moreover, many of those same communities have also experienced disproportionate health and environmental burdens from other types of pollution. Under New York's recent definition of "Disadvantaged Communities," a designation meant to identify communities facing environmental injustice, the majority of the population along the Hudson River is underserved and overburdened.[42]

The Hudson River PCBs Superfund Site is a quintessential environmental justice issue that demands urgent action from EPA. As described above, Regional Superfund Directors in particular were directed to prioritize environmental justice, and they were provided with specific tools to implement that directive. Despite being given those tools and encouraged to use them, EPA has failed to do so or show any urgency in addressing long standing environmental injustices in and around the Hudson River PCBs Superfund Site.

Rather than eliminating the underlying threat to human health and the environment—dangerous levels of PCBs in the water, sediment, and fish—EPA is relying on fish consumption advisories as an institutional control to protect human health. More simply, rather than making sure that Hudson River fish are safe to eat, EPA

[42] *Disadvantaged Communities*, N.Y. State Rsch. and Dev. Auth., https://www.nyserda.ny.gov/ny/Disadvantaged-Communities (last visited Oct. 31, 2024).

is telling people not to eat the fish. Despite those warnings, many people still eat the fish. Crucially, the people who eat Hudson River fish and rely on them for subsistence are among the most vulnerable members of their communities. In effect, that means EPA is shifting the burden from itself to individuals and communities that are already marginalized, underserved, and overburdened by disproportionately high levels of pollution. That is the opposite of environmental justice. The recent EPA memo to Regional Superfund Directors instructed them to ensure that institutional controls "are monitored for compliance on a regular basis and review[ed] to determine if they are having the intended effect."[43] EPA's fish consumption advisories, however, are based on angler surveys from the 1990s; we simply do not know how many people are currently being put at risk because they are eating fish from the Hudson. Regardless, even one person is too many.

The entire Hudson River PCBs Superfund Site, including the many overburdened communities living along the Hudson, has waited far too long for relief from toxic PCB pollution. If EPA does not act, these communities that live, work, and fish along the Hudson River will continue being exposed to high levels of PCBs through the air, water, sediment, and fish for generations to come.

[43] Memorandum from Lawrence E. Starfield, *supra* note 41, at 3.

IV. The Hudson River Five-Year Review Process

Under Section 121(c) of CERCLA, EPA must review the status of any remedial action that results in hazardous substances remaining onsite "to assure that human health and the environment are being protected by the remedial action being implemented."[44] Such review must be conducted no less than every five years.[45] If EPA determines that further action is necessary based on a Five-Year Review conducted pursuant to Section 121(c), it "shall take or require such action."[46] This duty is non-discretionary.

FYRs are intended to evaluate the implementation and performance of remedial actions. Through this process, EPA must determine whether the selected remedy is "protective of human health and the environment"[47]—or, whether the cleanup is working and activities to date will achieve the RAOs. In an FYR, EPA should consider the human health and ecological risks as well as the general performance of the selected remedy in order to assess the protectiveness of the cleanup. EPA must then make a "protectiveness determination."

In assessing the protectiveness of the remedy, EPA will consider whether the remedy is functioning as intended by the ROD, and whether there are problems with the implementation of the remedy that could suggest that protectiveness is at risk. EPA will also consider whether the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid—for example, whether there have been changes to Applicable or Relevant and Appropriate Requirements ("ARARs") or the discovery of new contaminants, new health or ecological exposure pathways or receptors have been identified, or there have been changes in the physical site conditions.

Because remedial construction is complete at the Hudson River PCBs Superfund Site, EPA must make a site-wide protectiveness determination, which should "generally be the same protectiveness determination as the least protective [Operable Unit] at the site."[48] In addition, because the OU2 remedy here includes the use of institutional controls by way of the NYSDOH fish consumption advisories, EPA must also evaluate the "current and long-term effectiveness" of the fish consumption advisories and include "relevant information" about the advisories as "part of the

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[44] 42 U.S.C. § 9621(c); *see also* 40 C.F.R. § 300.430(f)(4)(ii).
[45] 42 U.S.C. § 9621(c).
[46] *Id.*
[47] *Id. at § 9621(d)(1).*
[48] Memorandum from James E. Woolford, Dir., Off. of Superfund Remediation and Tech. Innovation and Reggie Cheatham, Dir., Fed. Facilities Restoration and Reuse Off. to Nat'l Superfund Program Managers, Region 1-10 2 (Sept. 2012), https://semspub.epa.gov/work/HQ/174829.pdf.

protectiveness determination."[49]

There are five possible conclusions EPA may reach about the protectiveness of the remedy in a five-year review:

1) Protective;

2) Will be protective;

3) Short-term protective;

4) Protectiveness cannot be determined (or "protectiveness deferred");

5) Not protective.

In an FYR, EPA is directed to answer three questions "based on and sufficiently supported by data and observations"[50] and then make the most appropriate protectiveness determination as guided by the condition of the river and the best available data analysis.

The questions and the topics to be included under each question include (but are not limited to) the following:

Question A: Is the remedy functioning as intended by the decision documents? Topics include remedial action performance and monitoring results; system operations/operations and maintenance; costs of system operations/operations and maintenance; opportunities for optimization; early indicators of potential remedy problems; and implementation of institutional controls and other measures.

Question B: Are the exposure assumptions, toxicity data, and RAOs used at the time of the remedy still valid? Topics include changes in exposure pathways; changes in land use; new contaminants and/or contaminant sources; remedy byproducts; changes in standards, newly promulgated standards, and "to be considered-"; changes in toxicity and other contaminant characteristics; expected progress towards meeting RAOs; and risk recalculation/assessment (as applicable).

Question C: Has any other new information come to light that could call into question the protectiveness of the remedy? Topics include ecological risks; natural disaster impacts; and any other information that could call into question the protectiveness of the remedy.

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[49] EPA, RECOMMENDED EVALUATION OF INSTITUTIONAL CONTROLS: SUPPLEMENT TO THE "COMPREHENSIVE FIVE-YEAR REVIEW GUIDANCE" 2 (Sept. 2011), https://www.clu-in.org/conf/tio/NARPMPresents10/IC-5YR-supplement-guidance-FINAL-09.14.2011.pdf [hereinafter FYR GUIDANCE SUPPLEMENT].
[50] *See* COMPREHENSIVE FYR GUIDANCE, *supra* note 30, at 1-1.

The Consent Decree for the Hudson River PCBs Superfund Site clarifies that the information and conditions that will be considered "previously unknown" by EPA shall include that information and those conditions

> known to EPA as of the date of lodging of this Consent Decree and set forth in the Record of Decision, the administrative record supporting the Record of Decision, the documents issued by EPA with respect to the Site between the issuance of the ROD and the date of lodging of this Consent Decree, any information receive by EPA pursuant to the requirements of the [Administrative Order on Consent, Index No. CERCLA-02-2002-2023] or [Administrative Order on Consent for Remedial Design and Cost Recovery] prior to the date of lodging of this Consent Decree, any data regarding PCB levels in the water column, sediments, or fish at the Site generated by EPA or that EPA received from any person prior to the date of lodging of this Consent Decree, and any data or information submitted by [GE] to EPA Region 2, in writing, with respect to the Site prior to the date of lodging of this Consent Decree."[51]

Essentially, any information or conditions that EPA knew or should have known about prior to the lodging of the Consent Decree in 2005 will not be considered new information; but information that came to light after that date can be considered under Question C.

The First Five-Year Review for the Hudson River PCBs Superfund Site—which EPA started and completed in only sixty days—was released on June 1, 2012 with a conclusion that "the remedy at OU2 will be protective of human health and the environment upon completion. In the interim, human exposure pathways that could result in unacceptable risks are being controlled."[52]

While the First FYR acknowledged that high levels of contamination in areas outside of the dredging footprint would delay reaching the 2002 ROD goals within the expected timeframes,[53] EPA offered no recommendations for appropriate action to achieve the protectiveness goals. Due to EPA's failure to recognize and adaptively manage the predicted shortcomings of the remedy,

In the Final Second FYR, begun on June 1, 2017 and finalized in 2019, EPA offered a "protectiveness deferred" determination despite acknowledging that remedy was currently not protective of human health and the environment.

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[51] Consent Decree at 63, United States v. Gen. Elec. (Oct. 2005), https://www.epa.gov/sites/default/files/2020-01/documents/consent_decree.pdf.

[52] *See* EPA, First Five-Year Review Report for the Hudson River PCBs Superfund Site iii (June 2012), https://www3.epa.gov/hudson/pdf/Hudson-River-FYR-6-2012.pdf [hereinafter First FYR].

[53] *Id.* at 33-34.

It should be noted that during the Second FYR process, EPA's sister agencies, (also tasked with Superfund responsibilities) and New York State issued warning statements flagging potential problems with the Upper Hudson RA.

- The National Oceans and Atmospheric Administration stated that "[r]ecovery of the Upper and Lower Hudson will not be reached due to elevated PCBs remaining in surface sediment equivalent to a series of Superfund Sites being left behind."[54]

- The New York State Department of Environmental Conservation ("NYSDEC") issued a "parallel review" of the effectiveness of the cleanup to date and found that "[t]he remedy is not protective of human health and the environment based on uncontrolled risks, and EPA should undertake all necessary actions to ensure that the remedy becomes fully protective to the benefit of the people of New York State."[55]

- The New York State Attorney General stated in late 2016, "it is now clear that the remedy has not met the remedial action objective of reducing PCB concentrations in fish to 0.4 mg/kg by 2016, and may not reach the ROD's more dramatic reductions to 0.05 mg/kg."[56]

- An independent panel of scientists convened by the Hudson River Foundation issued its review of the effectiveness of the cleanup and found, "[b]ased on 2016 post-dredging monitoring, [total] PCB concentrations in fish throughout the Upper and Lower Hudson remain above interim target levels and remediation goal specified in the ROD."[57]

As discussed further, based on the currently available data, EPA must determine that the OU2 remedy is not protective.

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[54] *See* L. Jay Field, John W. Kern & Lisa B. Rosman, *Re-Visiting Projections of PCBs in Lower Hudson River Fish Using Model Emulation*, 557-558 Sci. of the Total Env't 489 (2016).
[55] Dep't of Env't Conservation, Recommendations to EPA for the "Five Year Review Report" for Hudson River PCBs Site 3 (Dec. 2016), https://extapps.dec.ny.gov/docs/fish_marine_pdf/hudsondredging5yr.pdf [hereinafter DEC Recommendations] .
[56] Letter from Maureen F. Leary, Assistant Att'y Gen., N.Y. Att'y Gen.'s Off., Env't Prot. Bureau, to Judith Enck, Regional Adm'r, EPA and Walter Mugdan, Dir., Emergency and Remedial Response Div., EPA 4 (Sept. 16, 2016), https://www.scenichudson.org/wp-content/uploads/legacy/9.16.16_Letter-NYOAG-to-EPA-re-cleanup-failure.pdf.
[57] Kevin J. Farley et al., An Independent Evaluation of the PCB Dredging Program On the Upper Hudson and Lower Hudson River 17 (June 2017), https://www.hudsonriver.org/wp-content/uploads/2018/10/Farley-et-al-2017.pdf.

V. Answering the Three Five-Year Review Questions Results in the Conclusion that the Upper Hudson River Remedy is Not Protective of Human Health and the Environment

A. Question A: Is the remedy functioning as intended by the decision documents?

At this time, the human health and ecological remedial goals set forth in the 2002 ROD have not been achieved. The post-dredging data indicate that the remedy's outcomes are inconsistent with modeling analysis and expectations presented in the ROD. Fundamentally, MNR is not occurring as modeled. Analysis of available data shows that full achievement of human health and ecological remedial goals will likely take decades, and that very little progress is being made toward the interim targets set by EPA for relaxing fish consumption advisories.[58] Even allowing for uncertainty in the modeled rates of decline, the fact that concentrations remain significantly above the predicted thresholds strongly indicates that the remedy is not functioning as was intended at the time of selection.

EPA chose an active remedy under which significant amounts of PCBs would be removed from the sediments of the Upper Hudson by dredging, largely based upon the time it would take to achieve targeted fish PCB concentrations after the completion of active remediation.[59] This was necessary, according to EPA, to protect the human and ecological receptors exposed to PCBs by eating fish, as any delay in achieving the remediation goals would increase the risk of harmful exposure to PCB contamination.[60] Moreover, the agency understood that fish consumption advisories were not completely effective and can never apply to ecological receptors, making the time to meet the targeted reductions in fish PCB concentrations a primary consideration in remedy selection.[61]

Based on fish sampling data gathered by EPA, we can predict that it will take significantly more than ten additional years to achieve the preliminary remediation

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[58] *See* THE FRIENDS OF A CLEAN HUDSON, AN INDEPENDENT REVIEW OF EPA'S UPPER HUDSON RIVER PCB DREDGING REMEDY 12–13 (Nov. 2023), https://www.clearwater.org/wp-content/uploads/2024/02/November-10-2023_FOCH-Independent-Review-of-Upper-Hudson-River-Dredging-Remedy-1.pdf [hereinafter FOCH REPORT].

[59] *See* 2002 ROD, *supra* note 13, at 66–67.

[60] *See, e.g.*, *id.* at 37–39 (modeling both lifetime excess cancer risk and non-cancer hazard quotient as functions of chronic daily exposure, which itself represents a time-dependent measure of average intake over a projected seventy-year period).

[61] *See id.* at 79.

goals set forth in the 2002 ROD. The model which EPA relied upon during remedy selection predicted a seven to nine percent per year decline in fish tissue PCB concentrations,[62] but actual data show consistently lower recovery rates.[63] As a result, the risks to human health and the environment remain above EPA's acceptable risk range.

"Acceptable risk ranges" for human health as used in the Federal Superfund program, also known as "acceptable exposure levels," have two criteria: excess cancer risk, and the non-cancer health effect metric of "hazard index."[64] In the 2002 ROD, EPA stated that the acceptable cancer risk range for a reasonable maximum exposure ("RME") individual is below 10^-6, corresponding to a 1 in 1,000,000 excess lifetime risk of developing cancer.[65] At the time the 2002 ROD was issued, the cancer risk from PCB exposure in the Upper Hudson was stated as 1 in 1,000 for an RME individual.[66] For non-cancer health effects, the 2002 ROD estimated a hazard index of between 7 and 12 for an average exposure, while the RME resulted in a hazard index of between 65 and 104.[67] In contrast, EPA's goal for the RME population was a non-cancer hazard index of less than 1.[68]

Both excess cancer risk and the non-cancer hazard index associated with PCB exposure in the Upper Hudson are failing to meet the cleanup targets. Even taking into account reductions in fish PCB concentrations since the 2002 ROD was issued (approximately a threefold decrease), the risks posed by PCB exposure in the Upper Hudson still significantly exceed levels understood to be protective of human health.[69]

Current and future concentrations of PCBs in the sediment in the Upper Hudson River are expected to limit the ability to achieve the targets for PCBs in fish. The rapid reduction in sediment concentrations post-dredging did not occur as anticipated in the 2002 ROD, nor has natural recovery occurred at the expected rate.[70] Instead, PCB concentrations in the top two inches of river sediment, as measured by sediment

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[62] DRAFT THIRD FYR, *supra* note 23, at 38.
[63] *See* FOCH REPORT, *supra* note 58, at 11.
[64] 40 C.F.R. § 300.430(e)(2)(i)(A).
[65] *See* 2002 ROD, *supra* note 13, at 37. The reasonable maximum exposure is defined as the highest exposure to the hazardous substance that is reasonably expected to occur at a site. *Id.* at 32.
[66] *Id.* at 38.
[67] *Id.* at 39. Hazard index is calculated as the sum of all hazard quotients for the various chemicals and pathways of exposure at a site. A hazard quotient, in turn, is calculated as the ratio of actual exposure to a hazardous substance relative to the threshold level at which non-cancer human health impacts are no longer expected. For example, a hazard quotient of 2 indicates that the exposure level is currently double the level at which health effects are not expected. *See id.* at 38–39.
[68] *Id.*
[69] *See* FOCH REPORT, *supra* note 58, at 13.
[70] *Id.* at 10.

sampling in 2016–2017 and again in 2022, have changed very little since dredging was completed.[71]

The failure of EPA's model to accurately predict remedy performance may be attributed in part to incorrect assumptions about the magnitude and extent of remaining bioavailable contaminated sediment in the Upper Hudson River. While GE removed more sediment than was initially targeted in the ROD, less than 76% of total PCB mass was actually removed.[72] Similarly, the average surface sediment PCB concentrations after dredging for the top two inches of sediment are two to three times higher than anticipated in the 2002 ROD.[73] The model EPA used to inform the cleanup did not accurately capture the extent of contamination or accurately predict the length of time required to reduce unacceptable risk.

In fact, EPA has known that the models used in the 2002 ROD substantially underestimated PCB concentrations in surface sediment since at least 2012.[74] PCBs remaining after dredging in the surface sediment continue to be bioavailable, contributing to the recontamination of dredged areas and prolonging loading to the Lower Hudson River.

To address inaccurate assumptions about sediment concentration at the time of remedy selection, EPA must reevaluate the cleanup levels used in the 2002 ROD using post-dredging data and determine what changes to the cleanup levels need to be made to meet the overall remediation goals. The 2002 ROD set different cleanup levels for river sediment depending on where the dredging was to be done. In the first six miles from Fort Edward to the Thompson Island Dam, the cleanup levels established were a concentration of 10 mg/kg (ppm) of Tri+ PCBs in the surface top 12 inches and a mass per unit area of 3 grams of PCB per square meter of river bottom (g/m^2).[75] For the remaining portion of the Upper Hudson from the Thompson Island Dam downstream to the Federal Dam at Troy, the cleanup levels were set at 30 mg/kg and 10 g/m^2.[76]

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[71] *See id.* at 10.

[72] *See* EPA, Final Second Five-Year Review Report for the Hudson River PCBs Superfund Site 5 (Apr. 2019), https://www.epa.gov/sites/default/files/2019-04/documents/hudson_final_second_five-year_review_report.pdf [hereinafter Second FYR] ("EPA estimates that approximately 76 percent of the overall PCB mass from the Upper Hudson River was removed by the dredging").

[73] *Compare* FOCH Report, *supra* note 58, at 11, *with* First FYR, *supra* note 52, Appendix A, Table 1.

[74] First FYR, *supra* note 52, at 52 ("Over the past few years, there have been several discussions and analyses regarding the differences between the concentrations used in the ROD and the ones developed from the [Sediment Sampling and Analysis Program]. Concerns have been raised that the remedial design as currently planned will not yield the level of improvement in surface sediment concentrations of Tri+ PCBs anticipated by the ROD in all river sections.").

[75] *See* 2002 ROD, *supra* note 13, at 94.

[76] *Id.* at 95.

Weaknesses in sampling design likewise have underestimated the extent of remaining contamination. Sampling design after the completion of dredging has de-emphasized cohesive (fine-grained) sediment areas in River Sections 2 and 3,[77] which were identified as the most important primary source of PCBs to the food web and were shown to have the highest surface concentrations in areas surrounding the dredged areas.[78] During remedial design sampling, EPA established a sampling grid over cohesive sediment areas in River Sections 2 and 3 where PCB deposits were known to be found.[79]

Between 2002 and 2005, EPA's remedial sampling design identified numerous locations in River Section 2 and River Section 3 where Tri+ PCBs in the surface twelve inches exceeded the surface sediment target cleanup levels for River Section 1.[80] Due to the high target cleanup levels established for River Sections 2 and 3, areas identified for dredging only captured part of the contaminated sediment.[81] These areas represent important PCB deposits, likely remaining in the bioavailable surface layer, that must be evaluated.

In addition, EPA's current approach to sampling only examines the top two inches of sediment, biased towards non-cohesive areas outside the dredge boundaries.[82] For example, in River Section 2, cohesive sediments represent only 20% of the surface area outside the dredge boundaries.[83] However, EPA indicated during remedy selection that at least the top twelve inches of sediment may be bioavailable and contributing to ongoing fish contamination.[84] EPA's current sampling approach substantially underestimates the amount of bioavailable PCBs, which affects EPA's ability to understand how PCB concentrations in sediment are continuing to impact PCB concentrations in fish, re-contaminating dredged areas, and contributing to loading in the Lower Hudson River.

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[77] *See* Draft Third FYR, *supra* note 23, at 44.
[78] *See* 2002 ROD, *supra* note 13, at 22. EPA's bioaccumulation modeling assumed that cohesive sediment represented 75% of PCB exposure to the food web, while GE's models assumed 100%.
[79] Draft Third FYR, *supra* note 23, at 44.
[80] *See, e.g.*, Gen. Elec. Co., Hudson River PCBs Site Phase 2 Dredge Area Delineation Report 3-1 (Dec. 17, 2007), https://www.epa.gov/sites/default/files/2019-12/documents/phase2_dad_report.pdf ("The RD Work Plan specifies that, in River Section 3, sediments with an MPA_{3+} exceeding 10 g/m^2 in areas where burial has not been a significant ongoing process may be left in place consistent with the ROD criteria for that river section.").
[81] *Id.*; *see also* Jay Field et al., Hudson River Remedy: Unremediated PCBs and the Implications for Restoration, https://pub-data.diver.orr.noaa.gov/admin-record/6306/Battelle1_Field.final1.pdf.
[82] *See,* Draft Third FYR, *supra* note 23, at 19.
[83] First FYR, *supra* note 52, at Appendix A Table 1.
[84] *See, e.g.*, *EPA Issues Decision on General Electric's Dispute over Hudson River Areas Delineated and Targeted for Dredging*, EPA (July 22, 2004), https://www.epa.gov/archive/epapages/newsroom_archive/newsreleases/2b62bd623840f6628525713e006d0443.html.

The data do not support an argument that upstream loads are a cause of elevated PCB concentrations in sediment and fish. Remedial work at the GE plant sites was designed to achieve an average surface water PCB concentration of two nanograms per liter at Rogers Island, downstream of both GE plants and upstream of the dredged areas. Surface water monitoring has thus far shown that this goal has been met.[85] It is therefore unlikely that residual loads north of Rogers Island are causing the consistently high PCB levels observed.

B. Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

EPA has failed to acknowledge in the FYR any new information related to exposure assumptions or toxicity data that could impact the human health risk assessment. This is contrary to the weight of research and evidence now available.

First, EPA's current assumptions regarding PCB toxicity no longer reflect the international consensus. While EPA still classifies PCBs as probable human carcinogens,[86] the International Agency for Research on Cancer has listed PCBs as a known human carcinogen since 2013.[87] In addition, dioxin-like PCBs can now be evaluated via EPA's Integrated Risk Information System ("IRIS") listing of non-cancer endpoints for dioxin, as well as several additional toxicological endpoints which have been updated in terms of health effects.[88]

The exposure assumptions used in developing the selected remedy are based upon a 1991 survey to determine fish consumption rates, locations, and species for the risk assessments. This survey should be updated to confirm that the exposure assumptions made are still representative of this site. The toxicity information used, the IRIS database, needs to be updated by EPA; these updates should be expedited in order for EPA to have a current understanding of the risks posed by remaining PCB contaminated sediment at the site. The cleanup levels used for sediment at the site are based primarily on the risk assessment work and on the predictive computer model work done in the late 1990s.

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[85] Draft Third FYR, *supra* note 23, at 40–41.
[86] *See generally* EPA, Integrated Risk Systems Information Chemical Assessment Summary: Polychlorinated Biphenyls (May 1, 1989), https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0294_summary.pdf [hereinafter EPA IRIS for PCBs].
[87] *See generally* World Health Org. Int'l Agency for Rsch. on Cancer, *supra* note 7.
[88] *Risk Assessment for Dioxin at Superfund Sites,* EPA, https://www.epa.gov/superfund/risk-assessment-dioxin-superfund-sites#toxicity (last updated June 5, 2024).

Assumptions about site uses relied upon by the 2002 ROD may understate the actual risks associated with PCB exposure to humans, as the fish consumption advisories issued by the State Department of Health continue to allow for uncontrolled human exposure to PCBs in fish. Significant changes in demographics and fish consumption patterns on the Hudson River, particularly in the Lower Hudson, mean that more people are relying on Hudson River fish for subsistence than at the time the ROD was issued.

Recent angler surveys have reflected this trend, reporting widespread consumption of fish from the Hudson River despite the existence of longstanding NYSDOH fish consumption advisories. Between 2012 and 2016, the Cornell Cooperative Extension received 1,338 responses to its Dutchess County fish consumption surveys, finding that approximately 10% of those surveyed ate Hudson River fish.[89] Of the respondents, 54% reported that they were unaware of local fish consumption advisories.[90] In 2013, NYSDOH presented preliminary results of its own angler survey showing even higher consumption percentages (near 50%), also noting that awareness of fish consumption advisories in the more populated and linguistically diverse Lower Hudson was about half as high as in the Mid- and Upper Hudson regions.[91]

Since 2000, additional populations that rely on subsistence fishing have moved into Mid- and Lower Hudson River communities, and surveys indicate that these anglers feed fish to their families.[92] The FYR fails to consider these changes in subsistence fish consumption patterns, which increase exposure and human health risks. In addition, people are currently consuming small forage fish in ways that have not been included in the human health risk assessment, such as utilizing whole or untrimmed fish that contain higher levels of contamination.[93] Previous risk assessments were limited to the risks of consuming larger, traditional trophy or game fish, such as bass and perch.[94] It is important that exposure assumptions take into account all of the consumption patterns in order to accurately capture the risks that the Hudson River Superfund Site poses to human health.

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[89] *See* N.Y. State Dep't of Health, Hudson River Fish Advisory Outreach Project Update 2009-2016 Appendix: Preliminary Results of Hudson River Fish Consumption Surveys, 17 (Sep. 2016), https://www.health.ny.gov/environmental/outdoors/fish/hudson_river/docs/hrfaappendix.pdf.
[90] *Id.*
[91] *See id.* at 6, 20; Community Advisory Group (CAG) Hudson River PCBs Superfund Site, Meeting Summary 5-6 (Sep. 19, 2013), https://hudsoncag.wspis.com/files/Final%20Meeting%20Summary_Sept192013.pdf.
[92] *See* Michael Garcia, Scenic Hudson & Sierra Club, Hudson River Angler Study (Dec. 2016), http://www.scenichudson.org/sites/default/files/HR_Angling_Study.pdf.
[93] *E.g.,* N.Y. State Dep't of Health, Hudson River Fish Advisory Outreach Project Update, *supra* note 89, at 39.
[94] *See* 2002 ROD, *supra* note 13, at 33.

Second, the fundamental projection of what cleanup level in sediment would be necessary to achieve the remedial goals in the ROD must be revisited and updated based on data obtained post-dredging. As discussed above, these data show both that the mass of PCBs remaining in the river is greater than was believed at the time of remedy selection and that natural recovery is not occurring at the predicted rate.

EPA also continues to rely on the assumption stated in the 2002 ROD that the six-mile area upstream of the Thompson Island Dam, which was the first river section to be remediated, was the primary source of PCBs to the rest of the river.[95] This assumption was the primary basis for EPA's decision to set less stringent cleanup levels for the portion of the river downstream of the Thompson Island Dam. Adherence to these cleanup levels resulted in significant masses of PCBs remaining in the thirty-four miles of Upper River downstream to Troy, which continue to be bioavailable within the river.

Finally, recent science indicates that exposure to PCBs through inhalation is a more significant risk than previously believed. The RAOs, as formulated based on EPA's original risk assessment, are primarily intended to control unacceptable PCB exposures through consumption of contaminated food (i.e., fish).[96] However, since 2002, the scientific community has documented that exposure to PCBs can occur through contaminated water, direct skin contact, or breathing contaminated air.[97] In a 2015 Review of Scientific Literature, David O. Carpenter, M.D., presents information indicating that the inhalation of vapor-phase PCBs may be as or even more important than ingestion via fish consumption and other animal fats for causing negative human health impacts.[98] The research highlights the severity of the potential risks from "volatilized" or airborne PCBs, which have been associated with certain chronic illnesses—such as cancer, cardiovascular disease, hypertension, and diabetes—even at relatively low levels.[99]

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[95] 2002 ROD, supra note 13, at 28.

[96] EPA's program and regional offices identify human exposure pathways and estimate the amount of human exposure under different exposure scenarios. *See* EPA, REFERENCE DOSE (RFD): DESCRIPTION AND USE IN HEALTH RISK ASSESSMENTS 1.3.3 (Mar. 15, 1993), https://www.epa.gov/iris/reference-dose-rfd-description-and-use-health-risk-assessments. This exposure assessment is then combined with the hazard information and toxicity values from IRIS to characterize potential public health risks. *Id.* at 1.3.4.

[97] *See* EPA IRIS FOR PCBS, *supra* note 86.

[98] *See* David Carpenter, *Exposure to and Health Effects of Volatile PCBs*, 30 REVS. ON ENV'T HEALTH 81 (2015).

[99] *See* M. Kouznetsova et al., *Increased Rate of Hospitalization for Diabetes and Residential Proximity of Hazardous Waste Sites*, 115(1) ENV'T HEALTH PERSPECTIVES 75 (2007); Alexander Sergeev & David Carpenter, *Hospitalization Rates for Coronary Heart Disease in Relation to Residence Near Areas Contaminated with Persistent Organic Pollutants and Other Pollutants*, 113(6) ENV'T HEALTH PERSPECTIVES 756 (2005).

The cleanup levels set forth in the 2002 ROD for the sediment-dredging element of the remedy were risk-based. EPA established these targets based on the anticipated risk reduction that would occur as a function of reductions in fish PCB concentrations following sediment removal and natural recovery. Because PCB concentrations have not decreased as predicted by EPA's model, the reduction in risk is likewise less than expected. Likewise, overall site risks may be understated, as the risks of PCB exposure to humans and wildlife are based on outdated assumptions regarding toxicity and exposure pathways that EPA is still in the process of evaluating on a national basis. In light of data indicating the PCB levels consistently exceed EPA's model predictions for the Hudson River, these assumptions must be revisited to assess their continued validity.

C. Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

In answering this third question, all new information, including monitoring data gathered during remedy implementation and during post-remedial monitoring, should be evaluated to determine if any such information would lead the reviewer to conclude that the remedy is not protective. As discussed above, the data obtained since the 2002 ROD was issued and since the dredging remedy was implemented indicate that a significant mass of bioavailable PCBs was left behind in the surface sediments of the Hudson River. These data also indicate that the anticipated rapid decline in surface sediment PCB concentrations—and as a result, a corresponding rapid decline in fish PCB concentrations—is not occurring.

The decision-making process that led to the ROD relied on a complex suite of human health risk assessment tools and guidelines, as well as multiple sediment and water sampling programs. Those were in turn used by EPA and GE as the baseline informational database used in multipart mechanistic mathematical models to forecast future concentrations of PCBs in the Hudson River.[100] While the extensive body of scientific "information" for the site was appropriately employed in the remedy selection, EPA has failed to apply that same diligence to the evaluation of the newest scientific analysis and actual project data in the Draft Third FYR.

Post-ROD data collected after 2002 show higher levels of surface sediment contamination than anticipated in portions of River Sections 2 and 3 that were not targeted for dredging.[101] In fact, analyses of post-ROD data indicate that post-remediation PCB concentrations remain as much as five times higher than

[100] *See* DEC RECOMMENDATIONS, *supra* note 55, at 18-19.,
[101] *See* FOCH REPORT, *supra* note 58, at 11.

assumed by the ROD.[102] These residuals raise significant scientific uncertainty as to whether all RAOs, including target PCB levels in fish, will be fully achieved.

In addition, fish lipid concentrations in River Sections 2 and 3 have declined continuously post-dredging without clear explanation.[103] Given that PCBs accumulate in body lipids, declines in total lipid concentration can cause decreases in total PCB levels, even as lipid-normalized levels indicate a lack of meaningful decline. These trends must be better assessed in order to accurately evaluate the performance of the remedy.

Post-Phase 1 modeling by GE validated the ROD's conclusions that dredging of contaminated sediment does not impede recovery of the river through resuspension of PCBs, but rather achieves significant progress towards RAOs by removing PCBs from the system.[104] However, neither this model nor any other updated sediment transport or bioaccumulation model has been used to date to evaluate how much higher-than-expected surface sediment PCB concentrations outside of the area targeted for dredging will impact the ability of the remedy to be protective of human health and the environment in the future.

Taken together, this information is more than sufficient to call the protectiveness of the remedy into question.

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[102] *Compare id. with* FIRST FYR, *supra* note 52, App. A, Table 1.
[103] *See* DRAFT THIRD FYR, *supra* note 23, App. 3 at 17.
[104] *See* EPA, HUDSON RIVER PCBS SITE EPA PHASE 1 EVALUATION REPORT ES-18 (Mar. 2010), https://www.epa.gov/sites/default/files/2020-01/documents/2010-03-15_phase_1_evaluation_report_text.pdf.

VI. EPA Has a Duty to Ensure the Remedial Action Objectives Are Met

A. EPA Set Clear Goals for Protection of Human Health and the Environment in the 2002 Record of Decision and Cannot Redefine the Measure of Success

Setting clear, identifiable remediation goals by which success or failure of a remedy can be measured is at the heart of CERCLA. In the absence of these goals, EPA would be without a measurable standard by which to demonstrate satisfaction of its duty to protect human health and the environment. Moreover, there would be no measurable standard by which EPA and potentially responsible parties—in this case, GE—could be held accountable.

EPA cannot ignore the RAOs and the interim target concentrations outlined in the 2002 ROD for the Upper Hudson River cleanup remedy. Specifically, EPA established an RAO for the Hudson River PCBs site to "reduce the cancer risks and non-cancer health hazards for people eating fish from the Hudson River by reducing the concentration of PCBs in fish."[105] In addition, EPA adopted two interim target concentration goals of 0.4 mg/kg and 0.2 mg/kg PCBs in fish fillet to facilitate the relaxation of the fish consumption advisories and fishing restrictions.[106] EPA's models projected that these two target concentrations would be attained within five years and sixteen years of completion of dredging, respectively.[107] While it is understood that the Upper Hudson River cleanup remedy will not be fully protective of human health and the environment until the risk-based PRG for protection of human health (0.05 mg/kg PCBs in fish fillet) is achieved, the interim targets remain important benchmarks in evaluating whether the remedy is performing as anticipated.

EPA projected that it would take at least ten additional years for monitored natural attention to reach the 0.4 mg/kg and 0.2 mg/kg PCB interim target levels, as compared to the active remediation alternatives.[108] According to EPA's statements in the 2002 ROD, such a delay renders the remedy not protective. There is an unacceptable risk to human health and the environment from consumption of fish from the Hudson

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105 2002 ROD, *supra* note 13, at 50.
106 *Id.*
107 *Id.* at 103.
108 *Id.*

River. EPA selected active remediation for the site to ensure that this unacceptable risk does not continue for additional decades.[109]

EPA has repeatedly dismissed the importance of these interim targets. Distressingly, in a 2016 letter to NYSDEC, EPA implied that numeric goals for PCB levels in fish established in the 2002 ROD are no longer mandatory targets for the cleanup, but merely "interim milestones that, once achieved, might allow fish advisories to be relaxed somewhat."[110] EPA also stated that the goals of the selected remedy "do not include specific years in which specified PCB levels need to be achieved in fish in order for EPA to deem the remedy protective."[111]

EPA's statements are irresponsible and contrary to the fundamental goals of the 2002 ROD, which found "consumption of fish [to be] the major pathway of concern" for exposure to and harm from PCBs.[112] Indeed, the primary factors EPA used to select an appropriate remedy were its "ability to reduce PCB concentrations in fish"[113] and "[t]he time to reach target PCB concentrations in fish."[114] These remain the touchstones of a successful and protective cleanup today. For the EPA to suggest otherwise ignores the current dangers posed by unaddressed PCBs in the Hudson. If EPA ignores the interim fish tissue targets, then it may be impossible to evaluate protectiveness until the MNR period is over, some fifty-five or more years into the future. This is entirely inconsistent with the purpose and requirements of CERCLA, and with the remedy set forth in the 2002 ROD.

There is no question that the Upper Hudson River remedy failed to hit the first remediation target concentration of 0.4 mg/kg PCB in fish filet in 2020, and fish sampling data collected through 2023 continue to show that the concentration of PCBs in species-weighted fish fillet remain above the 0.4 mg/kg target, even three years after the initial target date. Given the lengthy and uncertain timeline to reach EPA's PRG of 0.05 mg/kg, EPA must be willing to measure the effectiveness of the cleanup against the interim targets, and, importantly, admit that the cleanup is not performing as anticipated and is therefore not protective of human health and the environment.

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[109] *Id.* at 102 ("Through the analyses conducted for the Reassessment RI/FS, EPA has determined that there is an unacceptable risk to human health and the environment from the consumption of fish from the Hudson River. It has also been determined that the unacceptable risk will continue for many decades without active remediation of the PCB-contaminated sediments and control of the upstream sources. Accordingly, the No Action alternative is not protective of human health and the environment and therefore could not be selected for the Site.").

[110] Letter from Judith Enck, EPA Region 2 Admin. to Basil Seggos, N.Y. Dep't of Env't Conservation Comm'r 3 (Dec. 16, 2016), http://bloximages.chicago2.vip.townnews.com/poststar.com/content/tncms/assets/v3/editorial/c/dd/cdd3e1d5-03bb-.

[111] *Id.*

[112] 2002 ROD, *supra* note 13, at 54.

[113] *Id.*

[114] *Id.* at 66.

VII. A "Protectiveness Deferred" Determination is Inappropriate for the Hudson River Remedy According to EPA Guidance

A. Based on the facts, data analysis and status of the OU2 Remedy, the only protectiveness determinations even potentially available to EPA for the Third FYR are (i) not protective or (ii) protectiveness cannot be determined

According to EPA's Comprehensive Five Year Review Guidance, the purpose of a Five-Year Review is to "…evaluate the implementation and performance of a remedy in order to determine if the remedy is or will be protective of human health and the environment… Evaluation of the remedy should be based upon and sufficiently supported by data and observations."[115]

The remedial objective in the 2002 ROD specific to fish tissue concentrations and human health is to "[r]educe the cancer risks and non-cancer health hazards for people eating fish from the Hudson River by reducing the concentration of PCBs in fish."[116] As discussed above, EPA evaluated five remedial alternatives in the 2002 ROD. In doing so, EPA stated that "[t]he time to reach target PCB concentrations in fish was a primary factor in comparing remedial alternatives."[117]

Quantifiable remediation goals are key components of the FYR process, where "EPA . . is legally responsible for making [a] protectiveness determination" for ongoing or completed remedies."[118] In other words, demonstrable accomplishment of the remediation goals contained in the Record of Decision's remedial objectives principally drives whether a remedy is "protective" or "not protective."[119] Where RAOs and/or remedial goals may not be met, EPA must determine what additional review or action is needed.[120]

EPA asserts that it does not have sufficient data to predict future trends in fish tissue concentrations and needs more years of data to "draw statistically-based

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[115] Comprehensive FYR Guidance, *supra* note 30, at 1-1.
[116] 2002 ROD, *supra* note 13, at 50.
[117] *Id.* at 66.
[118] *See* FYR Guidance Supplement, *supra* note 49, at 4..
[119] *See* Comprehensive FYR Guidance, *supra* note 30, at 3-4 (review should include "[d]ata supporting the effectiveness of the remedy in meeting cleanup levels and remedial action objectives" identified in ROD); DOE Groundwater Guidance, *supra* note 30, at 7-11 ("The suitability and performance of any completed or ongoing ground water remedial action should be evaluated with respect to the objectives of those actions (e.g., . . . attainment of cleanup levels)."). Thus, where quantifiable remediation goals are not met, EPA may not determine that the remedy is "protective."
[120] Comprehensive FYR Guidance, *supra* note 30, at 4-9, 4-12.

conclusions about trends with a high degree of confidence."[121] However, despite claims it is lacking key information necessary to evaluate the effectiveness of the cleanup, EPA insists that declines in fish tissue concentrations are "generally consistent with ROD predictions" and that "the system is responding as anticipated."[122] In fact, the absolute level of PCBs in fish in the Upper Hudson is much higher than EPA anticipated post-dredging, and the rates of decline observed are lower than EPA predicted. EPA cannot have it both ways. It should either make no prediction about the future if it thinks uncertainty is too high, or it should find that missing the first target indicates current expectations about the rate of decline in fish tissue concentrations is correct. Both approaches lead to the same finding—that the remedy is not protective.

As noted earlier, the RA at OU2 must be evaluated for protectiveness as a remedy for which construction has been completed. The dredging element of the remedy was completed in 2015 and habitat reconstruction efforts were completed in 2016. No further active remediation has been contemplated for this section of river as part of this remedy. A finding of "Not Protective" should be based primarily upon the current conditions at the site which include known and ongoing exposures to human and ecological receptors which result in risks beyond EPA's acceptable risk range.

The finding of "Protectiveness Deferred" is only appropriate if the available information and data analysis did not provide sufficient data and documentation that all human and ecological risks are currently under control, and no unacceptable exposures were occurring.

There is "new information" relevant to a "not protective" determination, including that institutional controls are inadequate (e.g., fish advisories not preventing subsistence anglers from eating the fish); remedial action is not expected to achieve cleanup levels; physical remedial structures have been inadequately operated and maintained; Remedial Action Objectives will not be achieved; monitoring activities to determine the protectiveness of the remedy have been inadequate; and physical site conditions have changed.[123]

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[121] SECOND FYR, *supra* note 72, at 7; *see, e.g., id.* at 6 (stating that "[f]ish, sediment, and water data at this early time are not sufficient to identify post-dredging trends with a high degree of confidence"); *see also id.* at 33, 69, 70; EPA, FINAL SECOND FIVE-YEAR REVIEW REPORT FOR THE HUDSON RIVER PCBS SUPERFUND SITE, APPENDIX 3 ASSESSMENT OF PCB LEVELS IN FISH TISSUE 1-2, 6-2, 6-3 (Apr. 2019), https://www.epa.gov/sites/default/files/2019-04/documents/appendix_3.pdf.

[122] SECOND FYR, *supra* note 72, at 62.

[123] *See* COMPREHENSIVE FYR GUIDANCE, *supra* note 30, at 4-10.

VIII. Current Data Indicate the Remedy is Not Protective of Human Health and the Environment

A. Overview

EPA's Draft Third FYR concludes that a protectiveness determination cannot be made until further information can be obtained. In coming to this conclusion, EPA cites the apparent lack of data to provide sufficient statistical power in calculating the specific rates of decline in fish PCB concentrations. EPA further states that additional data may be available to allow for a calculation of the rates of decline in the next few years (2025 – 2027),[124] and briefly describes additional data gathering efforts which may be undertaken over that period.

After reviewing the available data and the Draft Third FYR and appendices, it appears that sufficient information is available at this time to conclude that the remedy is not protective of human health and the environment.

The current human health and ecological risks posed by consumption of fish from the site, for both humans and piscivorous (fish-eating) wildlife remain in excess of the acceptable risk range for humans, and in excess of the criteria set in the 2002 ROD for protection of piscivorous wildlife.[125]

It is also important to point out that the performance of the current phase of the remedy, MNR, appears to not be meeting the expectations of remedy performance at the time of the 2002 ROD. EPA's expectation at the time of the ROD was that two specific health based target concentrations for species and river section length weighted average fish PCB concentrations (0.4 parts per million five years after dredging, and 0.2 parts per million sixteen years after dredging). The first target, to have been met in 2020, was not and as of yet has not been met.

Not only has the first health based interim target concentration not been met, the overall performance of the MNR portion of the remedy does not appear to be meeting the expectations of remedy performance at the time of remedy selection. EPA, during remedy selection, anticipated that there would be an approximately seven to nine percent annual reduction in fish PCB concentrations in the Upper Hudson due to MNR after dredging was complete.[126] While EPA's position is that more data are needed to quantify the rate of decline to meet the statistical criteria (set by EPA after remedy

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[124] DRAFT THIRD FYR, *supra* note 23, at 68-69.
[125] 2002 ROD, *supra* note 13, at 50, 74.
[126] DRAFT THIRD FYR, *supra* note 23, at E-3.

selection was completed), a protectiveness determination does not require the specific calculation of recovery rates to EPA's desired high degree of statistical certainty.

The review of available fish PCB data indicates that there is sufficient data to conclude that the performance of the MNR element of the remedy is not meeting expectations at the time of remedy selection. There has been only modest recovery in fish PCB concentrations during the MNR period when looking at total PCB in fish.[127] This modest recovery is driven by some declines in PCB in bass and bullhead; however, when accounting for the decrease in lipid content in the fish collected, the declines in fish total PCB concentrations appear to be driven not by changes in exposure conditions, but rather by the declines in bass and bullhead lipid content.

When looking at overall recovery in fish PCB concentrations in the Upper Hudson, there has been little recovery during the MNR period which cannot be explained by changes in lipid content. These modest reductions in fish total PCB content due to reductions in fish lipid content cannot continue significantly, as the current lipid content in bass and bullhead is currently very low for these species, and there is little room for further declines in lipid content. The finding that the declines in fish PCB concentrations are driven primarily by declines in fish lipid concentrations leads to the conclusion that it is unlikely that the first target will be met in the near future, and that the second target will also not be met in the time frame anticipated at the time of the ROD. More importantly, the low rate of decline in fish PCB concentrations during the MNR period, primarily driven by declines in fish lipid content, will result in the currently elevated human health and ecological risks, well in excess of EPA's acceptable risk range for humans and well above the risk targets for ecological receptors, continuing for the foreseeable future.

B. Review of Available Fish Monitoring Data

An overall review of the available fish monitoring data was conducted, including an evaluation of the total PCB concentrations, lipid based PCB concentrations, and lipid percentage, for each species group at each location. The monitoring data was also used to evaluate the species weighted and river section length weighted average concentrations for the entire project area and for each river section. The graphs depicting the data are presented in Attachment 1.

i. <u>Available Fish Data</u>

The publicly available fish data set for this site include total PCB and lipid content for several species of fish (black bass, bullhead, yellow perch, pumpkinseed,

[127] There has been only modest recovery during MNR in two of the four species with sufficient post-dredging data- bass and bullhead, but only on a wet-weight basis and not on a lipid-normalized basis. The other two species (yellow perch and pumpkinseed) show very limited post-dredging recovery.

and other forage fish) at fourteen locations in the Upper Hudson. There are data available through 2022, with preliminary data for 2023. This data set provides the basis for EPA's conclusions in the FYR and the conclusions drawn in this document.

ii. Total PCB vs. Lipid Adjusted PCB

It is important to note that there appears to be a significant relationship between total PCB and lipid content in the data set. PCBs are lipophilic, meaning that they accumulate primarily in the lipid tissues of the fish and other wildlife exposed to PCBs. As described in the Draft Third FYR, there can be changes to PCB concentrations in fish which are due to changes in lipid content, and not due to changes in exposure conditions.[128] As a result, it is important to look at trends in PCB concentrations over time on a lipid adjusted or lipid normalized basis;[129] this means that the total PCB concentrations measured are divided by lipid content to take into account changes in lipid content from year to year.

iii. Apparent Trends During Monitored Natural Recovery

In reviewing the fish data, several conclusions can be drawn about the changes in PCB concentrations in Upper Hudson fish during the current phase of the remedy after dredging–the monitored natural recovery phase.

1. For two species (black bass and bullhead), there has been a discernable decline in lipid content during the MNR phase of the remedy. This decline appears to be a primary explanation for the apparent declines in PCB concentration in these species. As these two species make up over 90 percent of the species weighted and river section length weighted average PCB metric developed by EPA, the conclusion here is that the apparent modest progress toward achieving the targeted reductions in fish PCB concentrations is due not to changes in exposure conditions, but rather to declines in lipid concentrations in black bass and bullhead. The figures below, from Appendix 3 of the Draft Third FYR,[130] display the species weighted and river section length weighted average PCB concentrations calculated by EPA, by river section and including the entire Upper Hudson project area. There is a clear difference between the trends in the data during the MNR period; the total PCB (wet weight) graph shows modest declines

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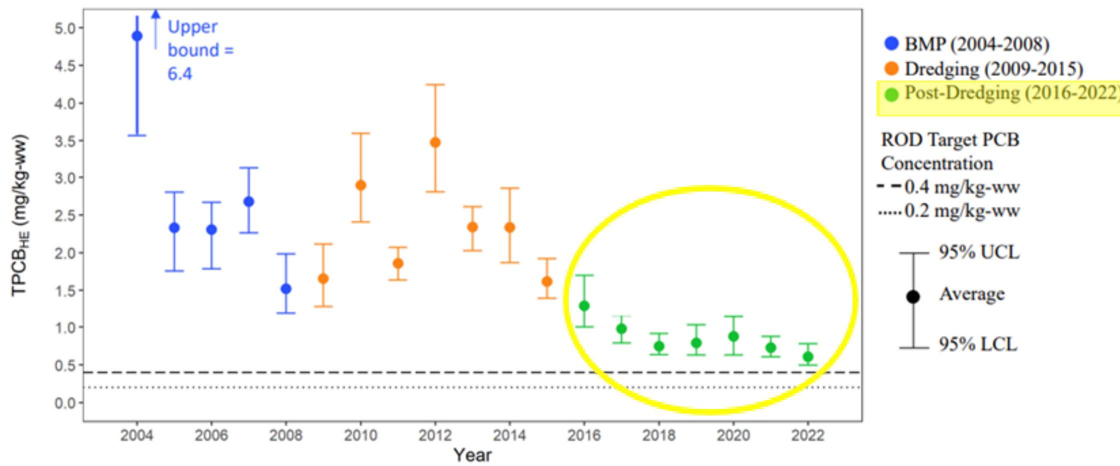
128 *Id.* at 45.

129 *See* EPA, VOLUME 2D - REVISED BASELINE MODELING REPORT (Jan. 2000), https://semspub.epa.gov/work/02/80094.pdf ("PCBs accumulate primarily in fish lipid tissue, and it is appropriate to normalize fish body burdens to concentration on a lipid basis.").

130 EPA, DRAFT THIRD FIVE YEAR REVIEW REPORT FOR THE HUDSON RIVER PCBS SUPERFUND SITE, APPENDIX 3 EVALUATION OF FISH TISSUE PCB CONCENTRATIONS (July 2024), www.epa.gov/system/files/documents/2024-07/appendix-3-evaluation-of-fish-tissue-pcb-concentrations.pdf.

in PCB concentrations, while the lipid normalized graph (which takes into account the declines in fish lipid concentrations) shows little to no downward trend in fish PCB concentrations. The graphs also show that there is little decline in fish PCB concentration once changes in lipid content are taken into account throughout the Upper Hudson project area.



Notes
1. Preliminary data from 2022 have been added to this plot, a single conversion factor (based on 2018, 2020, 2021 and 2022 Aroclor-congener matched pairs) was used to convert the 2017-2022 data from Aroclor basis to Total PCB-homologue equivalent (TPCB$_{HE}$). Please note that other figures in this appendix; where data ends in 2021; used a single conversion factor from 2018, 2020 and 2021 Aroclor-congener matched pairs. Therefore, the 2017-2021 values are slightly different than the ones shown here.
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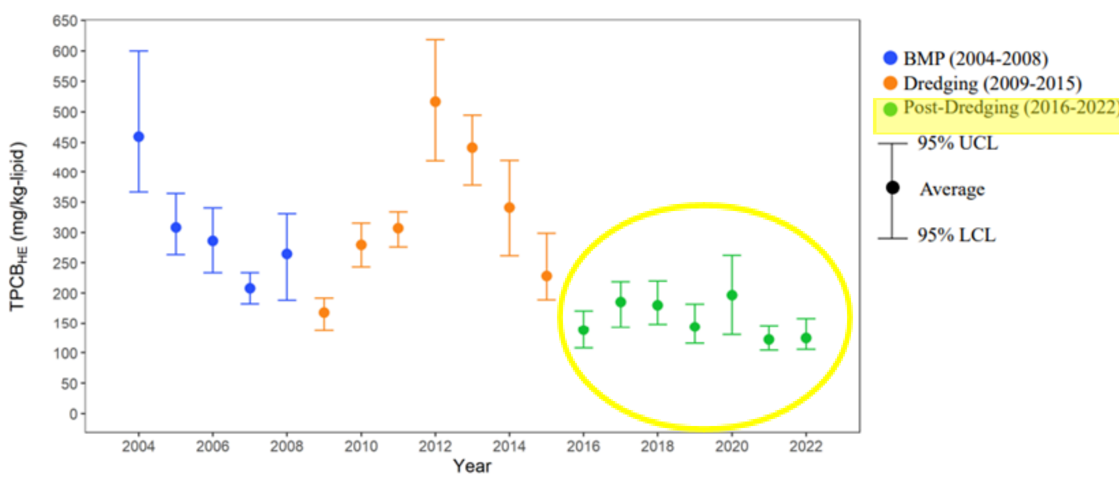
3. River Section fish tissue PCB concentrations are weighted by species as follows: black bass (largemouth or smallmouth) = 47%, brown bullhead = 44%, yellow perch = 9%.
4. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
5. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Wet-Weight Species-Weighted Average in River Section 1 with 2022 Data

Figure A3-21A
July 2024



Notes
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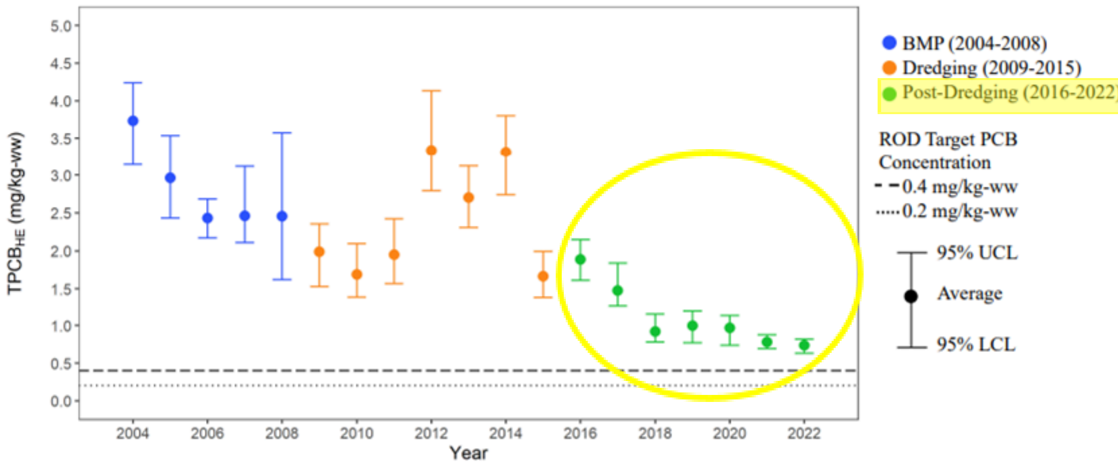
4. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
5. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Lipid-Normalized Species-Weighted Average in River Section 1 with 2022 Data

Figure A3-21B
July 2024

Draft



Notes
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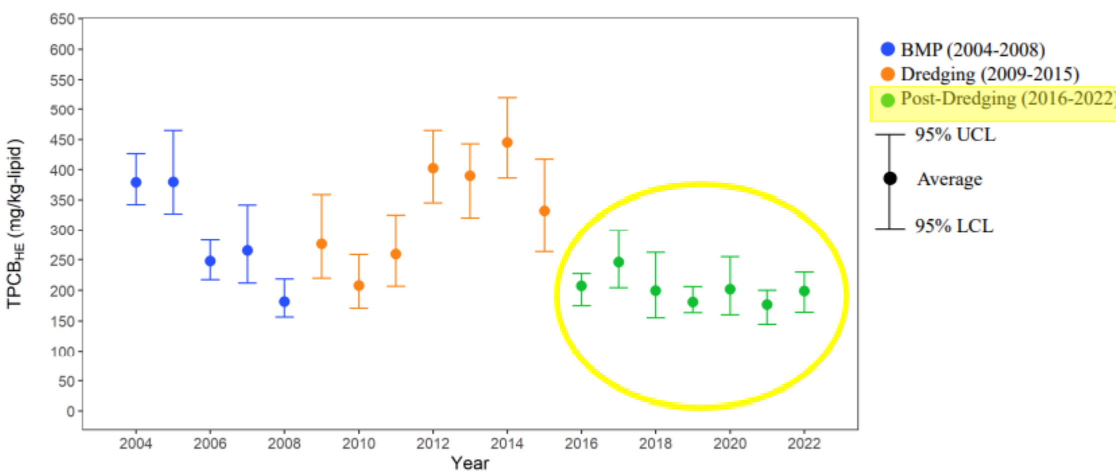
4. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
5. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Wet-Weight Species-Weighted Average in River Section 2 with 2022 Data

Figure A3-22A

July 2024

Draft



Notes
1. Preliminary data from 2022 have been added to this plot, a single conversion factor (based on 2018, 2020, 2021 and 2022 Aroclor-congener matched pairs) was used to convert the 2017-2022 data from Aroclor basis to Total PCB-homologue equivalent ($TPCB_{HE}$). Please note that other figures in this appendix; where data ends in 2021; used a single conversion factor from 2018, 2020 and 2021 Aroclor-congener matched pairs. Therefore, the 2017-2021 values are slightly different than the ones shown here.
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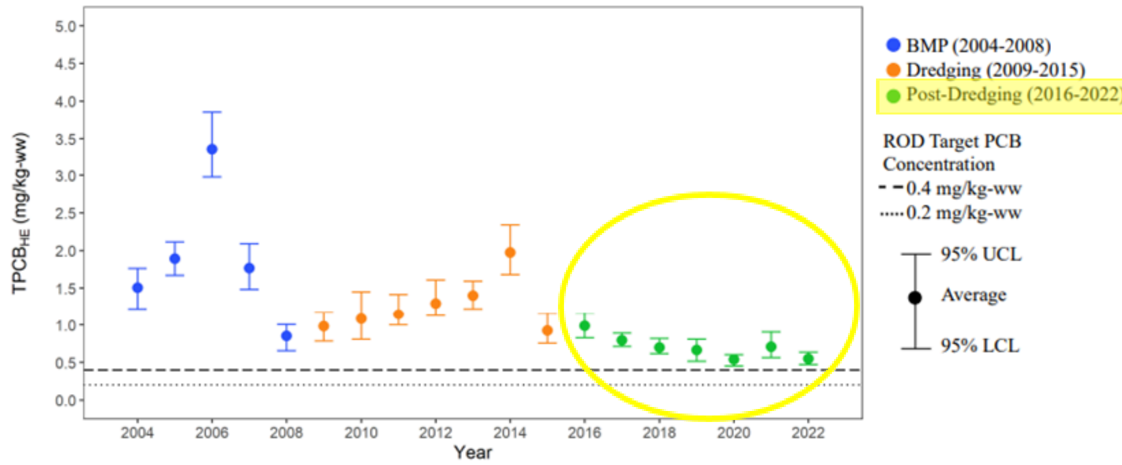
4. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
5. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Lipid-Normalized Species-Weighted Average in River Section 2 with 2022 Data

Figure A3-22B

July 2024

Draft



Notes

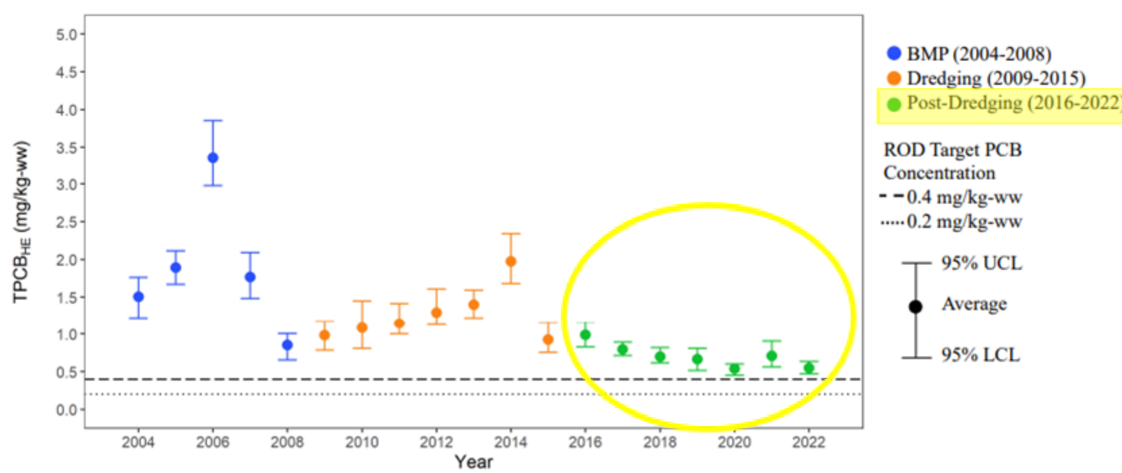
1. Preliminary data from 2022 have been added to this plot, a single conversion factor (based on 2018, 2020, 2021 and 2022 Aroclor-congener matched pairs) was used to convert the 2017-2022 data from Aroclor basis to Total PCB-homologue equivalent (TPCB$_{HE}$). Please note that other figures in this appendix; where data ends in 2021; used a single conversion factor from 2018, 2020 and 2021 Aroclor-congener matched pairs. Therefore, the 2017-2021 values are slightly different than the ones shown here.
2. To create the River Section average, individual species are first averaged by collection station. The results for each species at each station are then equally weighted to create an average for the species for the River Section. The individual species averages are then combined in a species-weighted average for the River Section. Largemouth bass and smallmouth bass results are combined and treated as a single species in the calculation. (See text for discussion.)
3. River Section fish tissue PCB concentrations are weighted by species as follows: black bass (largemouth or smallmouth) = 47%, brown bullhead = 44%, yellow perch = 9%.
4. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
5. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Wet-Weight Species-Weighted Average in River Section 3 with 2022 Data

Figure A3-23A

July 2024

Draft



Notes

1. Preliminary data from 2022 have been added to this plot, a single conversion factor (based on 2018, 2020, 2021 and 2022 Aroclor-congener matched pairs) was used to convert the 2017-2022 data from Aroclor basis to Total PCB-homologue equivalent (TPCB$_{HE}$). Please note that other figures in this appendix; where data ends in 2021; used a single conversion factor from 2018, 2020 and 2021 Aroclor-congener matched pairs. Therefore, the 2017-2021 values are slightly different than the ones shown here.
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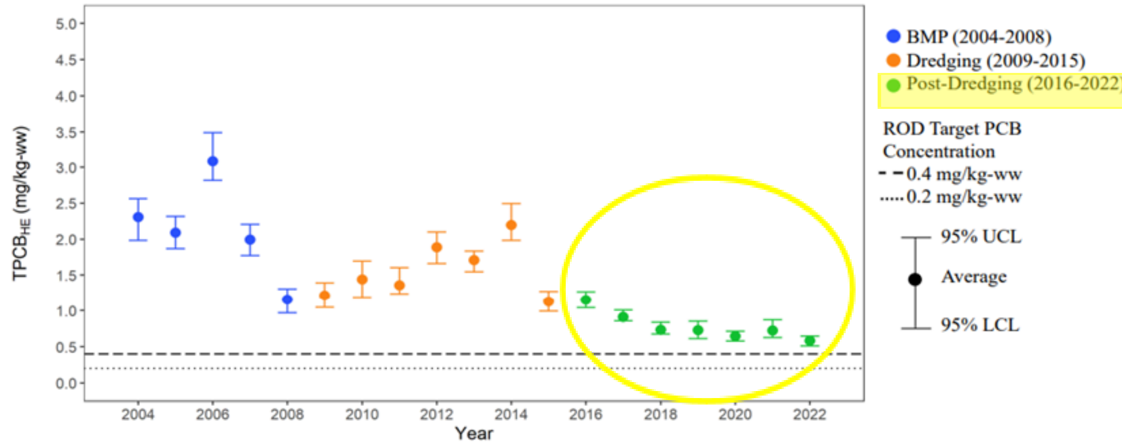
3. River Section fish tissue PCB concentrations are weighted by species as follows: black bass (largemouth or smallmouth) = 47%, brown bullhead = 44%, yellow perch = 9%.
4. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
5. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Wet-Weight Species-Weighted Average in River Section 3 with 2022 Data

Figure A3-23A

July 2024

Draft



Notes

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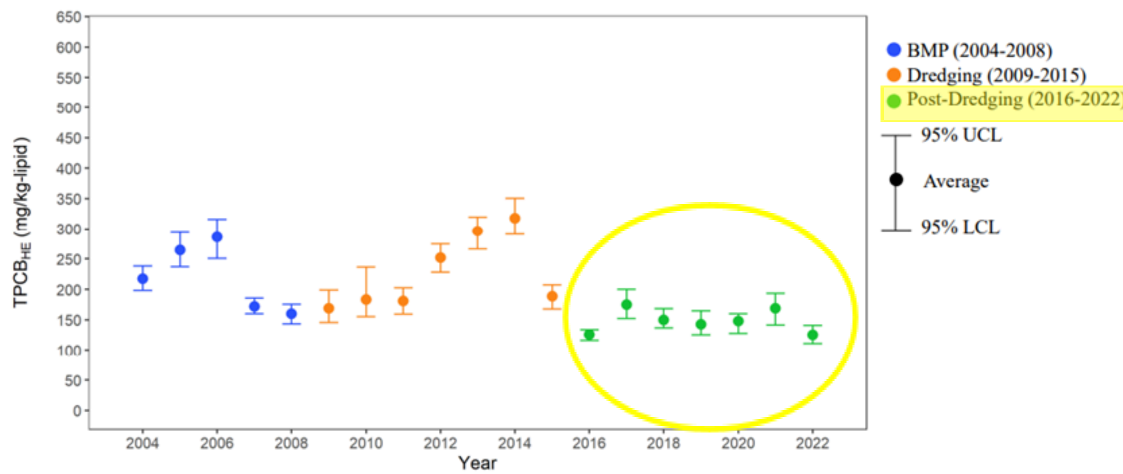
2. The Upper Hudson River average is weighted by both species and river section length. First, a species-weighted average is created for each River section, weighting the species as follows: black bass (largemouth or smallmouth) = 47%, brown bullhead = 44%, yellow perch = 9%. Then the results for the three River Sections are combined based on their relative lengths: River Section 1 = 6.3 miles (15.4%); River Section 2= 5.1 miles (12.5%); and River Section 3= 29.5 miles (72.1%). Data from river Reaches 4 through 1 are not included in this calculation since they were not collected regularly. Data from Reach 5 in River Section 3 are weighted to reflect all 29.5 miles of River Section 3, despite the fish monitoring stations representing River Section 3 are all located in the 14-mile span of Reach 5.
3. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
4. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Wet-Weight Species-Weighted Average in the Upper Hudson River (RS 1 to RS 3) with 2022 Data

Figure A3-24A

July 2024

Draft



Notes

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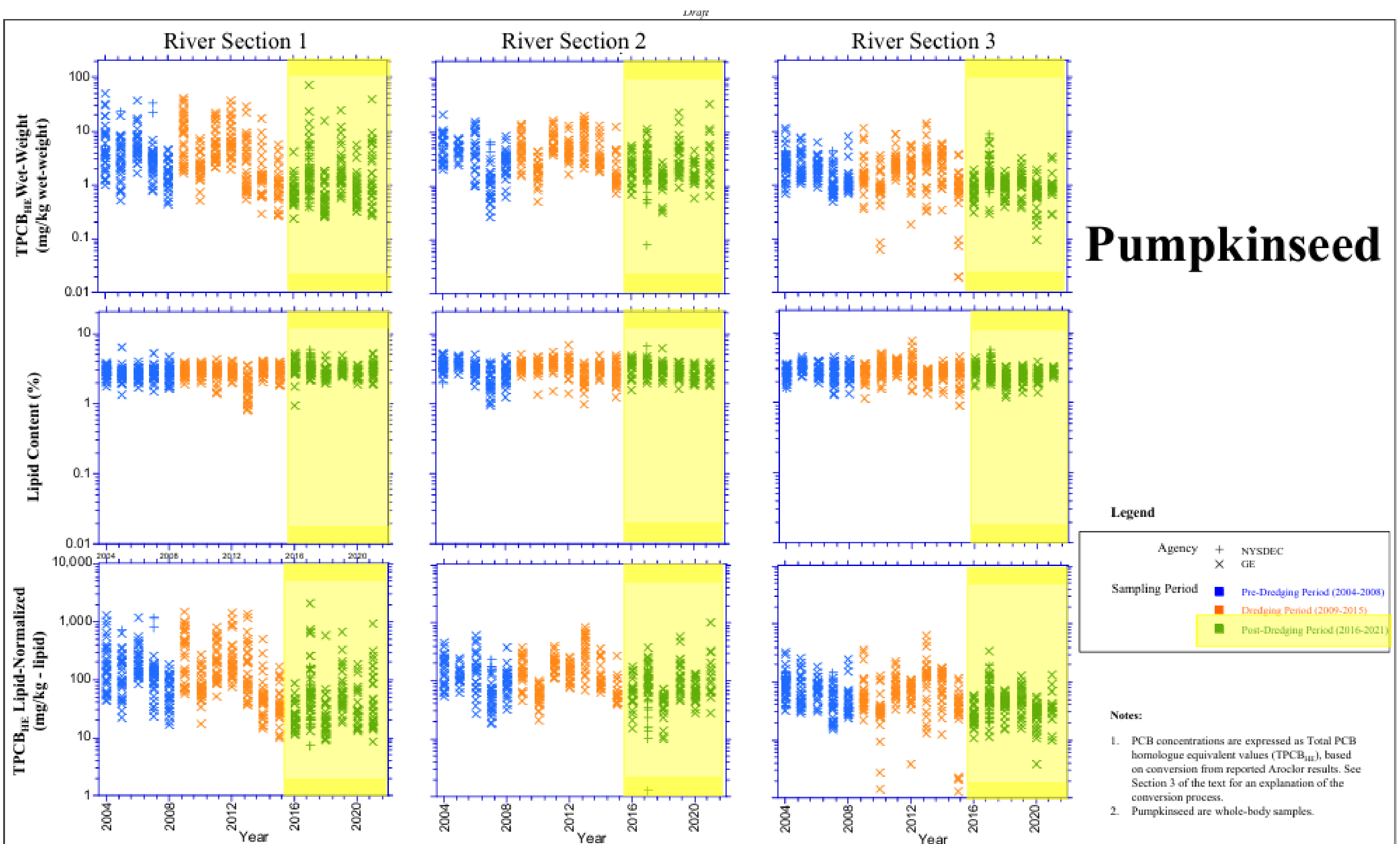
3. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
4. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Lipid-Normalized Species-Weighted Average in the Upper Hudson River (RS 1 to RS 3) with 2022 Data

Figure A3-24B

July 2024

2. PCB concentrations in pumpkinseed are more highly variable than in black bass, bullhead, or yellow perch. While this is to be expected, as the pumpkinseed are targeted to evaluate year to year variability in exposure conditions, there does not appear to be any pattern of decline in pumpkinseed PCB concentrations during MNR. Figure A3-8 displays the pumpkinseed PCB data by River Section; note the stable Total PCB and Lipid Based PCB concentrations in green.



$TPCB_{HE}$, Lipid and Lipid-Normalized $TPCB_{HE}$ in Pumpkinseed Fish Tissue Samples | **Figure A3-8** | July 2024

3. The data set for forage fish appears to be insufficient to evaluate the changes over time during MNR for these species. However, EPA still has the opportunity to use the pumpkinseed data to meet this data need;[131] pumpkinseed collected are small, younger fish, and pumpkinseed are a prey species for the other sport fish. EPA should make use of the pumpkinseed data to evaluate ecological risk.

[131] Volume 2D - Revised Baseline Modeling Report, *supra* note 129 ("Forage fish (pumpkinseed and spottail shiner) serve as primary prey base for the larger fish (that are piscivorous) and also other ecological receptors (such as mink and kingfisher, as examples).").

iv. There Are Sufficient Data to Make a Protectiveness Determination

In the Draft Third FYR, EPA concludes that there are not sufficient data, over a sufficient period of time, to quantify the rates of decline in fish PCB concentrations, and as a result cannot make a protectiveness determination at this time. It is unclear why a protectiveness determination cannot be made based on the available data simply because a single statistical test cannot be met with the desired statistical power.

When selecting a remedy for this site, EPA did not have the robust fish data set currently available. At the time of remedy selection for the Upper Hudson, the fish data set used to support remedy selection was primarily from two locations (out of the current fourteen). Evaluations of natural recovery rates prior to remedy selection were complicated by the repeated implementation of various remedial efforts in the Upper Hudson prior to remedy selection, including significant changes to upstream source control as remedial measures at the two GE plant sites at the upstream end of the project area. EPA relied primarily on modeling work using these fish data to understand the impacts of various remedial actions; these modeling results provided the basis for EPA's understanding of the anticipated performance of remedial alternatives, including the selected alternative.

At the time of remedy selection, EPA also described in its Feasibility Study the concept of a risk management "toolbox", under which EPA not only used the model projections of various remedial alternatives but also looked at an analysis of trends in the data.[132] The analysis done at this time did not involve the statistical criteria used by EPA in this FYR to quantify the anticipated rates of decline to a high degree of certainty, but rather used comparisons of the lipid-based PCB concentrations from the available fish data set at the time to the modeling predictions:

> Concentration trends in fish are evaluated here as lipid-based concentrations, on the assumption that conversion to a lipid basis better reflects actual uptake processes and helps to smooth out some of the year-to[1]year and sample-to-sample variability. A comparison of FISHRAND model median predictions to observed (corrected) Tri+ PCB data in fish lipid is shown for three species in the lower Thompson Island Pool and the Stillwater reach in Figures 1 and 2.[133]

In the current FYR, EPA's primary rationale for not making a protectiveness determination is the apparent lack of data needed to achieve a specific stringent statistical power to discern the rate of decline in fish PCB concentrations. However, EPA

[132] EPA, HUDSON RIVER PCBS REASSESSMENT RI/FS PHASE 3 REPORT: FEASIBILITY STUDY, APPENDIX D THROUGH APPENDIX H 1 (Dec. 2000), https://www3.epa.gov/hudson/fs000036.pdf.
[133] *Id.* at 4.

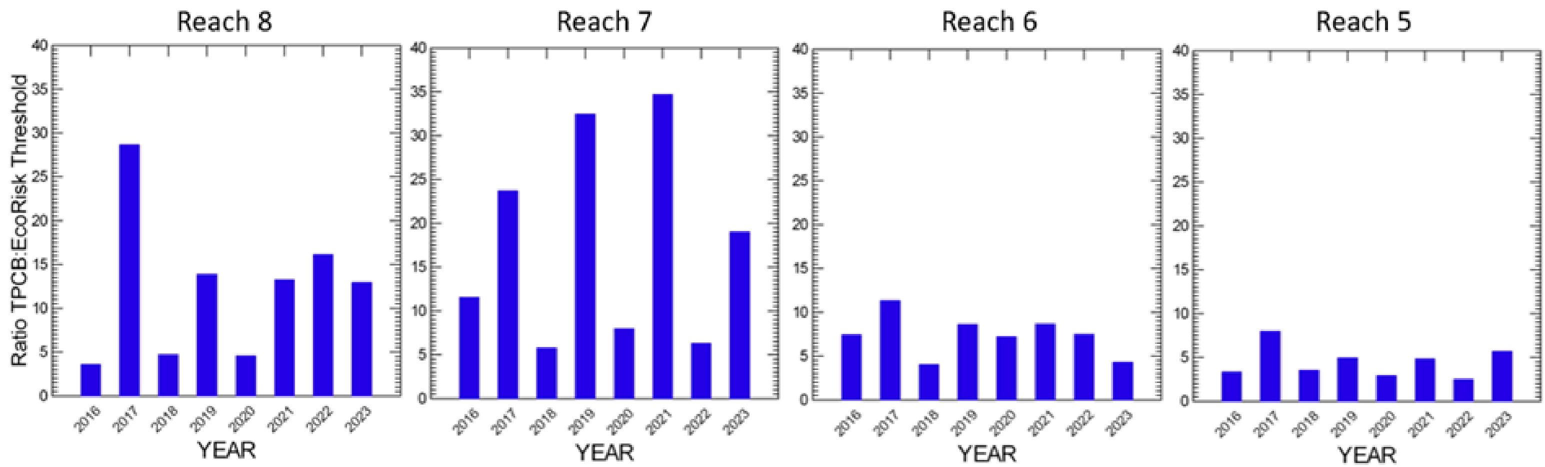
appears to not take into account the possibility that the rate of decline cannot be quantified not because a few more years of data are needed, but rather because the performance of the remedy is not meeting the expectations at the time of remedy selection. The rate of recovery in fish PCB concentrations may not be able to be quantified to a high degree of statistical certainty because the rate is much lower than anticipated.

Currently, while EPA states that it cannot meet the statistical criteria it has established for assessing recovery in species weighted and river section length weighted average fish, EPA should be able to sufficiently assess the data and conclude that the remedy is not meeting the expectations of remedy performance at the time of remedy selection, using the same “toolbox” approach to using the now much more robust fish PCB data set.

Fish PCB concentrations have not recovered as anticipated (EPA anticipated a seven to nine percent annual decline), resulting in the first target (0.4 parts per million five years after dredging, in 2020). PCB concentrations in pumpkinseed and yellow perch show little decline, and the apparent declines in black bass and bullhead can be explained primarily by declines in lipid content in these species. These findings, when considered along with the apparent lack of decline in surface sediment PCB concentrations (see discussion below) and the remaining elevated human health and ecological risks, should lead EPA to conclude that the remedy is not performing as anticipated and, with the remaining elevated human health and ecological risks, not protective.

In the following chart, the total PCB concentrations in pumpkinseed are compared to the ecological risk threshold established by EPA at each monitoring location in the Upper Hudson. In each comparison, the ecological risk threshold is exceeded by the pumpkinseed total PCB concentrations by a factor of three to over thirty and showing no evidence of decline, indicating that the level of ecological risk remains well in excess of that targeted in the ROD.

Pumpkinseed: Ratio of TPCB to EcoRisk Threshold (0.34 ppm)



C. Review of Available Surface Sediment Data

i. <u>Available Surface Sediment Data</u>

Three surface sediment sampling programs have been implemented during the MNR period after dredging, in 2016, 2017, and in 2021. The 2016 and 2017 sampling programs have been combined by EPA into a single data set, for comparison to the 2021 data set. These sediment sampling programs were designed to provide data to assess the trends in PCB concentrations in the upper surface sediments, to a depth of two inches.

ii. <u>Two Inch vs. Twelve Inch Definition of “Surface”</u>

It is important to point out that the surface sediment sampling program does not focus on bioavailable (ie. top twelve inches, as defined in the Record of Decision) PCB-contaminated sediments in the Upper Hudson. Instead, the sampling programs have focused on the top two inches to assess rapid changes over time. However, the bulk of the remaining bioavailable PCB mass in the Upper Hudson is not in the top two inches, but rather in the top foot. As a result, it is not possible with the available data set to assess the changes in bioavailable PCB in sediment over time during the MNR period. This is a key metric that should be monitored as the project moves forward; broad representative sampling of the remaining bioavailable PCB contaminated sediments throughout the project area should be an element of further monitoring for this site. An additional surface sediment sampling plan that focuses on the PCB deposits in the top 12 inches that were identified during pre-dredging remedial design sampling should be an element of further monitoring.

iii. Apparent Trends in Surface Sediment PCB Concentrations During Monitored Natural Recovery

In the Draft Third FYR, EPA presents an assessment of surface PCB sediment concentrations between 2016/17 and 2021. EPA concluded that there were not sufficient data to quantify the trend in PCB concentrations over time, and that more data were needed. However, EPA did present comparisons of the data sets in Appendix 2.[134]

In Figure A2-9, EPA presents the area weighted surface sediment data comparisons by river section and by river reach.[135] There appears to be stable concentrations in River Sections 1 and 2, with little decline noted in River Section 3. This should be viewed in the context of the anticipated rate of decline at the time of remedy selection of approximately seven to nine percent per year declines; if the remedy was performing as anticipated, a reduction in surface sediment concentrations of over 30 percent should be observed. Instead, a trend of stability in surface sediment concentrations is observed in the monitoring data.

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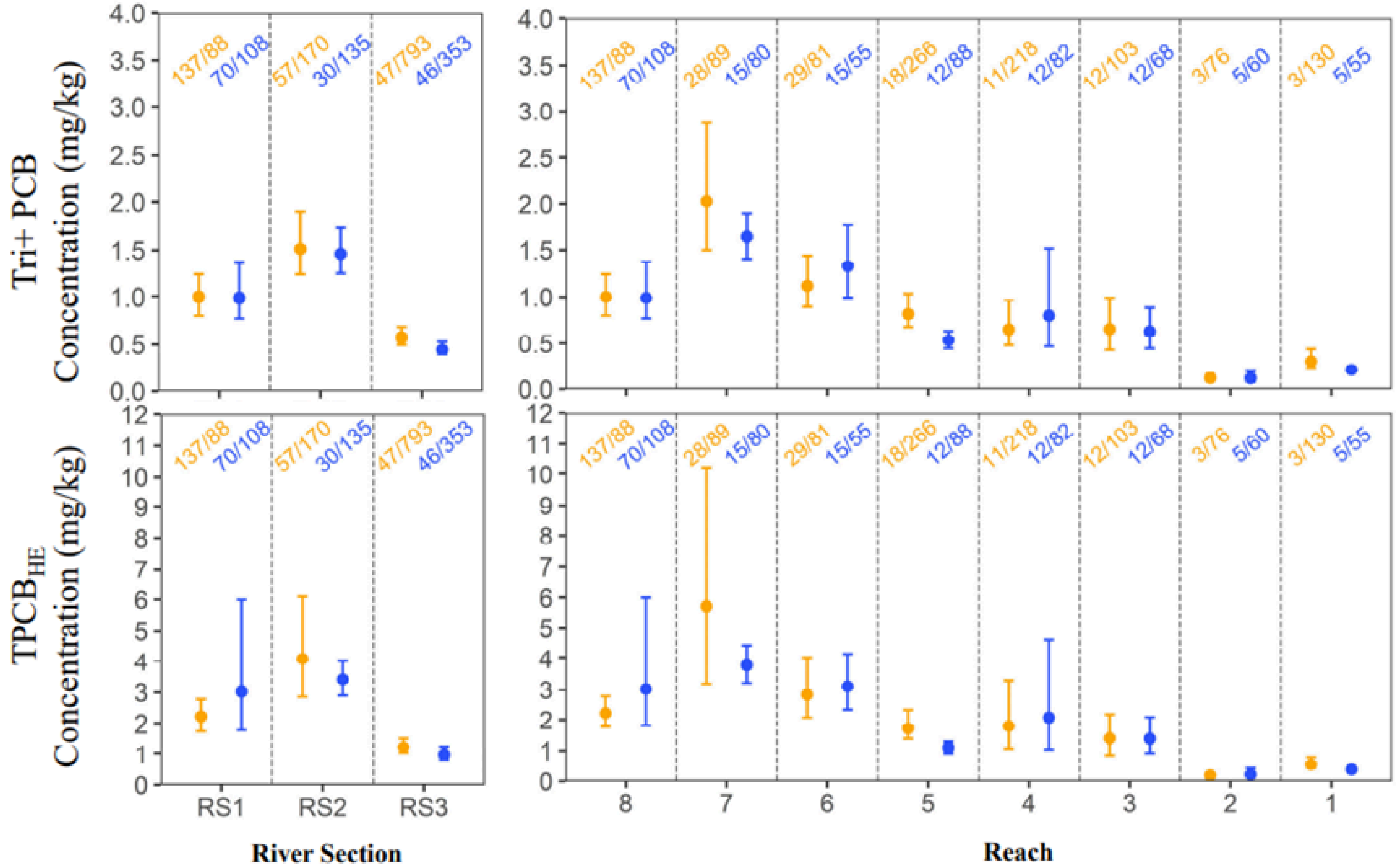
[134] DRAFT THIRD FIVE YEAR REVIEW REPORT FOR THE HUDSON RIVER PCBS SUPERFUND SITE, APPENDIX 2 EVALUATION OF SURFACE SEDIMENT CONCENTRATIONS, (July 2024), https://www.epa.gov/system/files/documents/2024-07/appendix-2-evaluation-of-surface-sediment-concentrations.pdf.
[135] *Id.* at 83.



Legend

- 2016/2017
- 2021

95% UCL
Average
95% LCL

Notes:

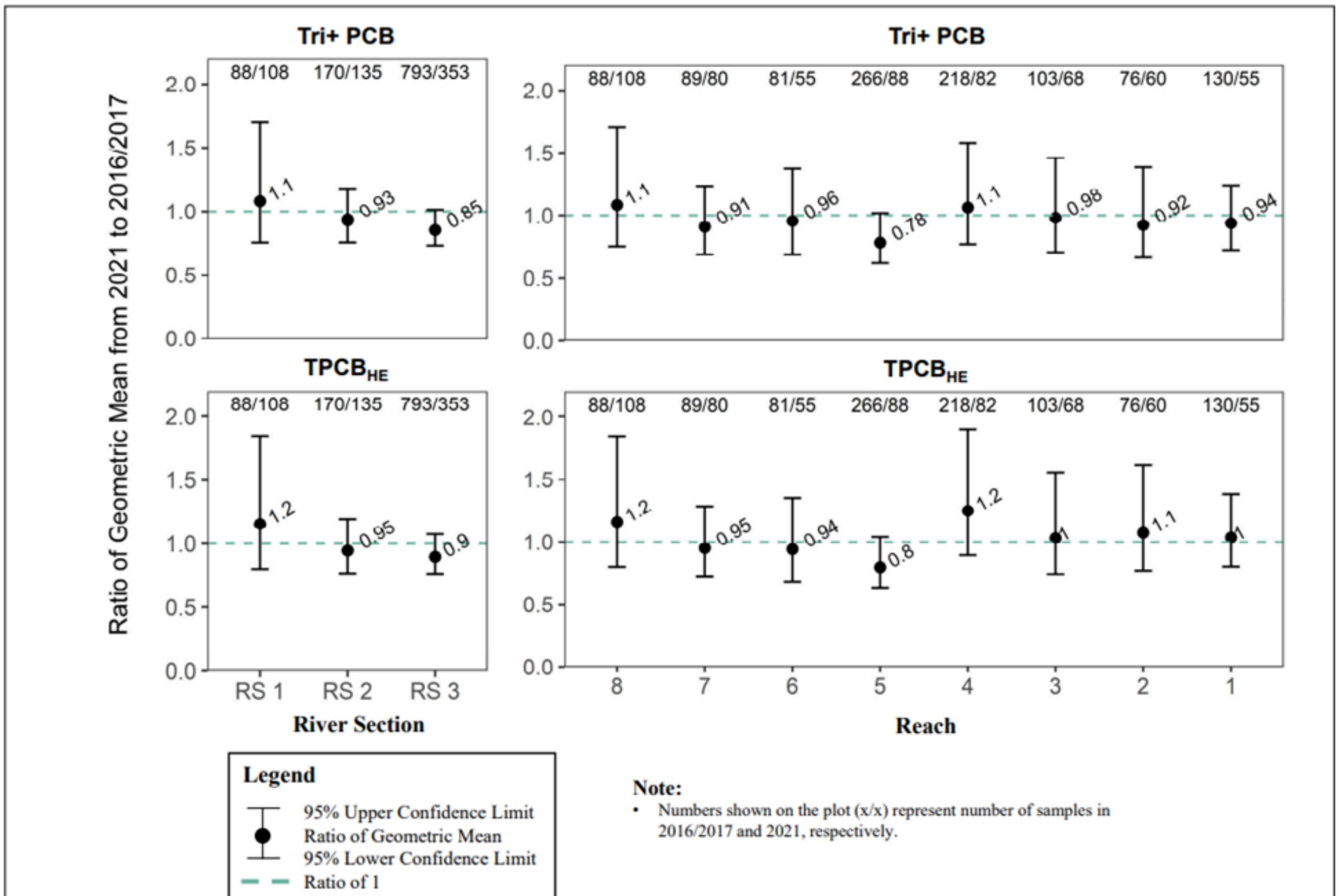
- Numbers shown on the plot (x/x) represent number of samples in dredged and non-dredged areas, respectively.
- See text in Section 3.2.1 for the calculation of RWA-weighted averages and 95% confidence limits.
- UCL: Upper Confidence Limit
- LCL: Lower Confidence Limit

River-Wide-Area (RWA)-Weighted Average PCB Concentrations by River Section and Reach

Figure A2-9

July 2024

Figure A2-10b in Appendix 2 also illustrates the apparent lack of recovery in surface sediment PCB concentrations.[136] In this graph, EPA uses the geometric mean surface sediment PCB concentrations to develop a ratio of the 2016/17 results and the 2021 results. The graph displays these ratios by river section and river reach, for both total PCB and for Tri+ PCBs. In both cases, the ratios are clustered around a ratio 1, indicating no change between the data from the two sampling events. In some cases, the ratio exceeds 1, indicating an increase in surface sediment PCB concentrations. If the anticipated declines in PCB concentration from the time of remedy selection had occurred, then one would expect to see these ratios clustered around a value of approximately 0.7. It appears that the performance of the MNR portion of the remedy is not as anticipated for surface sediment.



Ratio of Geometric Mean PCB Concentrations in 2021 to 2016/2017 in Non-Dredged Areas

Figure A2-10b

July 2024

[136] *Id.* at 85.

iv. There Are Sufficient Data to Make a Protectiveness Determination

It appears that there are sufficient surface sediment PCB data available for EPA to support a protectiveness determination. EPA has two data sets available, from which estimates of the recovery rate in surface sediment PCB concentrations can be assessed and compared to the recovery rates anticipated at the time of remedy selection. The surface sediment PCB concentrations appear to have similar recovery rates during MNR to those found in the fish PCB concentrations during MNR. As the sediment PCB concentrations are directly linked to the fish PCB concentrations, one would expect the two recovery rates to be similar.

D. Review of Available Water Column PCB Data

i. Available Water Column Data

EPA has a robust data set of water column PCB concentrations during the MNR period after dredging. There are data available from upstream of the project area (Bakers Falls), at Rogers Island (downstream of the two GE plant sites at the upstream end of River Section 1), at Thompson Island (immediately downstream of River Section 1), at Schuylerville (immediately downstream of River Section 2) and at Waterford (downstream end of River Section 3). Samples are collected routinely at these stations. There are also data collected from a limited number of locations during high flow events to evaluate high flow event driven changes in PCB concentrations and loads.

ii. Routine vs. High Flow Event Sampling

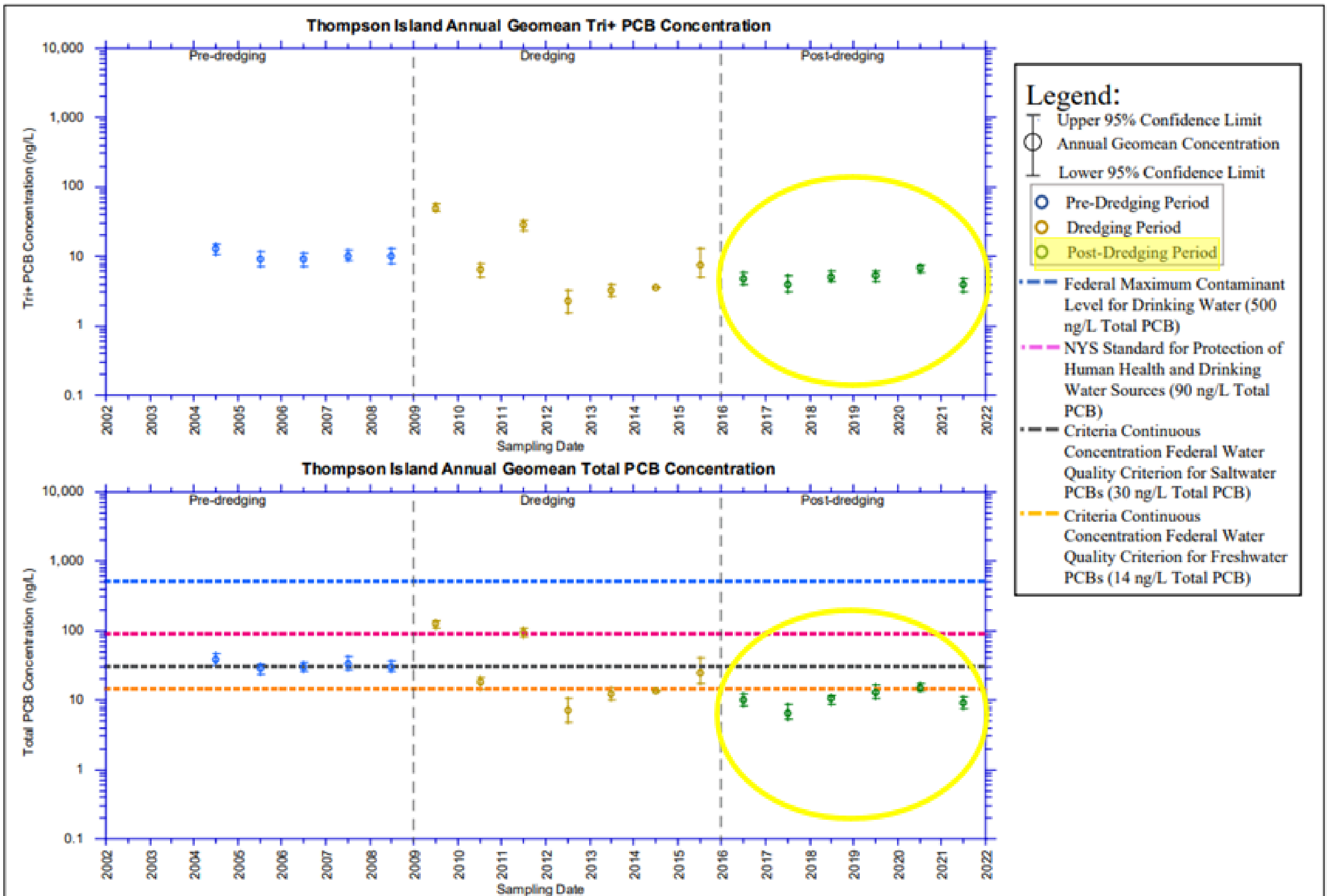
There is much more routine water column monitoring data than high flow event data. EPA also believes that it is important to take into account the impact of flow during non-high flow event periods, and presents in the Draft Third FYR report the need to account for changes in flow during routine monitoring. EPA does present, however, trends in water column PCB concentrations over time during the MNR period.

iii. Apparent Trends during Natural Recovery

In Appendix 1 of the Draft Third FYR, EPA presents graphs of geometric mean water column total PCB and Tri+ PCB concentrations at Thompson Island (downstream of River Section 1), at Schuylerville (downstream of River Section 2) and at Waterford (downstream end of River Section 3).[137] For River Sections 1 and 2, there is little

[137] Draft Third Five Year Review Report for the Hudson River PCBs Superfund Site, Appendix 1 Evaluation of Water Column PCB Concentrations and Loads (July 2024), https://www.epa.gov/system/files/documents/2024-07/appendix-1-evaluation-of-water-column-pcb-concentrations-and-loads.pdf.

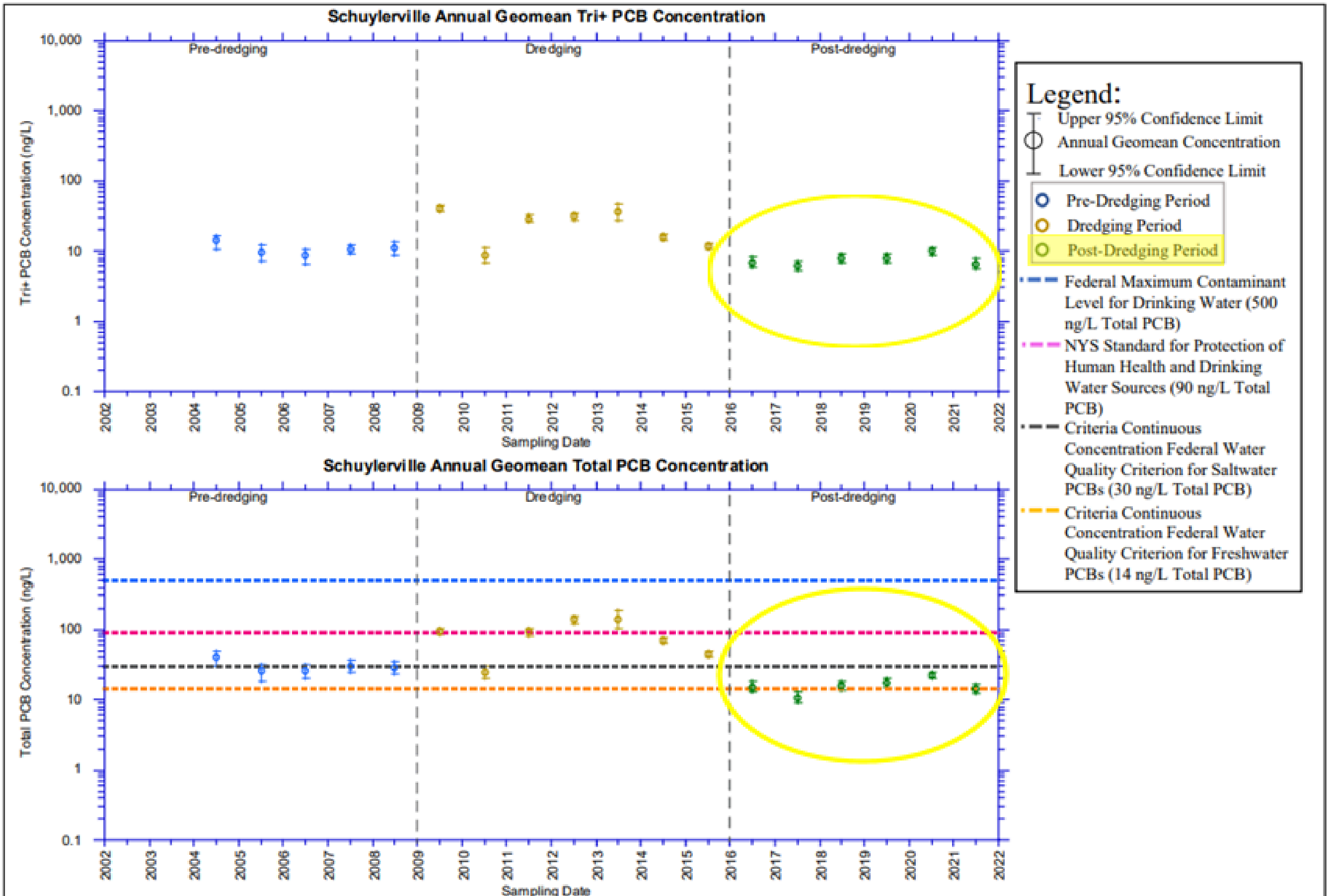
evidence of a significant downward trend in water column concentrations during MNR after dredging was completed. For River Section 3, modest improvement is depicted during MNR.



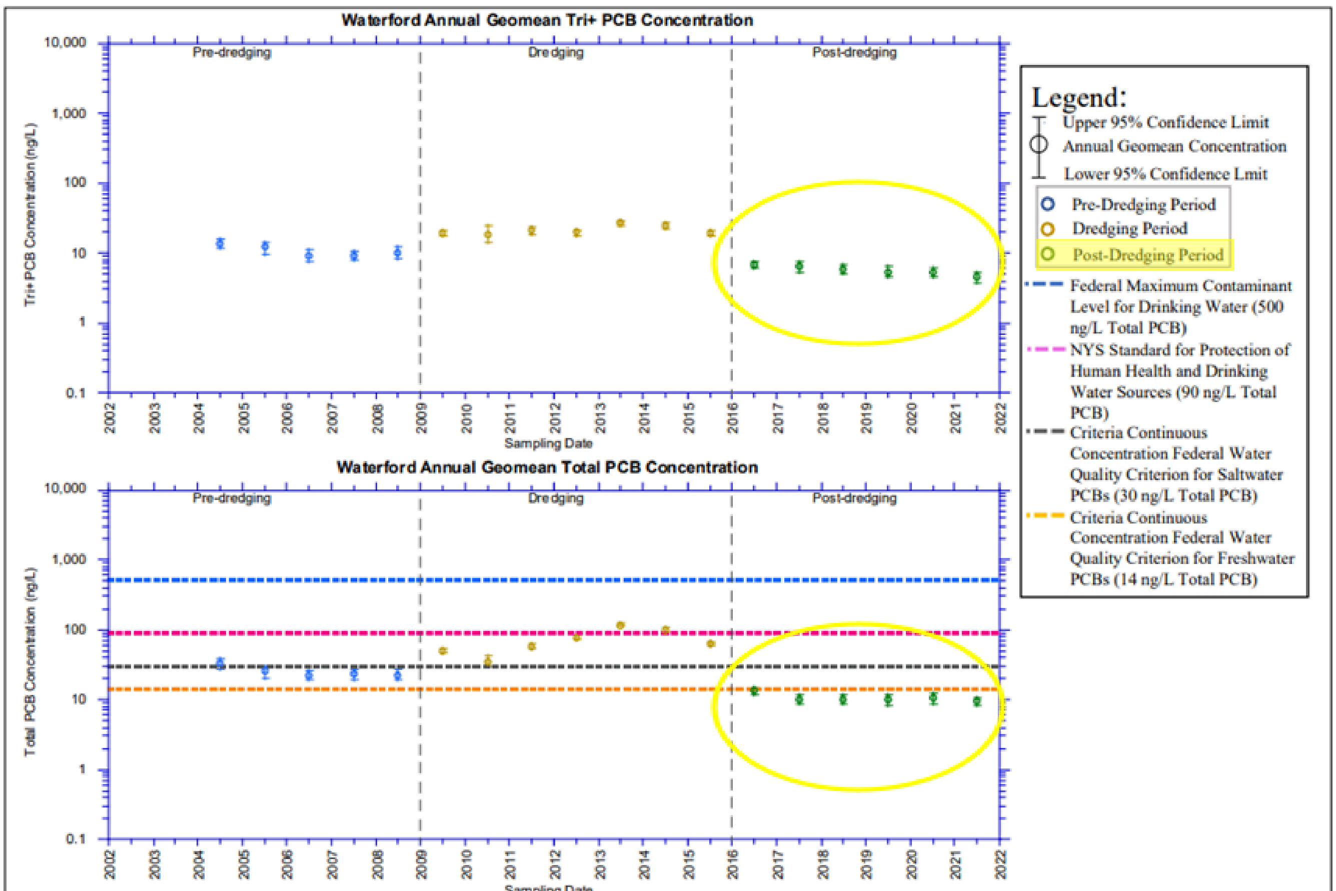
Annual Geometric Mean PCB Concentration for Routine Samples Collected at the Thompson Island Dam Monitoring Station from 2004 to 2021

Figure A1-11

July 2024

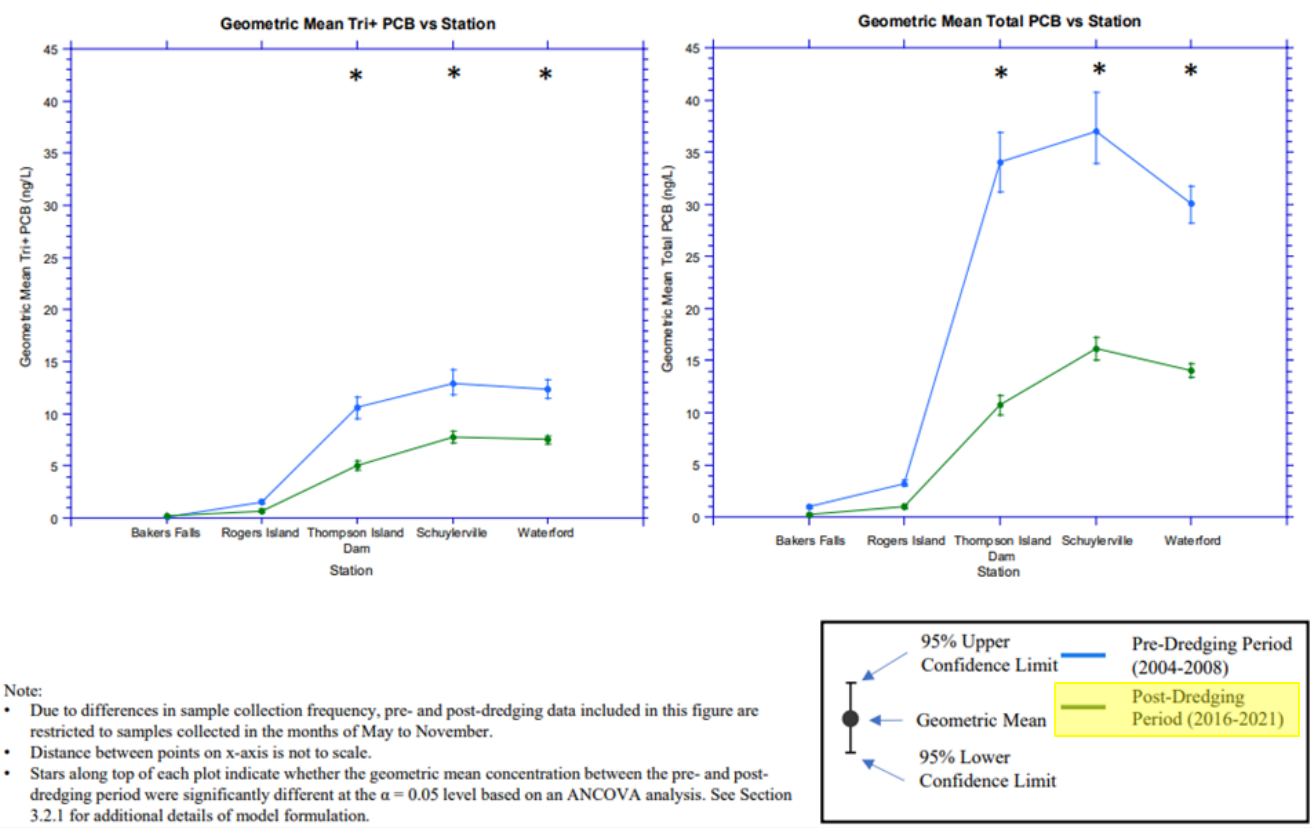


	Annual Geometric Mean PCB Concentration for Routine Samples Collected at the Schuylerville Monitoring Station from 2004 to 2021	**Figure A1-12**
		July 2024



	Annual Geometric Mean PCB Concentration for Routine Samples Collected at the Waterford Monitoring Station from 2004 to 2021	**Figure A1-13**
		July 2024

EPA also included a graph of changes in water column PCB concentrations as the river water passes through the Upper Hudson, from Bakers Falls upstream of the two GE plants downstream to Waterford. In this graph, one can see the increases in PCB water column concentrations as the river passes over the contaminated sediments in River Sections 1 and 2, indicating that the PCB contaminated sediments of the Upper Hudson are still sources to the water column. For River Section 3, with more significant tributaries entering the river, this assessment should be done based on load rather than concentration, as the load may be increasing without the concentration increasing due to tributary dilution. EPA should present a graph in the report using PCB load as well as PCB concentration, in order to provide an estimate of the change in water column PCB load as the river passes over the remaining contaminated sediments in the Upper Hudson.



Note:

- Due to differences in sample collection frequency, pre- and post-dredging data included in this figure are restricted to samples collected in the months of May to November.
- Distance between points on x-axis is not to scale.
- Stars along top of each plot indicate whether the geometric mean concentration between the pre- and post-dredging period were significantly different at the α = 0.05 level based on an ANCOVA analysis. See Section 3.2.1 for additional details of model formulation.

Pre-Dredging (2004 to 2008) and Post-Dredging (2016 to 2021) Annual Geometric Mean PCB Concentration for Routine Samples by Station

Figure A1-15

July 2024

iv. Sufficient Data to Make Protectiveness Determination

EPA has a robust water column PCB data set available for the period after dredging was completed, during the MNR phase of the remedy. This data set shows that there has been little recovery in water column water column PCB in River Sections 1 and 2, and only modest recovery in River Section 3. This pattern is consistent with the trends in surface sediment and fish PCB concentrations observed in the Upper Hudson during MNR.

E. Comparison of Fish, Sediment, and Water Data during Monitored Natural Recovery

i. Robust Data Sets Available

For each of the three major environmental media monitored (fish, surface water, surface sediment) EPA has a robust data set available. Several fish species are monitored annually at 14 locations; representative surface sediment PCB concentrations have been measured twice in each river section and river reach, and surface water is monitored routinely upstream of the project area and downstream of each river section. While EPA maintains that sufficient statistical power is not yet available to calculate specific trends for each media, enough data exists to understand the performance of the remedy in the context of what declines were anticipated at the time of remedy selection. In the Draft Third FYR, EPA has already presented comparisons of the data in the three media over time to evaluate the changes in concentrations during MNR. In no media is there a data set which shows that the anticipated seven to nine percent annual decline in PCB concentrations has been achieved.

ii. Similar Trends in All Three Media - Fish, Sediment, and Water

In each of the media monitored (surface sediment, fish, surface water), there is a pattern of no decline, or only modest declines, in the media sampled. In each River Section, the water column PCB concentrations, surface sediment PCB concentrations, and fish PCB concentrations (once lipid changes are accounted for in the analysis) are stable or declining slowly. It is expected that the trends in all three media should show similar trends in monitoring results, and the available data sets are consistent with this expectation. However, the performance of the remedy during MNR was also expected to result in an annual seven to nine percent reduction in PCB concentrations, which is not evident in the available data sets.

F. Comparison of Monitoring Data to Anticipated Remedy Performance

i. Fish PCB Data

The expectation at the time of remedy selection was that there would be, after dredging, an approximate seven to nine percent reduction in fish PCB concentrations during MNR. The available fish data sets do not show this pattern; instead, as shown in the Draft Third FYR, fish concentrations are relatively stable (once changing lipid content is accounted for in the analysis), with little recovery in River Sections 1 and 2 and only modest recovery in River Section 3. EPA also expected the MNR portion of the remedy to allow for a specific metric to be met–the targeted species weighted and river section length weighted average PCB concentration to decline to 0.4 parts per million five years after dredging (in 2020). Neither of these expectations have been met.

ii. Water Column PCB Data

The expectation at the time of remedy selection was that there would be, after dredging, an approximate seven to nine percent reduction in water column PCB concentrations. The available water column PCB data sets do not show this pattern; instead, as shown in the Draft Third FYR report, water column concentrations are relatively stable in River Sections 1 and 2, with only modest reductions in River Section 3. This expectation has not been met.

iii. Sediment PCB Data

The expectation at the time of remedy selection was that there would be, after dredging, an approximate seven to nine percent reduction in surface sediment PCB concentrations during MNR. The available surface sediment PCB data sets do not show this pattern; instead, as shown in the Draft Third FYR report, surface sediment PCB concentrations are relatively stable, with little recovery in River Sections 1 and 2 and only modest recovery in River Section 3. The expected reductions in surface sediment PCB have not been met.

iv. Summary of Monitoring Data vs. Anticipated Remedy Performance

In each media, there is a pattern of relative stability in River Sections 1 and 2, and only modest reductions in River Section 3. For all three media, in the entire Upper Hudson, the data do not support a conclusion that the remedy is performing as anticipated at the time of remedy selection. Rather, the data available in each media and in each River Section support the conclusion that the remedy is not performing as anticipated at the time of remedy selection, as there has not been an observed media which shows a trend even approaching the anticipated seven to nine percent reductions in PCB concentrations.

IX. EPA Must Do More for the Lower Hudson River

A. EPA must issue a clear schedule for and commitment to a Remedial Investigation/Feasibility Study of the Lower Hudson

After a site is added to the NPL, the next step, as required by law, is to perform a Reassessment Remedial Investigation and Feasibility Study ("RI/FS").[138] An RI/FS defines the nature and extent of the threat and evaluates proposed remedies. Such study is required to precede any remedial action.[139] GE's Hudson Falls and Fort Edward former operations have been identified as a source of PCBs to the Lower Hudson River system.[140] As a result of GE's PCB release from these facilities, "PCBs were mobilized from the Upper Hudson River to the Lower Hudson River by flowing water and suspended sediment over the Federal Dam at Troy. Some of those PCBs continue to flow over the dam, and remain in the water column and sediments of the Lower Hudson River."[141] Despite known PCB contamination in the Lower Hudson and the continued and unacceptable risks presented, and that prior assessments, including the 2000 RI/FS and the 2002 ROD, conclude that PCB contamination presents an unacceptable risk to human and ecological health **in both the Upper and Lower Hudson,**[142] EPA has still failed to conduct an RI/FS for the Lower Hudson.[143]

While the 2002 ROD only adopted a remedial action for sediments in the Upper Hudson River, the selected remedial action was designed to reduce risks to humans and ecological receptors living in and near the Upper Hudson and Lower Hudson River.[144] To protect human health and the environment in the Lower Hudson, EPA adopted the following remedial action objective in the 2002 ROD: "Minimize the

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[138] *See* 42 U.S.C. § 9616(d). Superfund aims for timely commencement of RI/FS and remedial action once a site is listed on the NPL. *Id.*
[139] 40 C.F.R. § 300.430(a)(2) (2024).
[140] ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR TESTING/INVESTIGATION LOWER HUDSON RIVER 2 (Sept. 2022), https://www.epa.gov/system/files/documents/2022-09/ADMINISTRATIVE%20SETTLEMENT%20AGREEMENT%20AND%20ORDER%20ON%20CONSENT%20FOR%20TESTING%20INVESTIGATION%20LOWER%20HUDSON%20RIVER%20091322.pdf [hereinafter ASAOC].
[141] *Id*. at 5.
[142] ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR TESTING/INVESTIGATION LOWER HUDSON RIVER STATEMENT OF WORK 2 (Sept. 2022), https://www.epa.gov/system/files/documents/2022-09/Appendix%20B%20to%20Lower%20Hudson%20AOC%20SOW_0.pdf.
[143] In December 2000, EPA issued the Reassessment RI/FS which identified and evaluated the remedial alternatives for PCB-contaminated sediments in the Upper Hudson River. EPA, HUDSON RIVER PCBS REASSESSMENT RI/FS PHASE 3 REPORT: FEASIBILITY STUDY (Dec. 2000), https://semspub.epa.gov/src/document/02/66535.pdf.
[144] 2002 ROD, *supra* note 13, at i.

long-term downstream transport of PCBs in the river."[145] EPA did not require active remediation in the Lower Hudson because EPA anticipated that the reduced PCB load over the Federal Dam projected by the selected remedy would ultimately result in reduced concentrations of PCBs in fish, sediment, and water.[146] In 2024, nine years after GE completed dredging in the Upper Hudson, PCB levels in fish, sediment, and water in the Lower Hudson remain at levels that are unsafe for human health and the environment. Fish consumption advisories remain essential even in the Lower Hudson to mitigate the risks of PCBs to the public.

In September 2022, EPA and GE voluntarily entered into an Administrative Settlement Agreement and Order on Consent to provide for the performance of investigative activities by GE in the Lower Hudson River.[147] However, GE's Lower Hudson River Sampling and Analysis Plan/Quality Assurance Project Plan is not a substitute for an RI/FS—it will merely delay the beginning of an RI/FS for the Lower Hudson, which must occur before any meaningful response action can take place.[148] The 160-mile Lower Hudson portion of the Hudson River PCBs Superfund Site has waited nearly forty years for resolution of the legacy PCB pollution that has poisoned the river's wildlife, destroyed a vibrant fishing industry, impaired new commercial activity, and compromised the health of those living along its shores.

EPA expressly admits that fish tissue concentrations in the Lower Hudson River are not responding as anticipated. Fish tissue concentrations in the Upper Hudson River and upstream from the Green Island Bridge in Troy are declining more rapidly than in the rest of the Lower Hudson River, downstream from the Green Island Bridge.[149] The anticipated reductions in fish PCB concentrations in the Lower Hudson, as a result of the remedial work in the Upper Hudson, will likely not occur as modeled in the 2002 ROD. There is a disconnect between the remedial activities in the Upper Hudson River and the response in the Lower Hudson River.

Decisive action in the Lower Hudson River is long overdue. EPA must issue a clear schedule for and commitment to an RI/FS of the Lower Hudson River. Such RI/FS is necessary to determine the nature and extent of PCB contamination in the sediments, water, and biota of the Lower Hudson River, and to evaluate remedial alternatives to address the currently uncontrolled, unacceptable risks to human health and the

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[145] *Id.* at 51.
[146] *Id.* at 2.
[147] ASAOC, *supra* note 140.
[148] CERCLA provides that if it is determined it will be done properly and promptly, a responsible party may conduct an RI/FS, while the President (as delegated to EPA) is authorized to conduct investigations. *See* 42 U.S.C. § 9604(a)-(b).
[149] DRAFT THIRD FYR, *supra* note 23, at 30.

environment. EPA's current sampling and investigation lacks the robustness necessary to inform critical next steps.

B. EPA must improve its sampling efforts for the Lower Hudson River.

As part of an RI/FS or any subsequent investigation plans, EPA must improve its sampling efforts by providing sufficient spatial resolution to meaningfully assess the nature and extent of PCB in sediment and advance the understanding of relationships between PCB in fish, water, and sediments of the Lower Hudson.

GE's sampling and investigation of PCB concentrations in the water column, sediment, and fish of the Lower Hudson is unlikely to yield useful information to resolve the spatial distribution of PCBs and other contaminants in the Lower Hudson. The Lower Hudson is a much larger and more complex ecosystem than the Upper Hudson. GE's sampling and investigation plan includes a very limited number of locations (five water and fish sampling locations over the 150-mile estuary) to be sampled on an inadequate monthly basis. Sampling locations approximately thirty miles apart in the complex environment of the Hudson River estuary will not provide the spatial resolution necessary to meaningfully advance the understanding of the nature and extent of PCB contamination in the Lower Hudson.

The Lower Hudson is home to a diverse population of low-income and disadvantaged communities that continue to rely on fish from the Hudson River for food, putting their families at risk from toxic PCBs that "pose by far the largest potential carcinogenic risk of any environmental contaminants for which measurements exist."[150] Using only five planned sampling locations over the 150-mile length of the Hudson estuary, without a more comprehensive survey of what, when, who, and where anglers are fishing, will not develop a statistical and qualitative understanding of the nature and extent of PCB contamination in biota throughout the lower river.

C. A comprehensive angler survey should be conducted to determine which species are being consumed from which areas of the Hudson estuary.

The human health risks associated with fish consumption remain well above EPA's acceptable risk range, but the only protections in place to address these risks are the fish consumption advisories managed by the NYSDOH. In order for fish consumption advisories to successfully safeguard human health, NYSDOH requires an up-to-date understanding of the types of fish people are eating and an awareness of who is eating the fish. NYSDOH last published a Hudson River angler survey in 1996,

[150] Committee on Evaluation of the Safety of Fishery Products, Food and Nutrition Board, *Chemical Health Risk Assessment–Critique of Existing Practices and Suggestions for Improvement, in* Seafood Safety 186 (Farid E. Ahmed ed. 1991), https://www.ncbi.nlm.nih.gov/books/NBK235717/.

but the study excluded New York City.[151] The most recent comprehensive angler survey across the Hudson River PCBs Superfund Site was conducted by the Hudson River Sloop Clearwater in 1993.[152] Over the last few years, NYSDOH has relied on local fish consumption surveys conducted by Cornell Cooperative Extension mini-grant partners.[153] Such surveys depend on self-reporting from the public, which has resulted in a lack of statistical representation and incomplete responses.[154]

The current fish consumption advisory program identifies only a few of the fish species present in the Hudson Estuary that people may be consuming, informed by data from a limited number of fish sampling locations over 150 miles from Albany/Troy to New York City. A comprehensive program is needed to gather the data for NYSDOH to more fully understand who is eating fish from the Hudson River, what species are being consumed, and where people are likely to catch such fish. This understanding would allow fish advisories to better target communities most in need of NYSDOH's advice on fish consumption. EPA must do more for the Lower Hudson, starting with improving ongoing sampling, ordering an RI/FS, and conducting a comprehensive angler survey.

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[151] N.Y. State Dep't of Health, Health Consultation: 1996 Survey of Hudson River Anglers (Feb. 1999), https://www.researchgate.net/publication/274073248_Health_Consultation_1996_Survey_of_Hudson_River_Anglers.

[152] Bridget Barclay, Hudson River Angler Survey (Mar. 1993), https://semspub.epa.gov/work/02/68650.pdf.

[153] EPA, Third Five-Year Review for the Hudson River PCBs Superfund Site Appendix 8 28-29 (July 2024), https://www.epa.gov/system/files/documents/2024-07/appendix-8-fish-consumption-considerations.pdf.

[154] NYSDOH and Hudson River fish advisory mini-grant partner surveys do not include questions on how much of each species is consumed or how they are prepared.

X. EPA's Draft Third Five-Year Review Does Not Support or Explain the Lack of Fish Recovery in Expected Timeframes

In its Draft Third FYR for the Hudson River PCBs Superfund Site, EPA states:

> Progress is being made toward RAOs presented in the 2002 ROD…The fish species-weighted average TPCB concentration for the UHR as of 2021 was 0.71 mg/kg. The preliminary 2022 average was 0.58 mg/kg. Modeling results presented in the ROD estimated that the first human health target for protection of human health (0.4 mg/kg) would be reached five years after the completion of dredging. Similarly, model results presented in the ROD estimated the second target PCB tissue concentration for the UHR (0.2 mg/kg) would be reached 16 years after the completion of dredging. Although the first target was not achieved within the five-year time period, concentrations are approaching the first target and additional years of data collection are necessary to assess if the second target will be achieved in the timeframe estimated by the modeling… The percentage of sport fish below the 0.4 milligrams per kilogram wet-weight (mg/kg-ww) threshold has increased from 21 percent in the pre-dredging period to 37 percent in the post-dredging period.[155]

EPA compares the two most recent years of fish data to argue "progress toward," highlighting a reduction between 2021 and 2022, while continuing to state that many years of data are needed to reliably quantify trends in fish PCB concentrations. EPA should not here make conclusions that preliminary 2022 fish data indicate a "continued decline" in concentrations, while at the same time stating in this FYR that there is not sufficient data to quantify trends.

The percentage of fish meeting or not meeting any particular criterion, while interesting, is not a metric which helps understand whether or not the goals of the ROD are being met, which EPA has based upon a river section length and species weighted average. It is critical to recognize that the modeling results in the ROD relied on species-specific lipid distributions to estimate wet weight PCB concentrations, which means a direct comparison of wet weight values without considering lipid content is

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[155] DRAFT THIRD FYR , *supra* note 23, at 36.

misleading. Using species-specific lipid values (equivalent to lipid-normalized results), the preliminary average is much higher and the rate of decline post-dredging is about one-half the rate from using wet weight values only.

Progress toward meeting the human health targets included in the ROD associated with the dredging, while critically important to understand the effectiveness of the dredging program in meeting the removal goals, are not helpful in understanding the performance of the current phase of the remedy (MNR).

In Appendix 3 of the Draft Third FYR, EPA states "[f]igures A3-16B to A3-19B show that declines in wet-weight TPCBHE are less apparent when normalized to lipid content, suggesting that variability in lipid is important in determining concentration changes over time."[156] This statement highlights the importance of understanding trends in PCB concentration on a lipid normalized basis. There have been only modest declines in fish PCB concentration when changes in fish lipid content are taken into account, and due to the very low lipid concentrations in bass and bullhead in recent years, there is little reason to believe that the modest declines in fish PCB concentration, driven by decreases in fish lipid content, will continue as there is little room for further declines in lipid content.

A major assumption of the evaluation of human health target level is that the fish collected in spring are representative of concentrations throughout the summer. Given the extremely low and decreasing lipid content of the primary species (black bass and bullhead) used to calculate the species-weighted averages, this assumption may not be true, as these species are likely to accumulate lipid (and PCBs) over the summer.

The apparent decline in species-weighted average fish PCB concentrations can be explained by the reductions in fish lipid concentrations in bass and bullhead. These two species make up 91% of the species weighted average metric developed by EPA. Bass and bullhead PCB data, when lipid normalized, show much lesser declines than when looked at on a total PCB basis alone. As a result, basing assumptions on the recent trends in bass and bullhead total PCB concentrations ignores the relationship between PCB and lipid in these animals.

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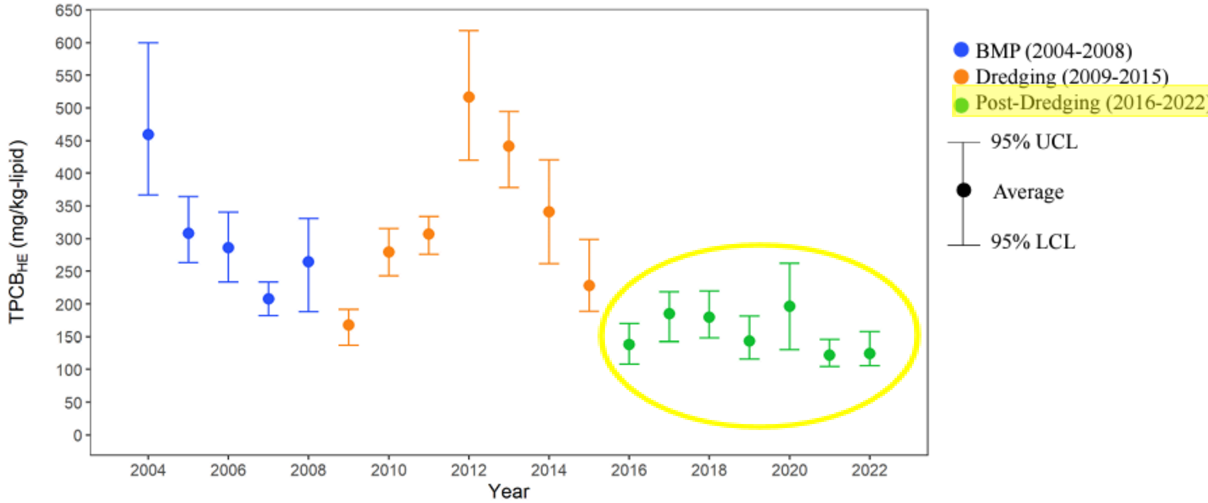
[156] DRAFT THIRD FIVE YEAR REVIEW REPORT FOR THE HUDSON RIVER PCBS SUPERFUND SITE, APPENDIX 3 EVALUATION OF FISH TISSUE PCB CONCENTRATIONS, *supra* note 130, at 24.

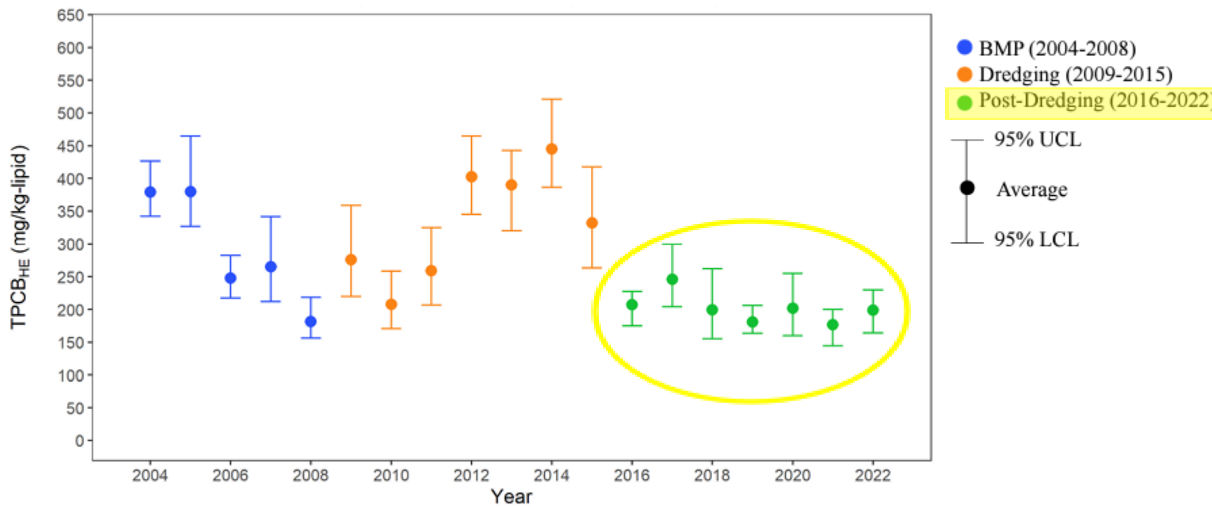
Draft



Notes
1. Preliminary data from 2022 have been added to this plot, a single conversion factor (based on 2018, 2020, 2021 and 2022 Aroclor-congener matched pairs) was used to convert the 2017-2022 data from Aroclor basis to Total PCB-homologue equivalent ($TPCB_{HE}$). Please note that other figures in this appendix; where data ends in 2021; used a single conversion factor from 2018, 2020 and 2021 Aroclor-congener matched pairs. Therefore, the 2017-2021 values are slightly different than the ones shown here.
2. To create the River Section average, individual species are first averaged by collection station. The results for each species at each station are then equally weighted to create an average for the species for the River Section. The individual species averages are then combined in a species-weighted average for the River Section. Largemouth bass and smallmouth bass results are combined and treated as a single species in the calculation. (See text for discussion.)
3. River Section fish tissue PCB concentrations are weighted by species as follows: black bass (largemouth or smallmouth) = 47%, brown bullhead = 44%, yellow perch = 9%.
4. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
5. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Lipid-Normalized Species-Weighted Average in River Section 1 with 2022 Data	Figure A3-21B
	July 2024

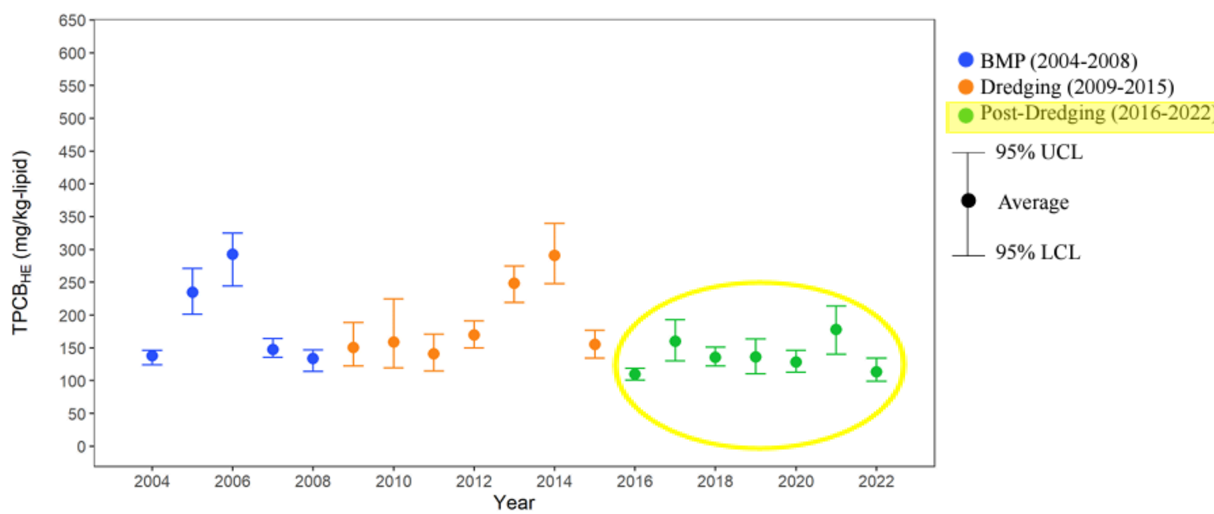
Draft



Notes
1. Preliminary data from 2022 have been added to this plot, a single conversion factor (based on 2018, 2020, 2021 and 2022 Aroclor-congener matched pairs) was used to convert the 2017-2022 data from Aroclor basis to Total PCB-homologue equivalent ($TPCB_{HE}$). Please note that other figures in this appendix; where data ends in 2021; used a single conversion factor from 2018, 2020 and 2021 Aroclor-congener matched pairs. Therefore, the 2017-2021 values are slightly different than the ones shown here.
2. To create the River Section average, individual species are first averaged by collection station. The results for each species at each station are then equally weighted to create an average for the species for the River Section. The individual species averages are then combined in a species-weighted average for the River Section. Largemouth bass and smallmouth bass results are combined and treated as a single species in the calculation. (See text for discussion.)
3. River Section fish tissue PCB concentrations are weighted by species as follows: black bass (largemouth or smallmouth) = 47%, brown bullhead = 44%, yellow perch = 9%.
4. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
5. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Lipid-Normalized Species-Weighted Average in River Section 2 with 2022 Data	Figure A3-22B
	July 2024

Draft



Notes
1. Preliminary data from 2022 have been added to this plot, a single conversion factor (based on 2018, 2020, 2021 and 2022 Aroclor-congener matched pairs) was used to convert the 2017-2022 data from Aroclor basis to Total PCB-homologue equivalent (TPCB$_{HE}$). Please note that other figures in this appendix; where data ends in 2021; used a single conversion factor from 2018, 2020 and 2021 Aroclor-congener matched pairs. Therefore, the 2017-2021 values are slightly different than the ones shown here.
2. To create the River Section average, individual species are first averaged by collection station. The results for each species at each station are then equally weighted to create an average for the species for the River Section. The individual species averages are then combined in a species-weighted average for the River Section. Largemouth bass and smallmouth bass results are combined and treated as a single species in the calculation. (See text for discussion.)
3. River Section fish tissue PCB concentrations are weighted by species as follows: black bass (largemouth or smallmouth) = 47%, brown bullhead = 44%, yellow perch = 9%.
4. 95% lower confidence limit (LCL) and upper confidence limit (UCL) on the average are calculated using a bias-corrected and accelerated (BCA) bootstrap method.
5. The GE samples from 2007-2013 are rib-out fillets, all other fillet data were processed using the NYSDEC standard fillet procedure. (See text for discussion.)

Lipid-Normalized Species-Weighted Average in River Section 3 with 2022 Data

Figure A3-23B

July 2024

These three figures summarize the current performance of the monitored natural recovery phase of the remedy. In each river section, there is very low recovery; the graphs display little recovery in the species weighted average metric used by EPA in the entire Upper Hudson, even when the 2022 data are added to the graphs.

EPA postpones making a protectiveness determination until sufficient fish data are available to reliably determine the rate of recovery, which EPA concludes requires at least ten years of data. However, problems with the available post-dredging data for the principal species make it highly unlikely that a reliable rate of recovery can be determined.

The post-dredging recovery data for the principal species used for determination of the species-weighted average (black bass and bullhead) are compromised by decreasing and very low lipid concentrations, which makes it difficult to reliably determine rate of recovery for those species, as clearly recognized by EPA's team in a 2019 presentation.[157]

[157] John W. Kern et al., Distinguishing a True Trend: Co-Variation in Lipid Content and Fish Tissue PCB Concentration: A Case Study in the Hudson River (Feb. 2019), https://www.researchgate.net/publication/331585481_Distinguishing_a_True_Trend_Co-Variation_in_Lipi

d_Content_and_Fish_Tissue_PCB_Concentration_A_Case_Study_in_the_Hudson_River_Katherine_von_Stackelberg_NEK_Associates.
158 *Id*.

On a lipid-standardized basis the decline for black bass and bullhead PCB concentrations is much slower or non-existent. Importantly, EPA's bioaccumulation models, which were used to predict the recovery of fish PCBs post-dredging, relied on species-specific percent lipid to estimate wet-weight concentrations post-dredging. Yellow perch and yearling pumpkinseed have relatively constant lipid content, which makes determining their rate of recovery much more reliable. The yellow perch and pumpkinseed data clearly show that little or no recovery is taking place for these species in the eight year post dredging period in most or all reaches included in the long-term monitoring. The temporal trends for these species are consistent, whether evaluated on a wet-weight or lipid standardized basis.

Annual post-dredging fish PCB monitoring has four species with consistent and robust databases. Two of these species, yellow perch and pumpkinseed, show little to no decline in post-dredging PCBs on either a wet-weight or lipid-normalized basis. The other two species, black bass and bullhead, show declines in wet-weight PCBs, but on a lipid-normalized basis, the declines are much slower or non-existent after eight years of post-dredging monitoring. As John Kern et al. point out, the results for those two species are confounded by temporally decreasing percent lipid.[158] It's not clear that additional years of data will resolve these issues for bass and bullhead (and, therefore, the species-weighted averages). However, the results for yellow perch and pumpkinseed clearly show that post-dredging recovery in Upper Hudson River fish is well below expectations and additional data are unlikely to change that conclusion.

XI. EPA Must Pursue Remedy Optimization to Ensure Protectiveness

It is recommended that EPA issue a "not protective" determination in the Third FYR. Following this, it is recommended that EPA perform a Remedy Optimization following EPA guidelines to evaluate the delay in achieving the anticipated declines in fish PCB concentrations, surface sediment PCB concentrations, and water column PCB concentrations. Once this Remedy Optimization is completed, EPA should take the necessary actions to meet the risk reduction goals established at the time of remedy selection.

A. Remedy Optimization

In recent years, EPA has increasingly turned to remedy optimization to resolve complex issues at particularly challenging Superfund sites. Through the remedy optimization process, EPA brings in a team of independent technical experts to recommend ways to improve the effectiveness of a cleanup action. Those recommendations can include improvements to the conceptual site model, changes to the remedial approach, and best practices for data management. While remedy optimization can take place at any stage in the Superfund process and at any type of Superfund site, EPA prioritizes large and complex sites where there is a "desire to accelerate or improve effectiveness of the remedial process."[159] The Hudson River PCBs Superfund Site is exactly the type of site that EPA should be targeting for remedy optimization.

The process for remedy optimization at EPA has evolved over the years, but optimization activities began in the late 1990s. EPA's Office of Superfund Remediation and Technology Innovation provided technical support to EPA regional offices by conducting independent reviews of Superfund sites. Over the years, it became clear that those optimization reviews were effective, and multiple EPA strategy documents called for an increase in funding for remedy optimization at Superfund sites.[160]

In September 2012, EPA formalized its optimization practices by releasing a National Strategy for Expanding Superfund Optimization.[161] While the National Strategy did not impose any legal binding requirements, it outlined a more formal structure for optimization, including a definition of remedy optimization:

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[159] EPA, National Strategy to Expand Superfund Optimization Practices from Site Assessment to Site Completion 6 (Sept. 2012), https://semspub.epa.gov/work/HQ/174096.pdf.
[160] EPA, Superfund Task Force Final Report 30 (Sept. 2019), https://www.epa.gov/sites/default/files/2019-09/documents/sftfreport_v17-9-5_for508s.pdf.
[161] National Strategy to Expand Superfund Optimization Practices from Site Assessment to Site Completion, *supra* note 159.

> Efforts at any phase of the removal or remedial response to identify and implement specific actions that improve the effectiveness and cost-efficiency of that phase. Such actions may also improve the remedy's protectiveness and long-term implementation which may facilitate progress towards site completion. To identify these opportunities, regions may use a systematic site review by a team of independent technical experts, apply techniques or principles from Green Remediation or Triad, or apply other approaches to identify opportunities for greater efficiency and effectiveness.

From 2012-2017, EPA completed 143 optimization and technical support evaluations, more than tripling its annual average from before the National Strategy was released. In 2020, EPA released a detailed report assessing the remedy optimization program, finding that the program had made "cleanups more efficient and effective and [] spurred the Superfund program forward."[162]

For several reasons, the Hudson River PCBs Superfund Site appears to be a good candidate for remedy optimization. First, the site has many of the features that EPA looks for: it is a large and complex site that has concerns about the effectiveness of the remedy and uncertainty regarding the conceptual site model. Second, the Hudson River PCBs Superfund Site urgently needs outside review from independent experts. The same team has been working at the site for years (in some cases, for decades); fresh eyes and a new perspective would be extremely helpful. Third, remedy optimization is intended for sites in all phases of the Superfund process. Since the Upper Hudson and Lower Hudson are at very different stages, it is important to have a flexible approach that can address both portions of the Site. Remedy optimization is likely the best path forward for the Hudson River PCBs Superfund Site.

It is important to point out that this would not be unprecedented, both at this site and in the Superfund program in general. After the 1984 Record of Decision for this site, EPA performed a Five-Year Review starting in 1989. This review developed into the "Reassessment RI/FS", which involved all of the data gathering, modeling, and remedial alternative evaluation done to support the most recent Record of Decision under which the current remedy was implemented. The same logic applies today: the selected remedy does not appear to be meeting the EPA risk reduction goals for the Superfund program, and the remedy is not performing as anticipated. EPA can, through the Remedy Optimization process, determine what, if any, further remedial action may be needed to meet the goals of the Superfund program.

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[162] EPA, SUPERFUND OPTIMIZATION PROGRESS REPORT ES-1 (Oct. 2020), https://www.epa.gov/sites/default/files/2020-10/documents/superfund_opt_progress_report_october_2020_final.pdf.

B. Enforcement Mechanisms Available to EPA to Achieve Site-Specific Superfund Goals

While remedy optimization would benefit the Site, there are other potential paths forward. Notably, there are different options available to EPA in the Upper Hudson and Lower Hudson, or at least different procedural requirements for pursuing those options.

i. ROD Reopener

In 2019, EPA issued a Certificate of Completion of the Remedial Action ("Certificate") for the Upper Hudson. By issuing that Certificate, EPA triggered a covenant not to sue under the terms of the 2006 Consent Decree between EPA and GE. The covenant not to sue prevents EPA from taking administrative or judicial action to compel GE to take additional response action in the Upper Hudson, or to seek reimbursement of response costs.[163]

Nevertheless, the reopener provisions in the 2006 Consent Decree provide a mechanism for additional action in the Upper Hudson. Under the reopener provisions, EPA can only compel additional action if EPA discovers "previously unknown conditions, or previously unknown information" indicating that the remedial action is not protective.[164] Since EPA issued the Certificate in 2019, a great deal of new information—including additional information about the amount of remaining contaminated sediment and the lack of recovery in fish—has revealed that the remedy in the Upper Hudson is not protective of human health and the environment. Therefore, there is a strong argument that EPA can compel GE to take additional remedial action in the Upper Hudson. However, the first step is a finding in the Five-Year Review that the remedy is not protective.

ii. Explanation of Significant Differences and/or ROD Amendment

Once a remedy is selected in a Record of Decision, any significant or fundamental changes to the scope, performance, or cost of the remedial action require specific steps and public notice.[165] If the changes are "significant," then EPA must publish an Explanation of Significant Differences ("ESD") that describes the nature of the significant changes and the reason such changes were made. The ESD must be made available to the public, and an additional public comment period or meeting may

[163] Consent Decree, *supra* note 51, at ¶¶ 98-99.
[164] *Id.* at ¶ 101(b).
[165] 40 C.F.R. § 300.435(c)(2).

be held, though neither is required.[166] If the changes are "fundamental," then EPA must propose an amendment to the ROD and provide an opportunity for public comment.[167]

iii. Modify Site Remedy If Needed To Meet CERCLA/SARA Risk Reduction Requirements

While it is premature to assume that further remediation will be required, EPA should acknowledge in the FYR that one of the possible outcomes of a "not protective" determination and a following Remedy Optimization could be some further targeted contaminated sediment removal, some capping of remaining contaminated sediment, or other remedial actions as needed to achieve the risk reduction goals of the Superfund program.

[166] EPA, A GUIDE TO PREPARING SUPERFUND PROPOSED PLANS, RECORDS OF DECISION, AND OTHER REMEDY SELECTION DECISION DOCUMENTS 7-2 (July 1999), https://www.epa.gov/sites/default/files/2015-02/documents/rod_guidance.pdf.
[167] *Id.* at 7-5.

XII. Conclusion

The PCB contamination of the Hudson River by GE has profoundly impacted the river, giving rise to unacceptable human health and ecological risks. This pollution, which began nearly eighty years ago caused by direct discharges of millions of pounds of PCBs from the GE capacitor plants in Hudson Falls and Fort Edward, has been addressed to date by the State of New York and EPA in a series of remedial decisions since the early 1980s. In the most recent EPA decision document, the 2002 Record of Decision, EPA selected an active remedial approach to achieve significant reductions in risk. This risk reduction was to be achieved by source control at the two GE plant sites, targeted environmental dredging to remove the most highly PCB contaminated sediment, and monitored natural recovery after dredging to achieve rapid reductions in fish PCB concentrations and the resulting human health and ecological risk.

EPA set interim targets for reductions in fish PCB concentrations, based upon the anticipated seven to nine percent annual reductions identified in the 2002 ROD. However, the first target was missed, and it does not appear that this target will be achieved in the foreseeable future. The data available indicate that the fish PCB concentrations are not recovering at the rate anticipated at the time of remedy selection, and in most cases the rate of recovery is very low or, for bullhead and bass, driven primarily by reductions in fish lipid content and not changes in exposure conditions. Surface sediment concentrations have not recovered as anticipated, with little reduction evident in the available data set.

EPA selected the cleanup levels for sediment set forth in the 2002 ROD based on risk reduction anticipated to result from the selected dredging remedy. These risks were based on outdated assumptions which EPA is still evaluating on a national basis. EPA should update its understanding of the relationship between sediment and fish PCB concentrations, and determine if, and how much, further active remediation is required to meet the risk reduction targets within the time frames established by the 2002 ROD.

EPA has avoided acknowledging the 0.4 and 0.2 ppm fish targets identified in the 2002 ROD, and is instead focusing on the ultimate remediation goal of 0.05 ppm. This approach is unacceptable based on EPA's own criteria for remedy selection. The time to reach the 0.05 ppm goal was the same regardless of which remedy EPA selected, inclusive of both the No Action alternative and the most aggressive active remediation plan evaluated in the ROD. EPA chose the selected remedy principally based on the time to reach the 0.4 and 0.2 ppm targets. If EPA no longer believes that time to reach these interim target concentrations is important, then it will be very difficult to justify any future active remediation should EPA determine that such action is necessary. This sets a dangerous precedent for the future remediation of Superfund sites across the country.

The public and environmental health threats posed by PCBs in the Hudson River have been borne by generations of people living along its shores. These health effects—including cancers, birth defects, and neurological impacts—are long-term and cumulative. Without a robust natural recovery, the current elevated human health and ecological risks posed by fish consumption will likely persist for the foreseeable future. Relying on fish consumption advisories is neither an effective nor a just solution to mitigate human health risks, particularly for environmental justice communities that rely on subsistence fishing. Such advisories place the burden on impacted communities to avoid the risk of PCB exposure posed by consuming contaminated fish, rather than on the polluter to reduce the risk it created.

To ensure genuine progress toward restoring the Hudson River, the EPA must formally acknowledge in its Final Third FYR that the current Upper Hudson River remedy is "not protective" of human health and the environment. Decades of contamination and insufficient reductions in PCB levels have left communities vulnerable, as the cleanup has not met the critical targets necessary to safeguard public health within the promised timeframe. The Friends of a Clean Hudson coalition calls upon the EPA to take decisive action by issuing this "not protective" determination and initiating a Remedy Optimization, in alignment with EPA guidelines, to accelerate reductions in PCB concentrations in fish, sediment, and water. Only by officially recognizing the shortcomings of the existing remedy can the EPA honor its commitment to the State of New York and place the Hudson River on a path to recovery that fully prioritizes the health of its ecosystem and the well-being of its communities.

Attachment 1

Available Upper Hudson Fish Data During MNR

Total PCB, Lipid Based PCB, and Percent Lipid in Hudson River Fish

Upper Hudson River

2016 to 2022

Terms

- Total PCB – PCB content in fish filet (Bass, Bullhead, Perch) whole Pumpkinseed) or in composite samples of Forage Fish, in milligrams per kilogram (mg/kg) PCB on a wet weight basis.
- Lipid Content – how much of the sample is made up of lipids, ie. fats, where the PCB tends to accumulate in the animal. This can vary from sample to sample, species to species, and within species in any sample population.
- Lipid Based PCB – this metric is calculated using the wet weight PCB concentration in mg/kg, divided by the lipid content of the sample, in mg/kg/percent lipid. By accounting for this variable, a more useful metric is generated to understand changing PCB concentrations over time in fish.

Comparing Trends in Weighted Average Metric Total PCB vs Lipid Based PCB

- EPA has developed a metric to represent overall average fish over time in the Upper Hudson, based on Total PCB.
- This metric is based on three species groups, weighted as follows: Black Bass 47%, Bullhead 44%, Perch 9%).
- This metric is also weighted according to length of River Section (RS), weighted as follows: RS1 - 15.4%, RS2 – 12.5%, RS3 – 72.1%.
- Concentrations of PCB in fish can also be understood on a basis of Lipid Based PCB.

Breakdown of Weighted Average Metric

River Section	Species Group	River Section Length Weighting	Species Weighting	Percentage of Overall Metric
1	Black Bass	15.4%	47%	7.2%
1	Bullhead	15.4%	44%	6.8%
1	Perch	15.4%	9%	1.4%
2	Black Bass	12.5%	47%	5.9%
2	Bullhead	12.5%	44%	5.5%
2	Perch	12.5%	9%	1.1%
3	Black Bass	72.1%	47%	33.9%
3	Bullhead	72.1%	44%	31.7%
3	Perch	72.1%	9%	6.5%

Results by Pool and Station

- Four of the eight discrete pools (reaches between dams) have fish sampling stations. EPA has chosen Reach 5 to represent all of River Section 3, with limited sampling below the upper Mechanicville dam.
- Evaluating monitoring results of each species at each location is useful in understanding the performance of the ongoing natural recovery after dredging.
- In order to evaluate the performance of Monitored Natural Recovery, EPA should take into account the change in concentrations over time for each species at each location.

Results by Pool and Station

- In order to evaluate the performance of Monitored Natural Recovery, EPA should take into account the change in concentrations over time for each species at each location, in addition to evaluating the species weighted and river section length weighted average.
- EPA can compare the fish PCB concentrations immediately after dredging in 2016 with the most recent data set available to evaluate the performance of the remedy. This is the same comparison as was used by EPA in Section 5.1 (p. 36), where the 2021 and 2022 fish data were used in the report text to support EPA's conclusion that there is "progress toward" reaching the ROD goals.

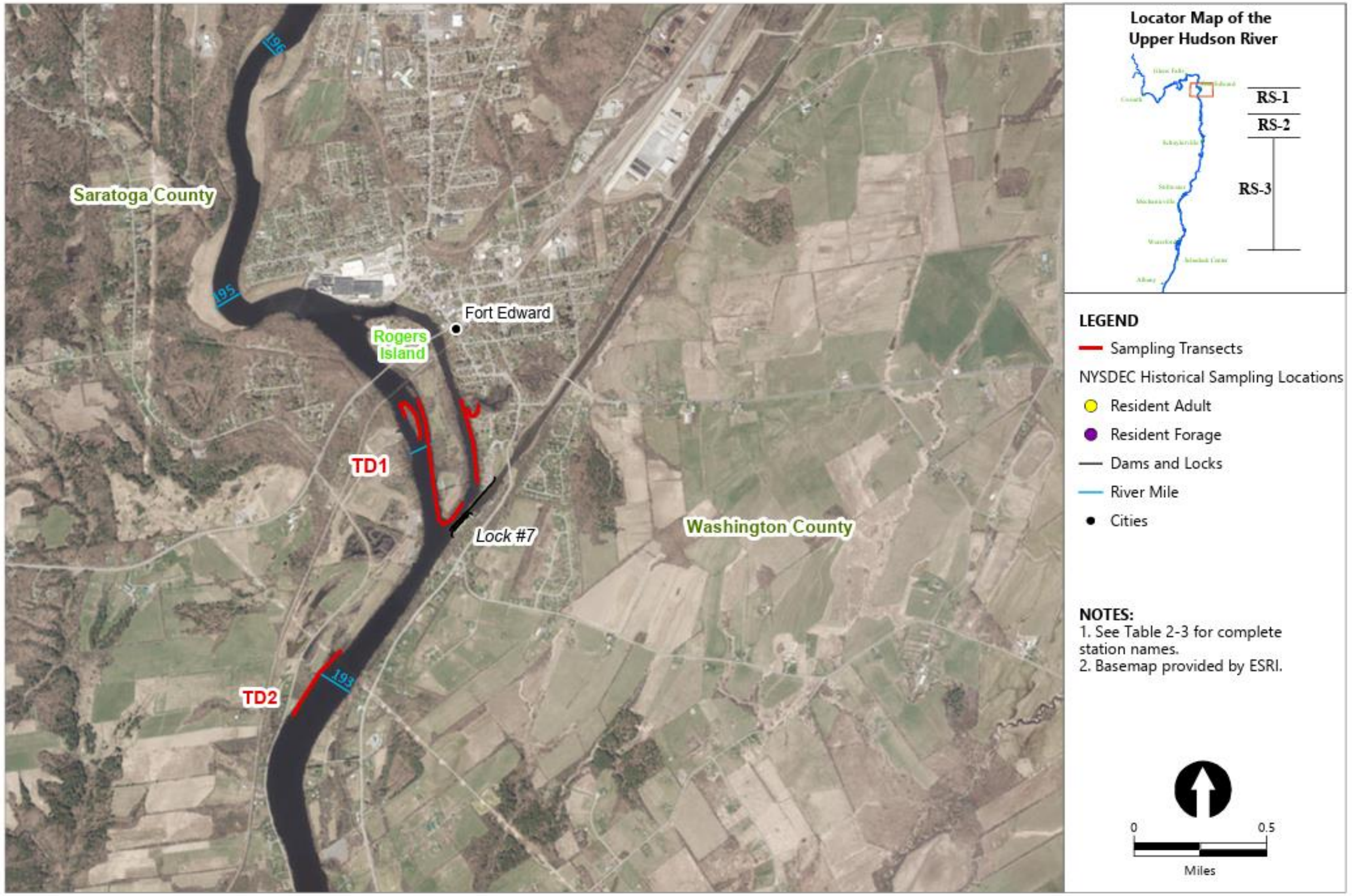
River Section 1 (Reach 8)
Thompson Island Pool

Reach 8 (Thompson Island Pool)
River Section 1

- Reach 8 extends from above Rogers Island in Fort Edward to the Thompson Island Dam, about 6 miles downstream.
- Reach 8 is the entirety of River Section 1.
- River Section 1 is the only portion of the river where EPA selected the more stringent cleanup level for delineating sediment removal, and where the most intensive dredging effort was undertaken.
- There are five fish monitoring stations in Reach 8, designated TD1 through TD5.

Station TD1

Stations TD1 and TD2



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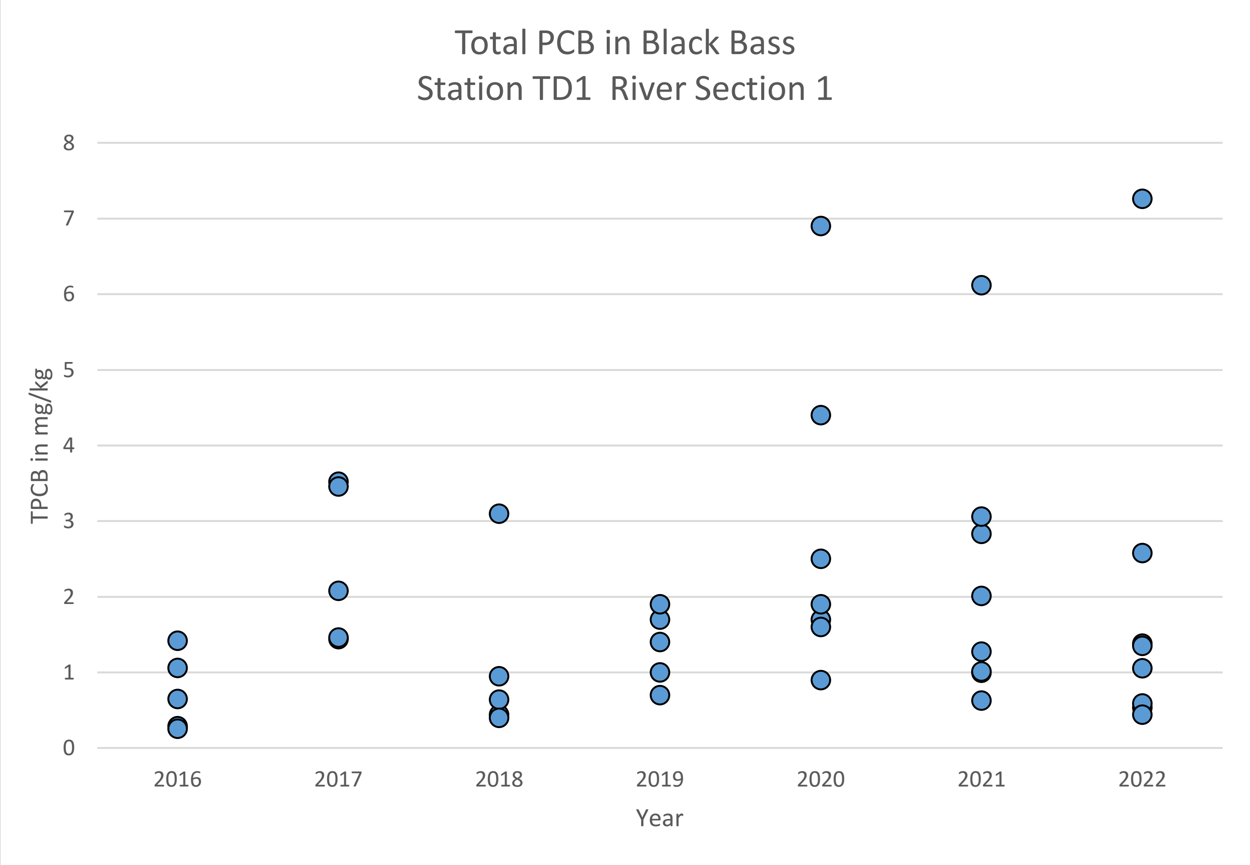
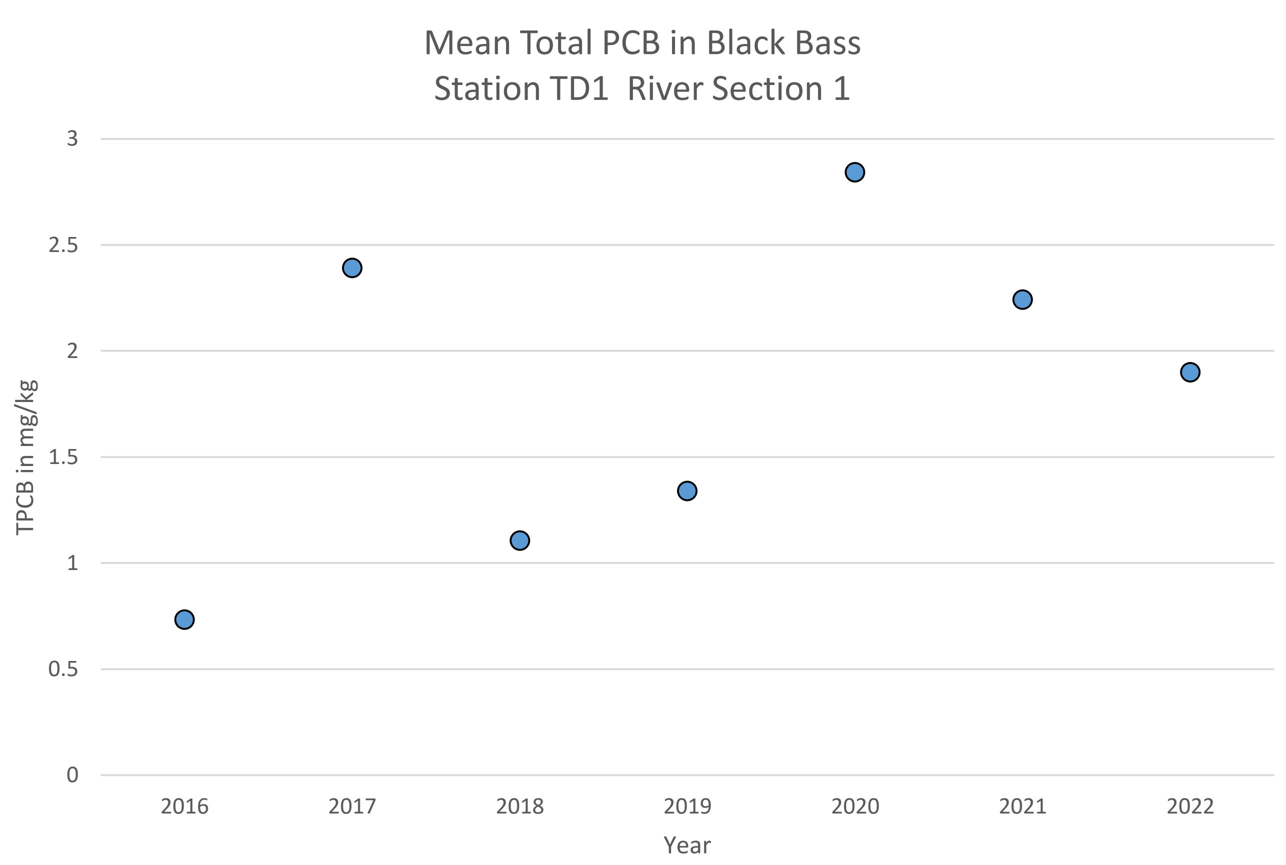
ANCHOR QEA

Figure 2-2b
Spring 2018 Fish Sampling Locations
2018 Water and Fish Data Summary Report
Prepared for the General Electric Company

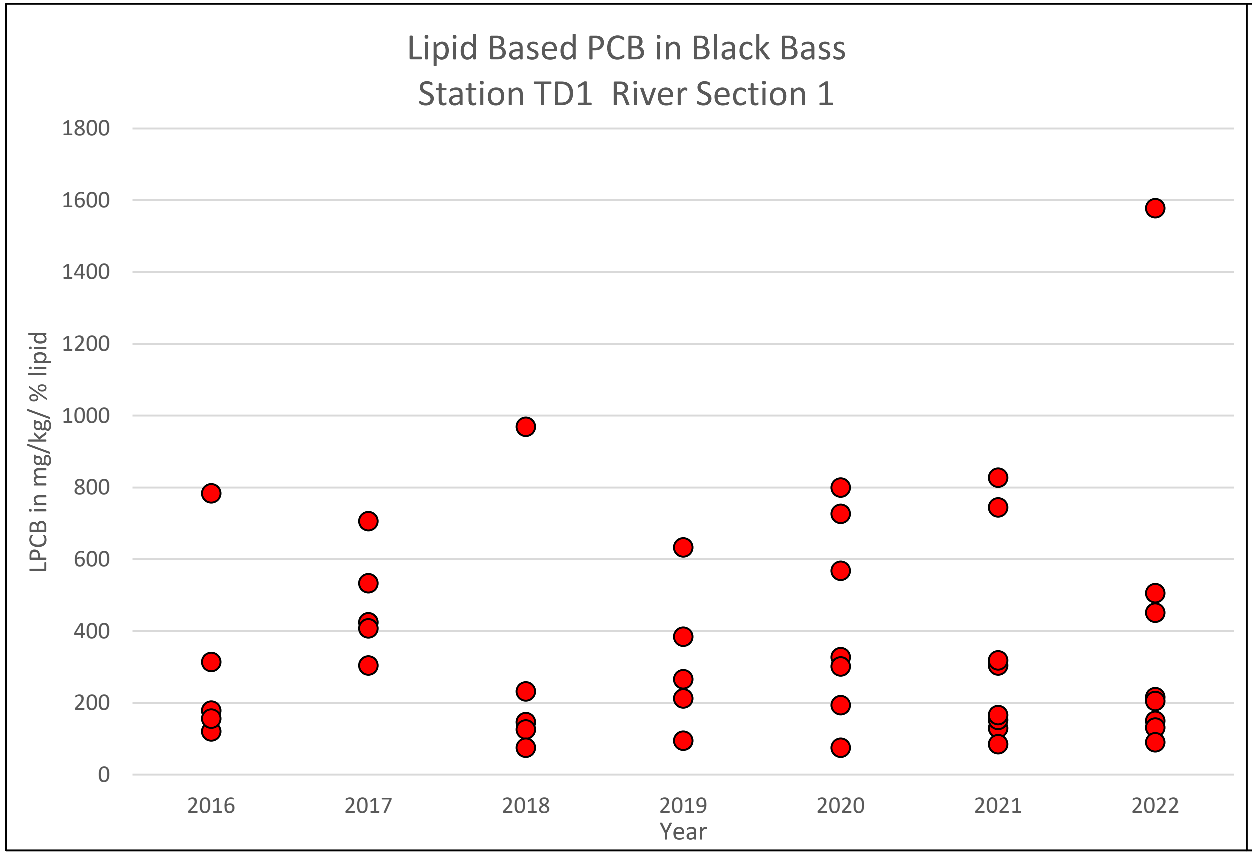
TD1 Black Bass Data

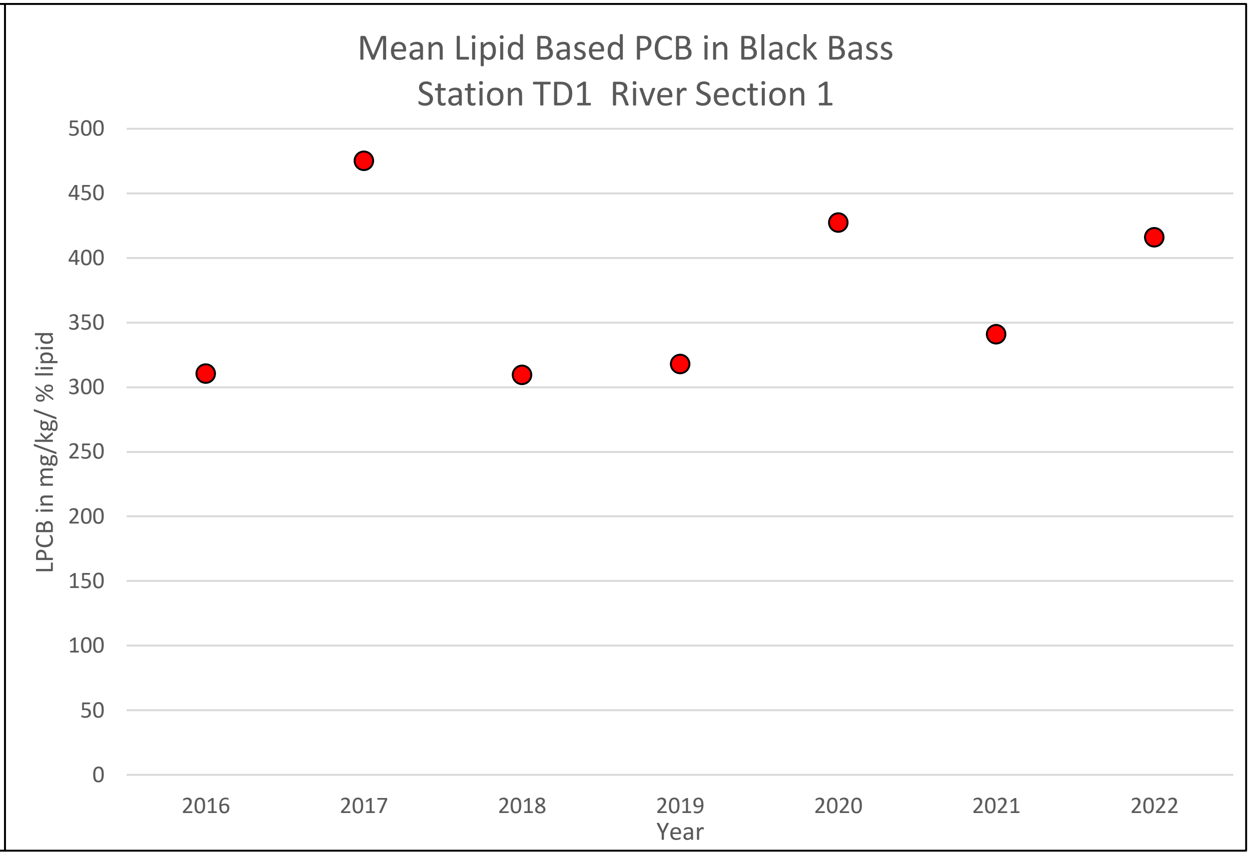
TD1 Black Bass Total PCB



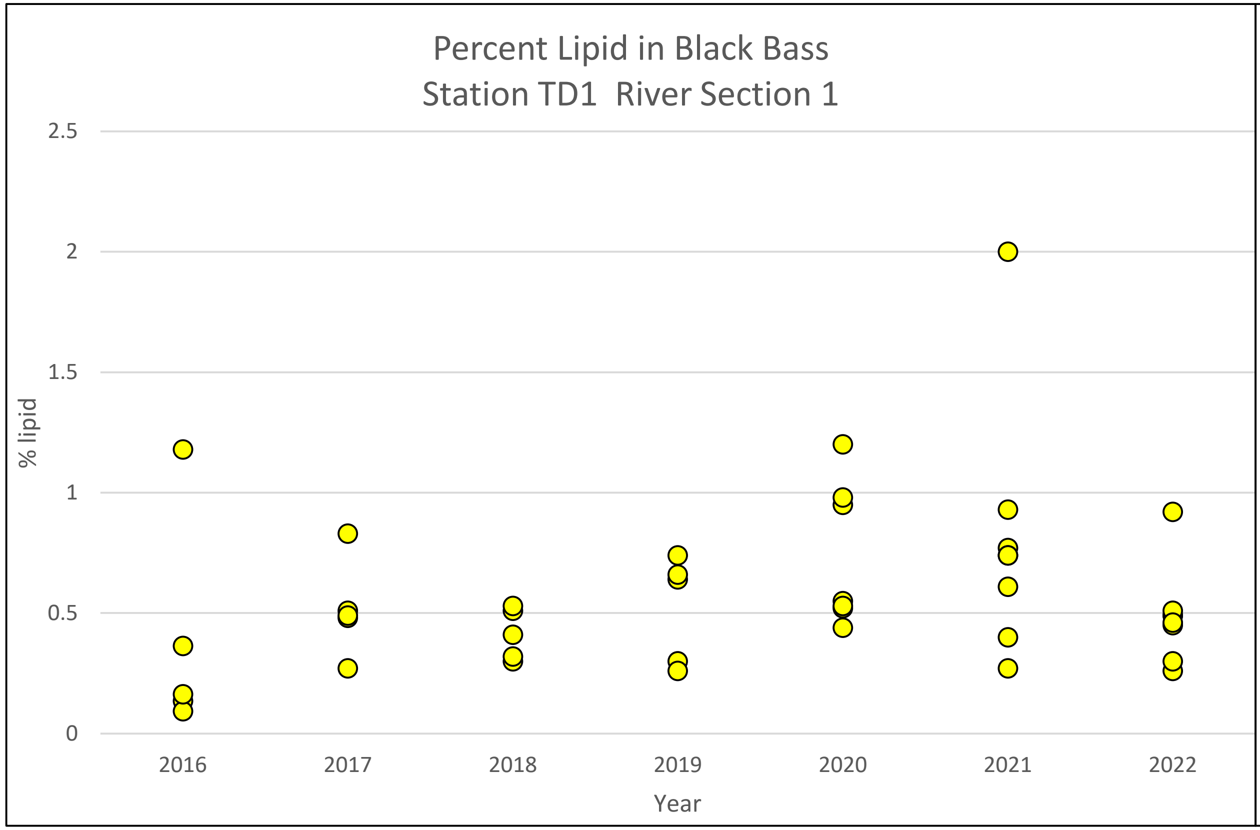


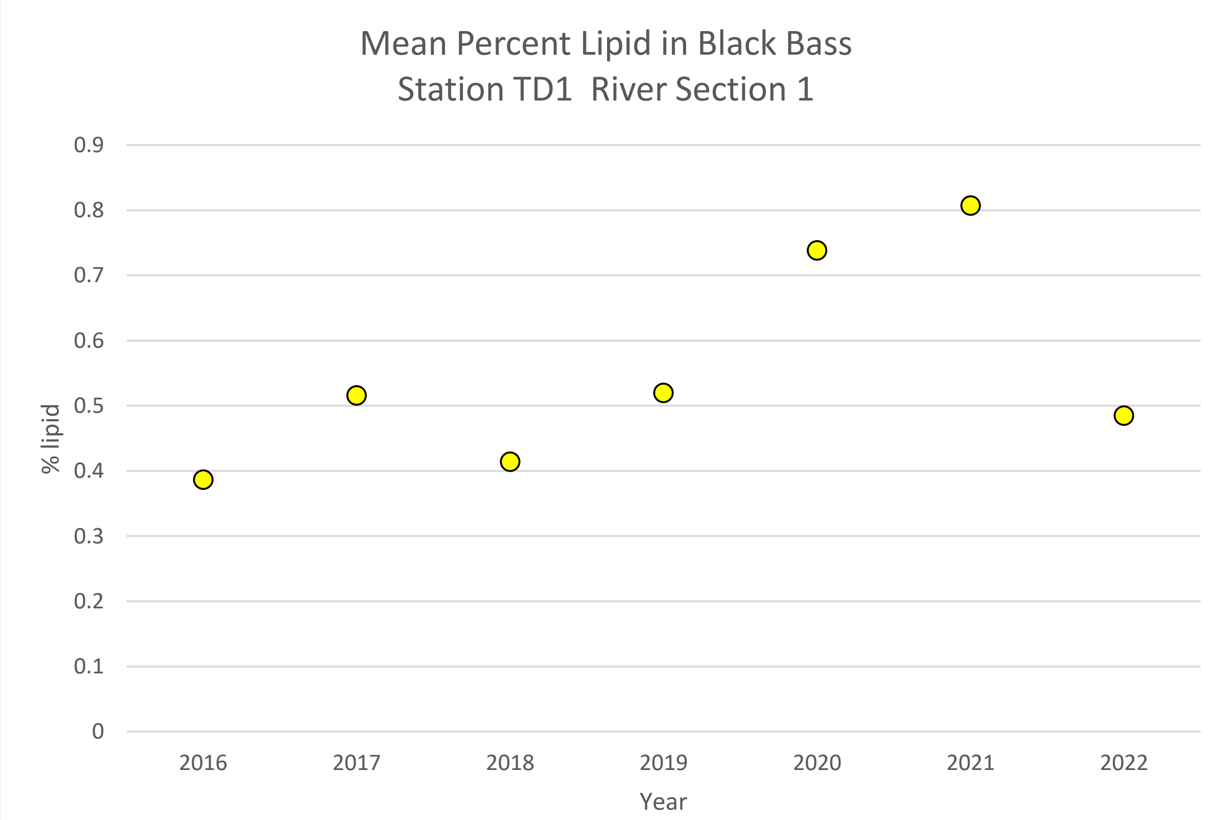
TD1 Black Bass Lipid Based PCB



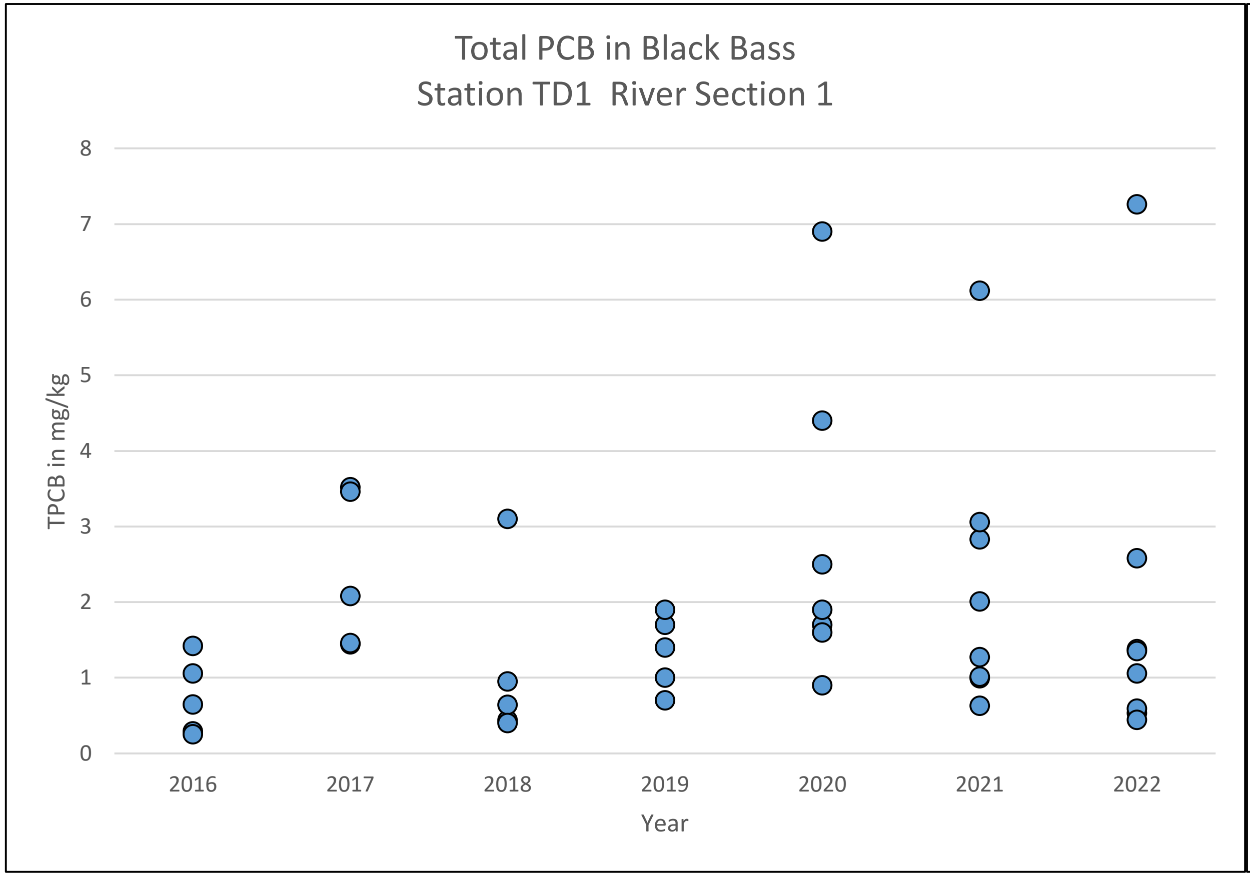


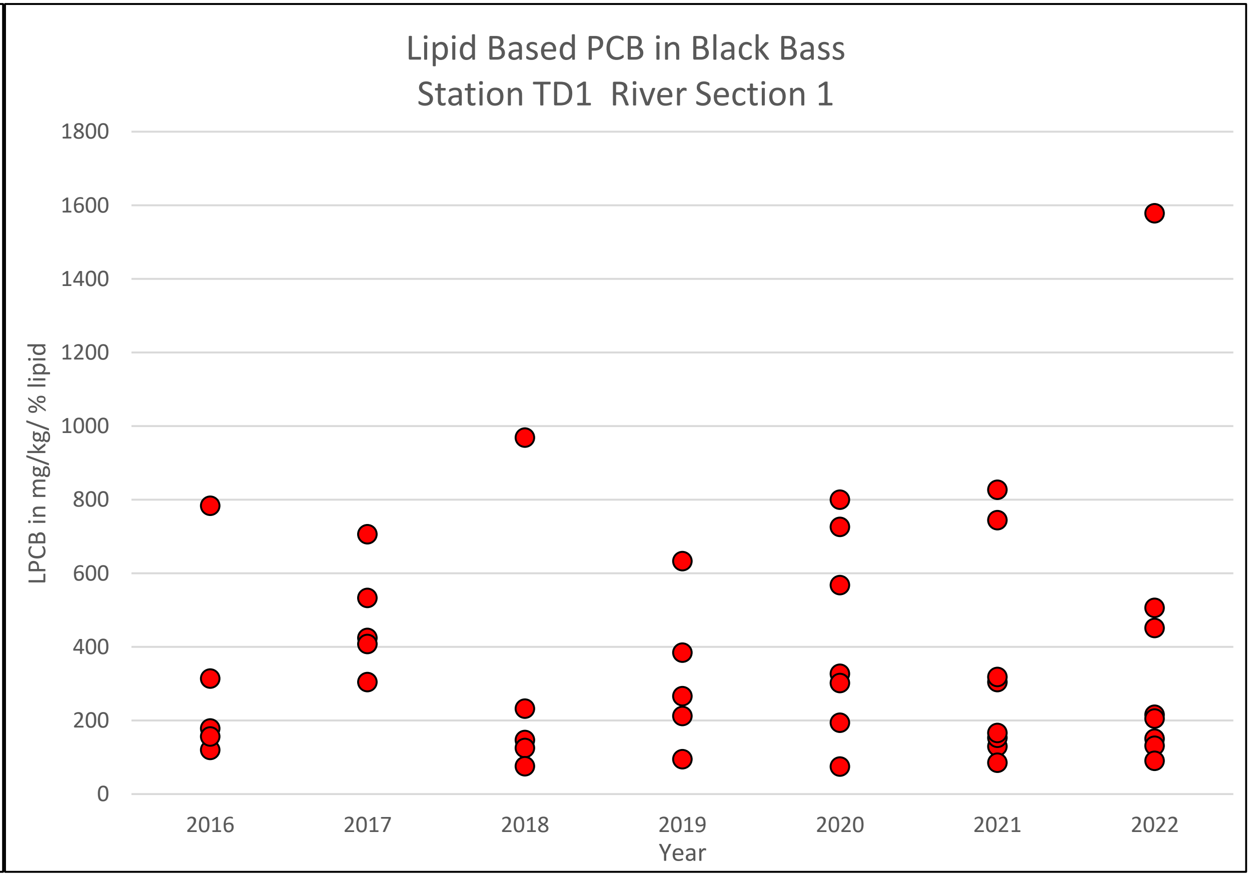
TD1 Black Bass Percent Lipid



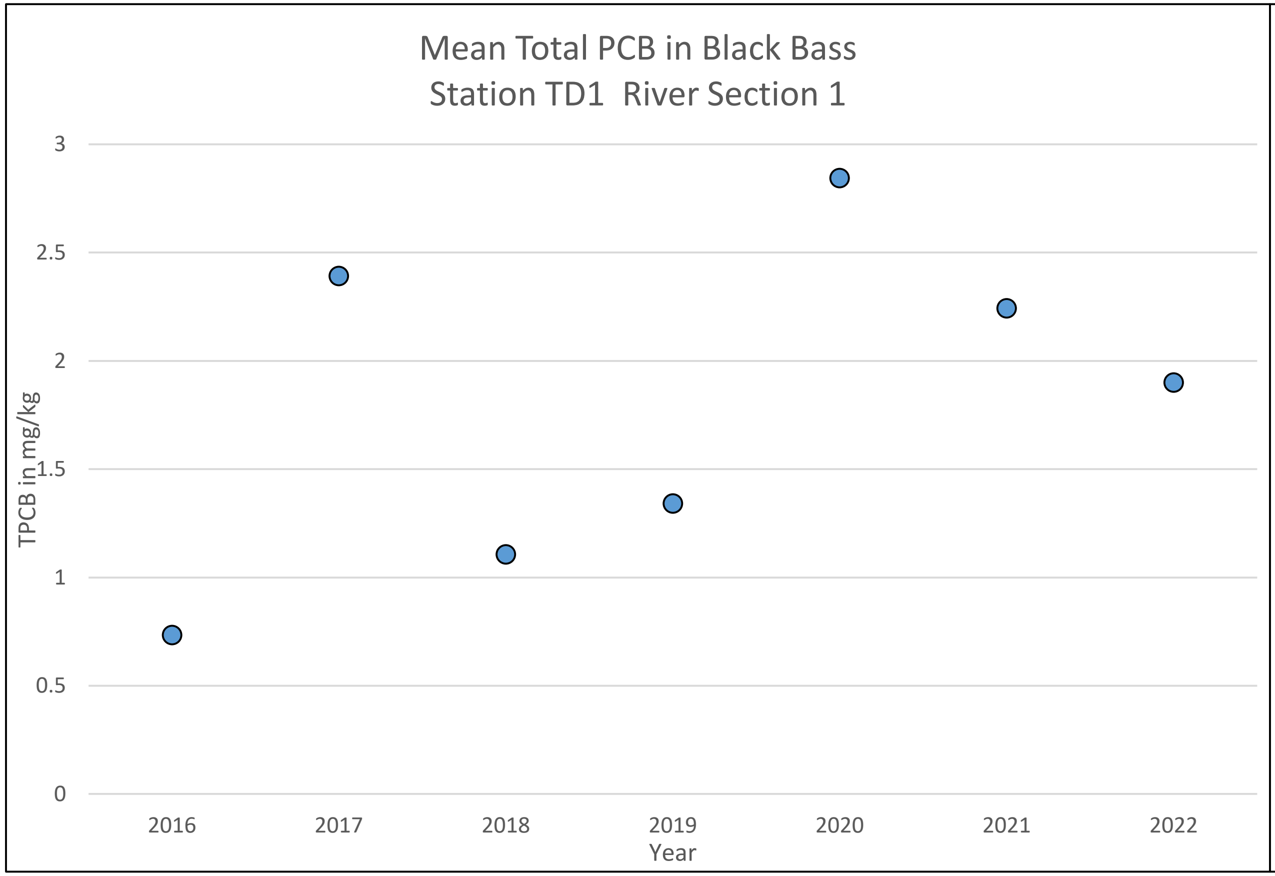


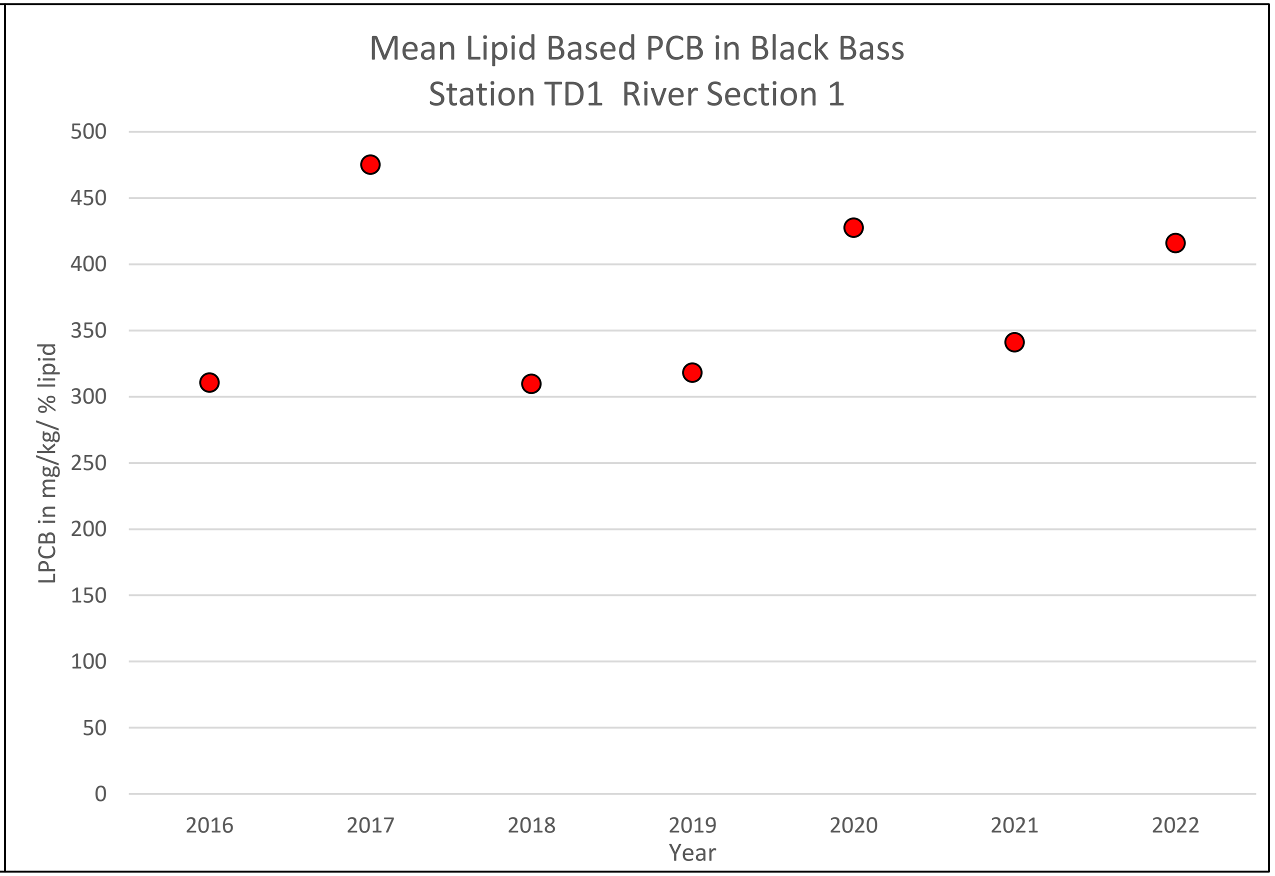
TD1 Black Bass Total PCB and Lipid Based PCB





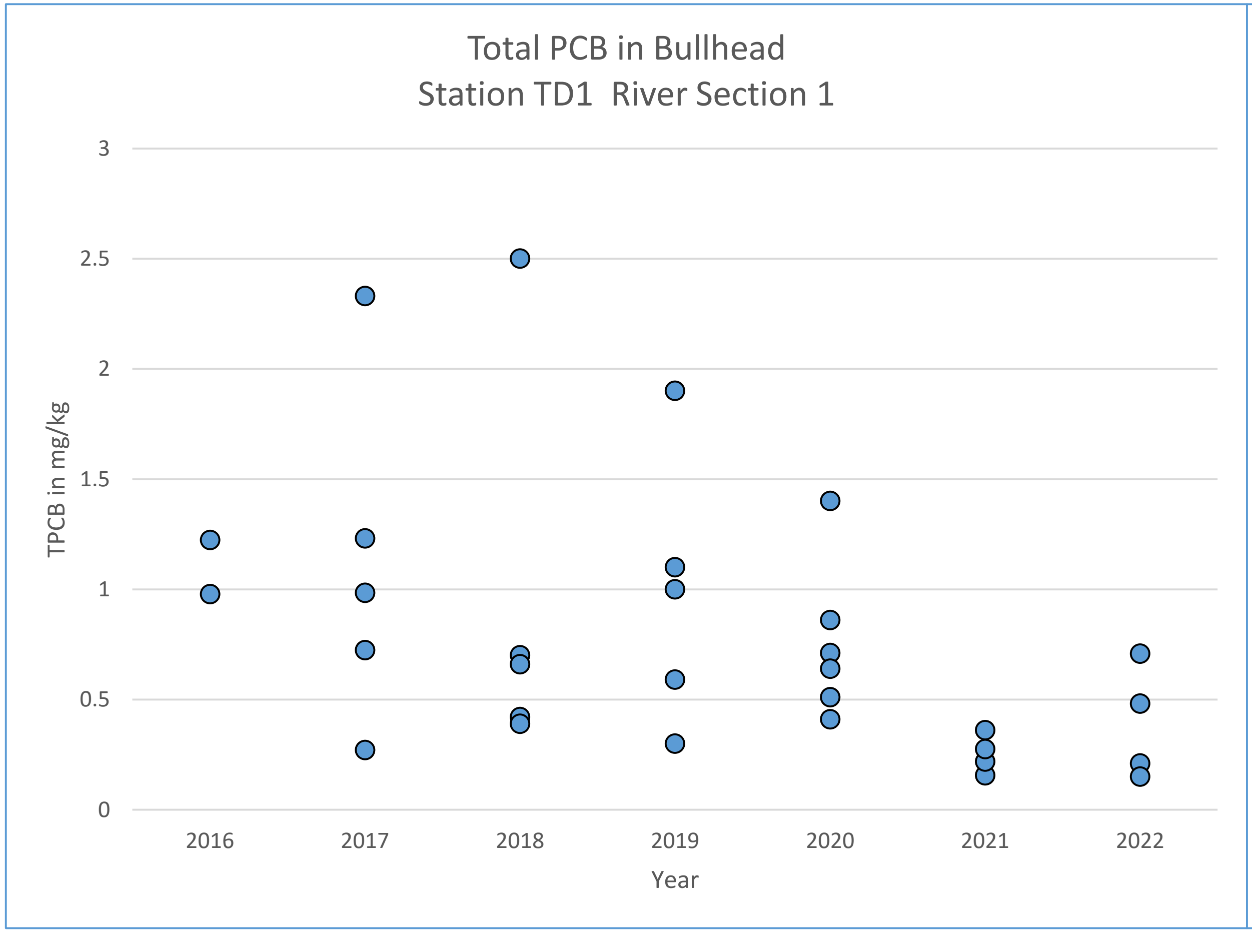
TD1 Black Bass Mean Total PCB and Mean Lipid Based PCB

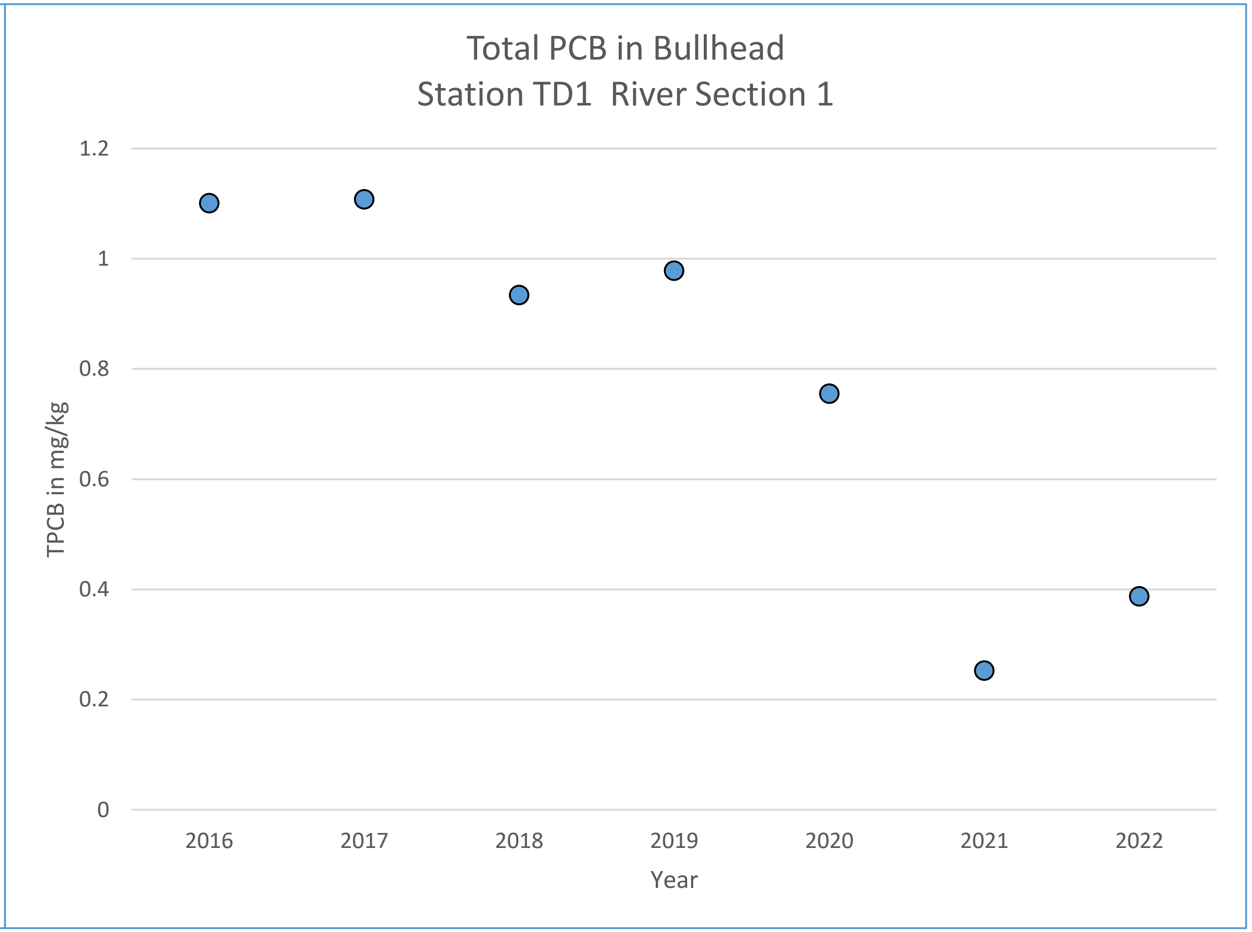




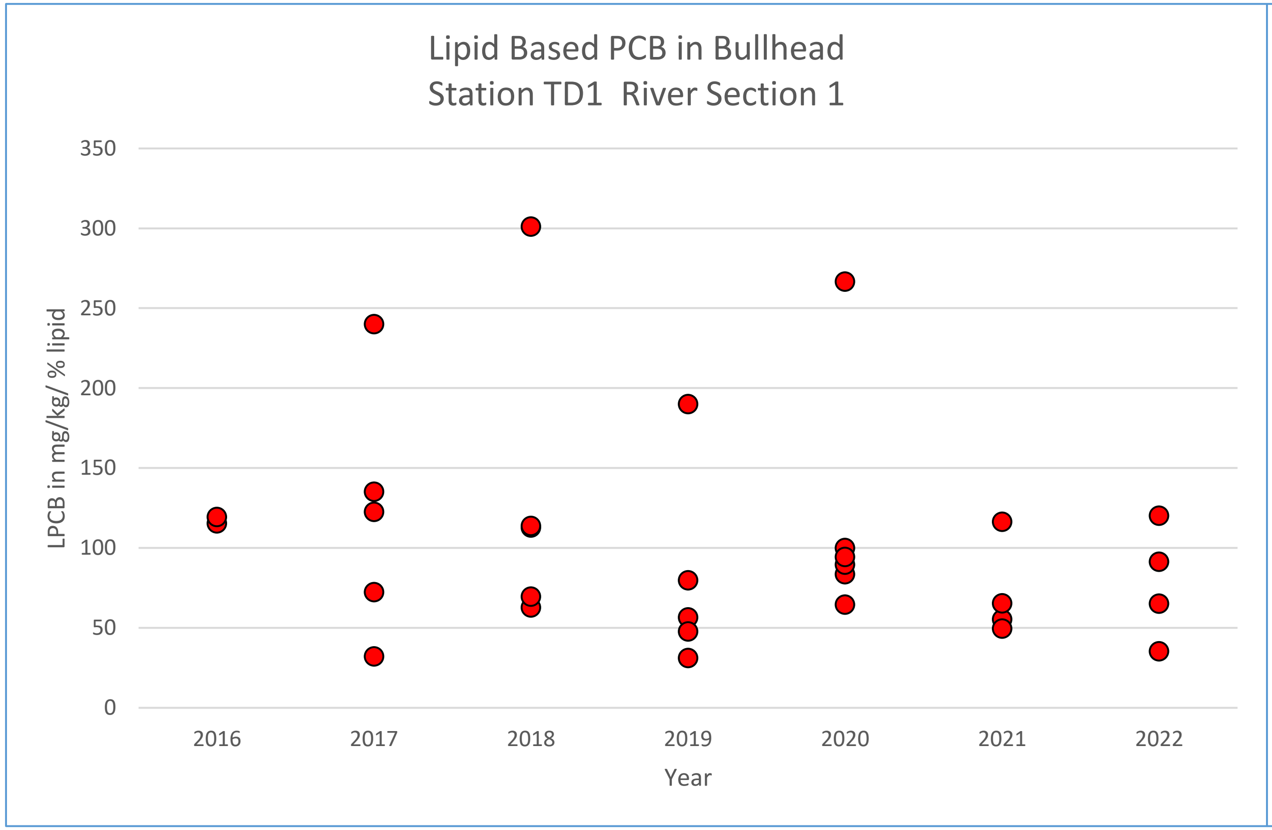
TD1 Bullhead Data

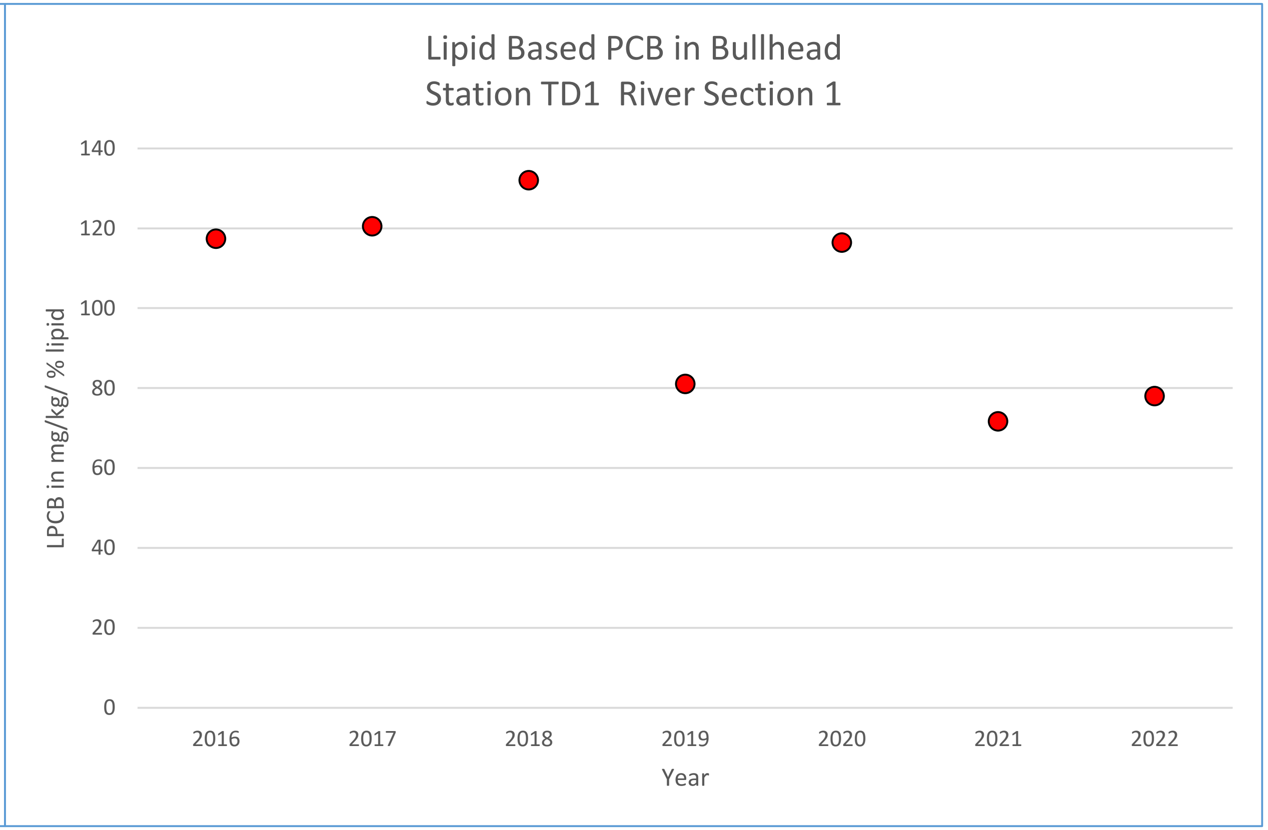
TD1 Bullhead Total PCB



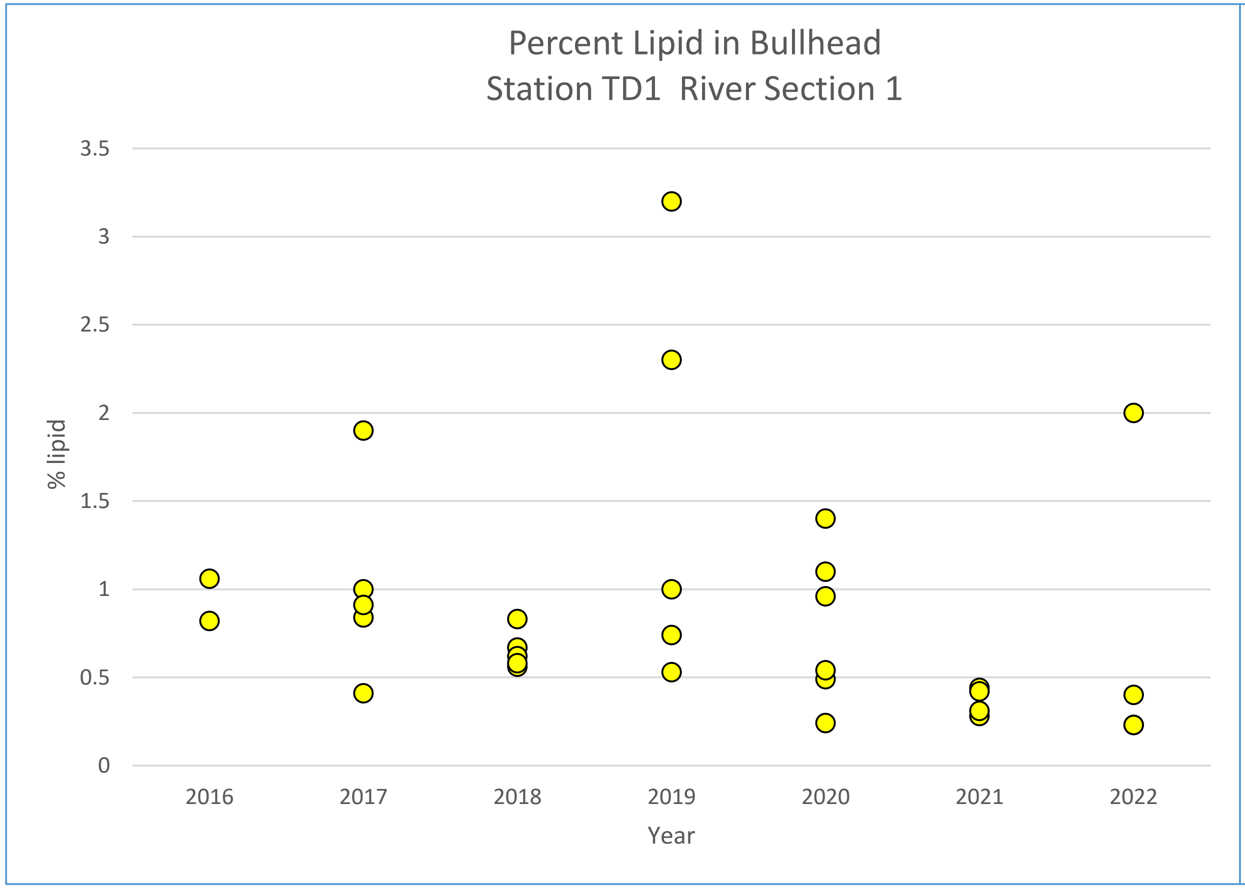


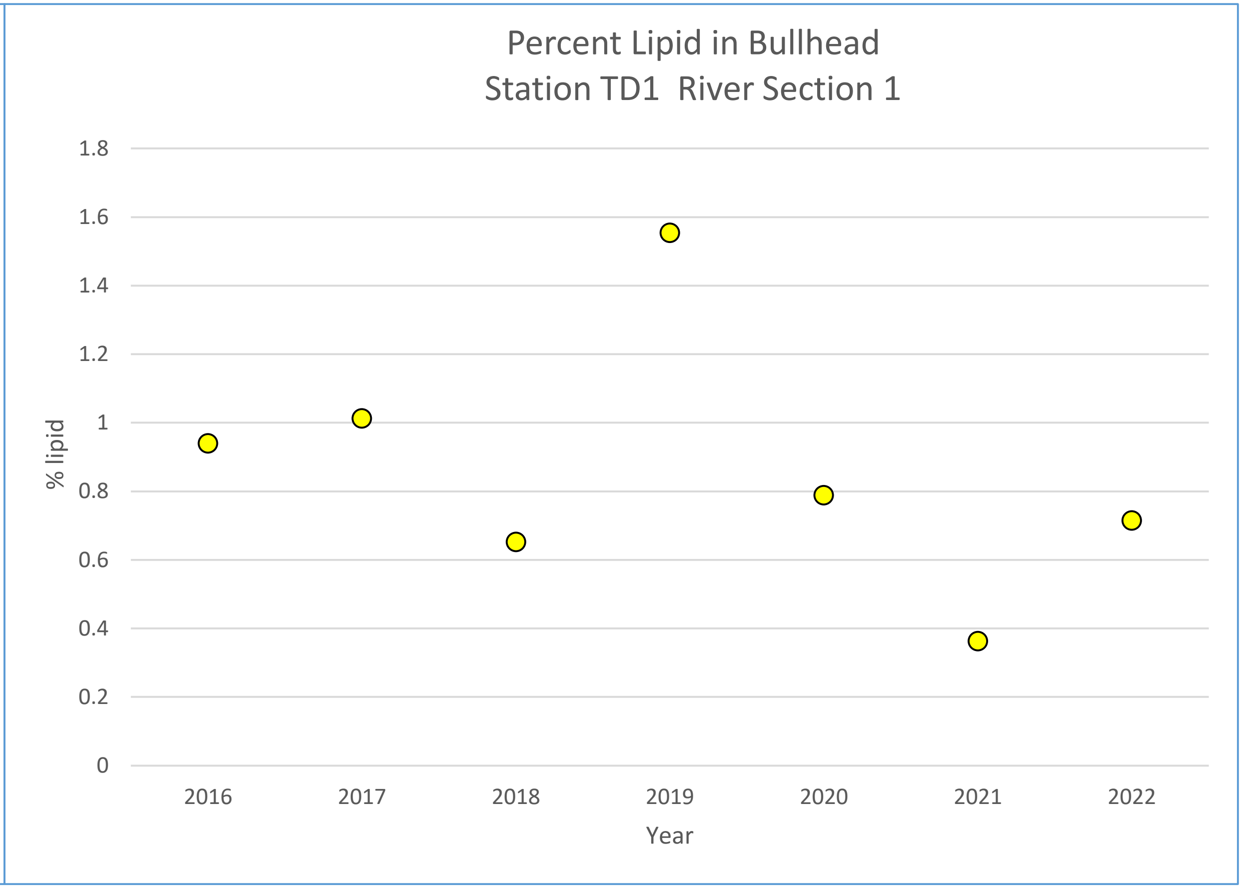
TD1 Bullhead Lipid Based PCB



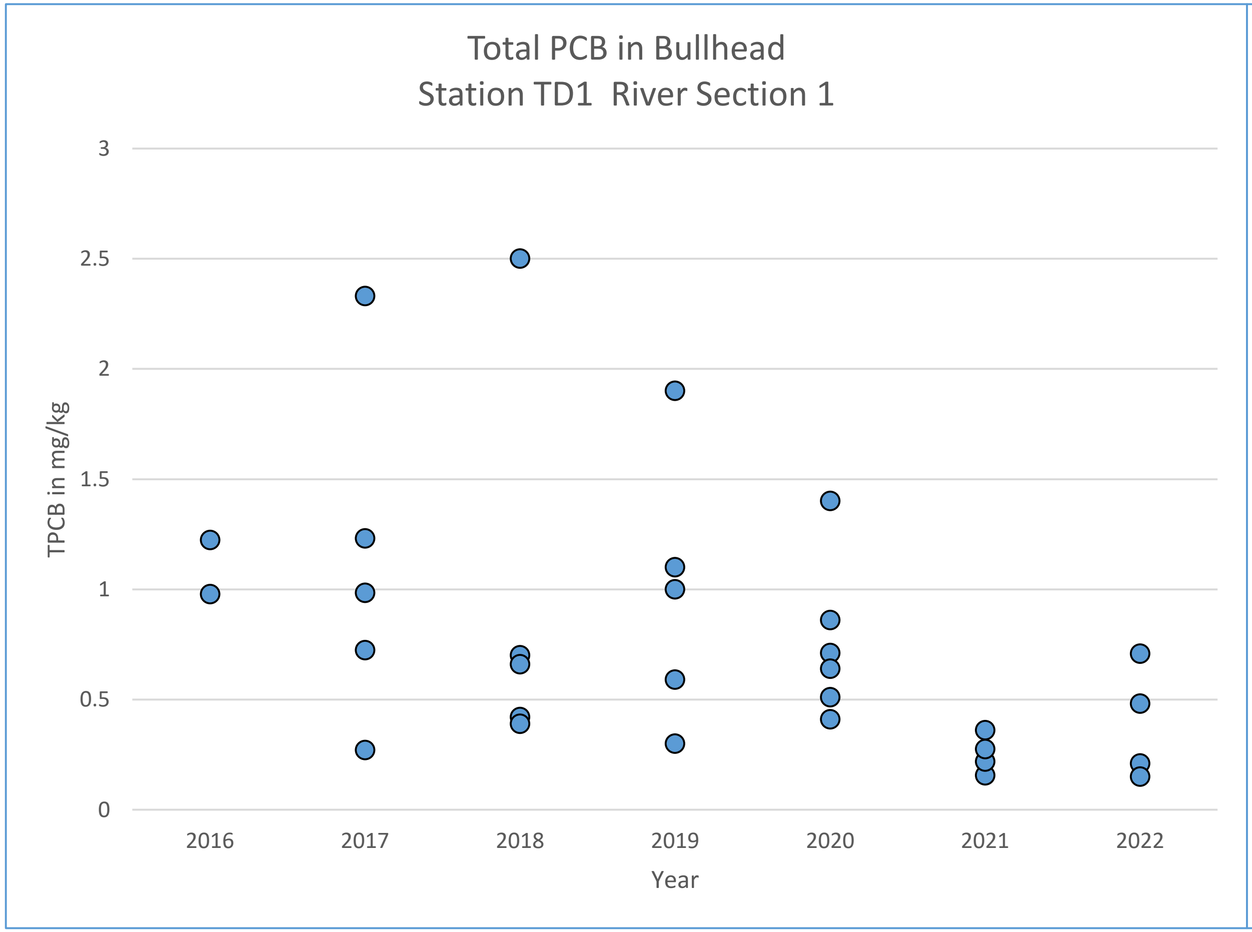


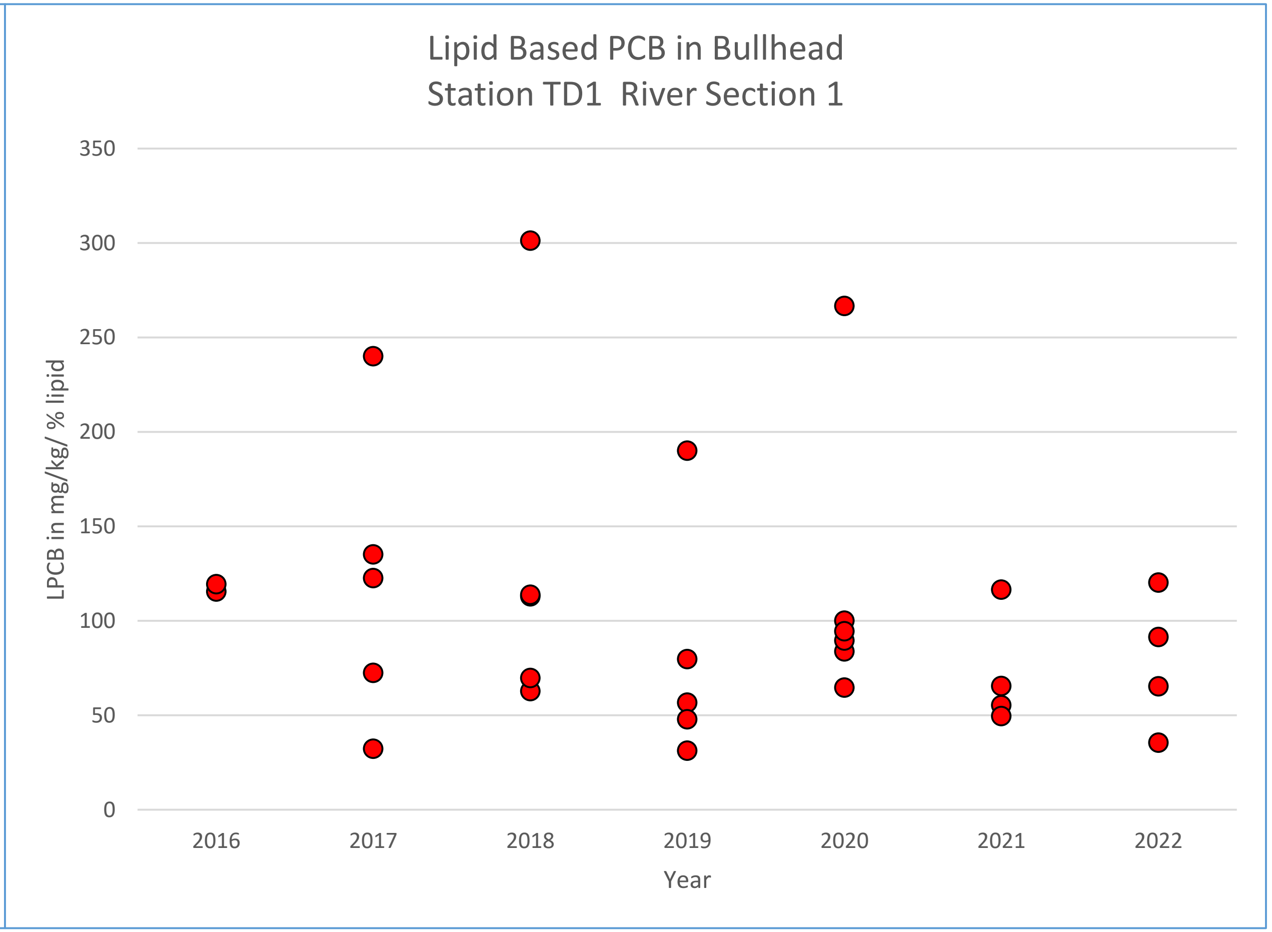
TD1 Bullhead Percent Lipid



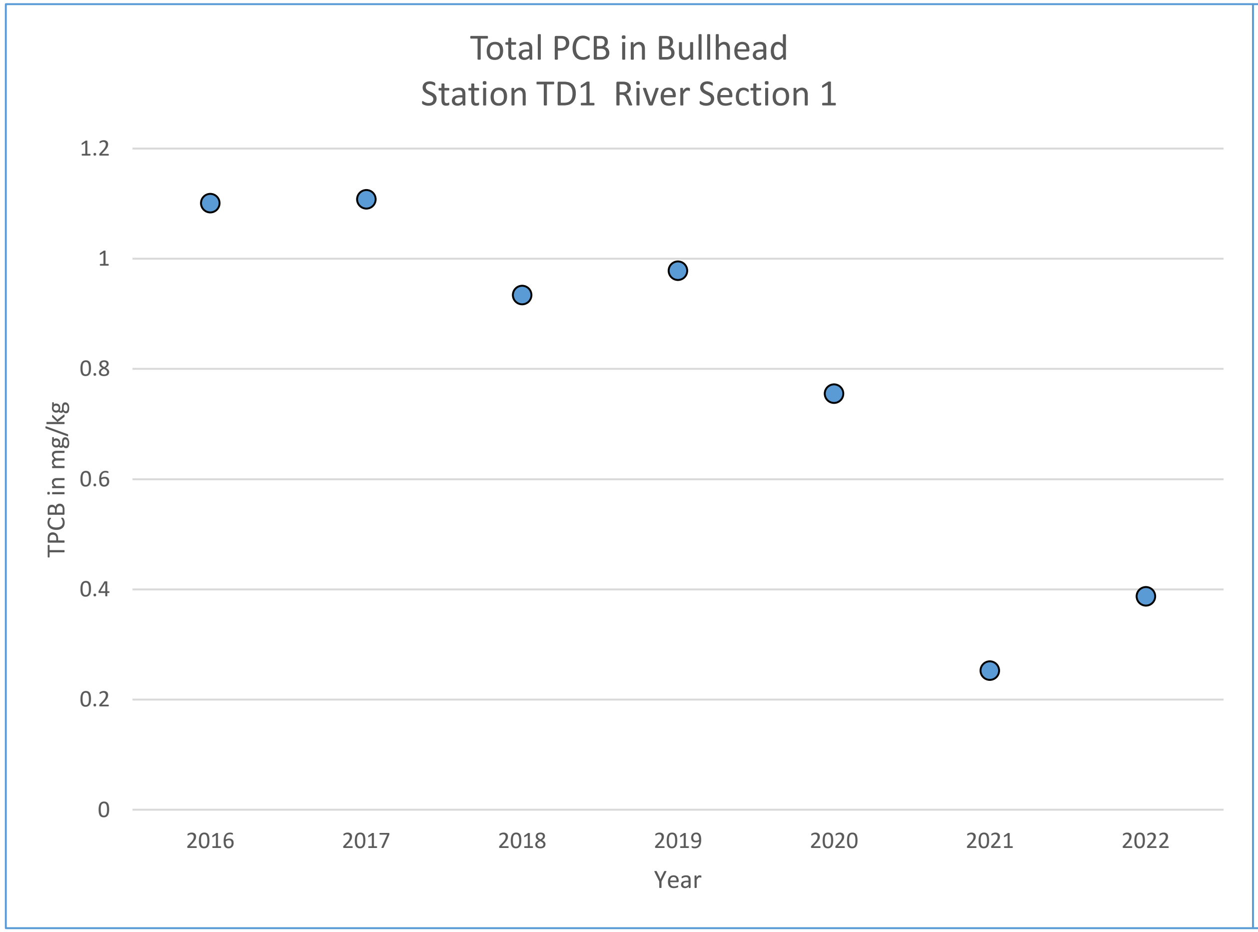


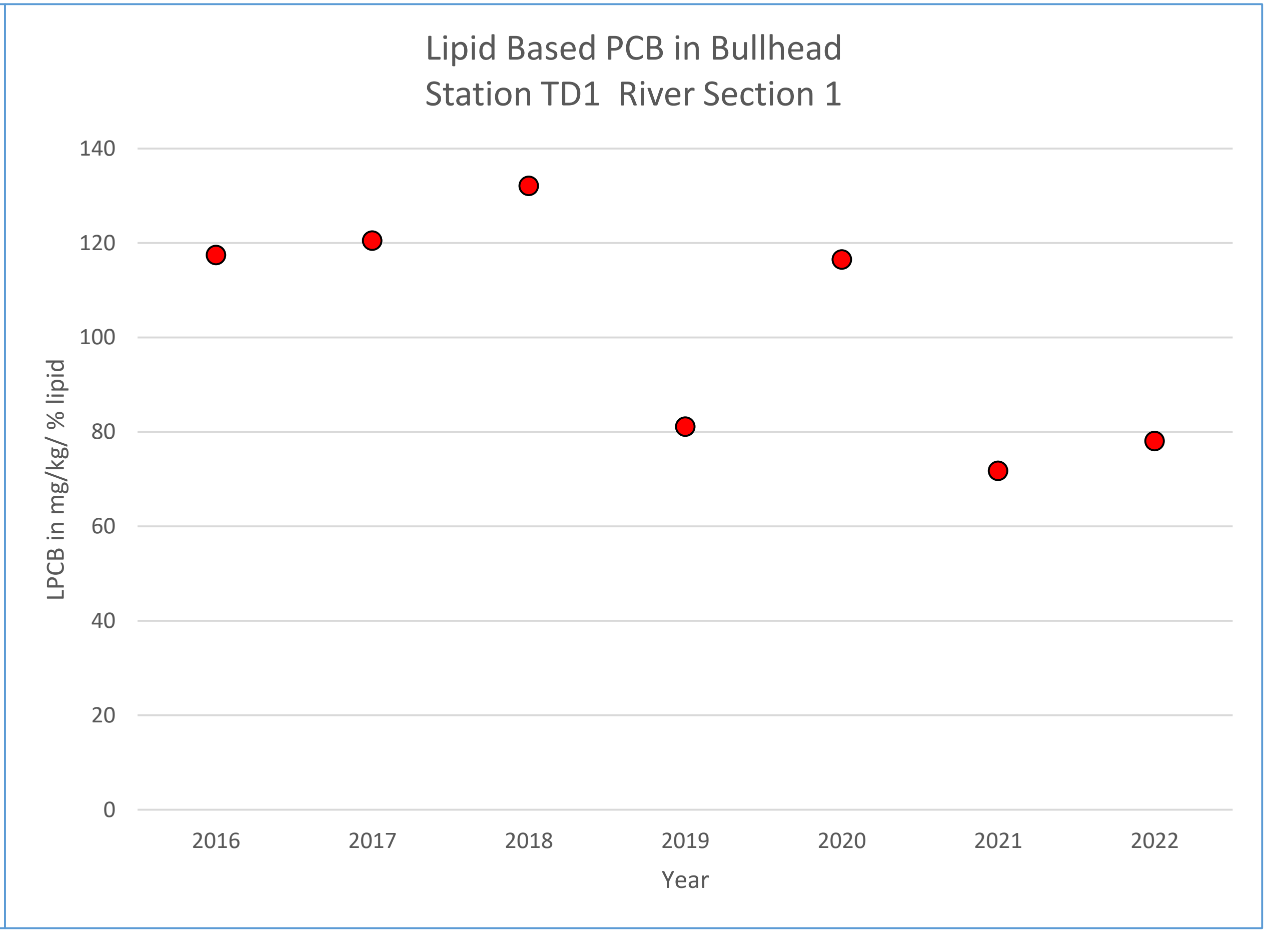
TD1 Bullhead Total PCB and Lipid Based PCB





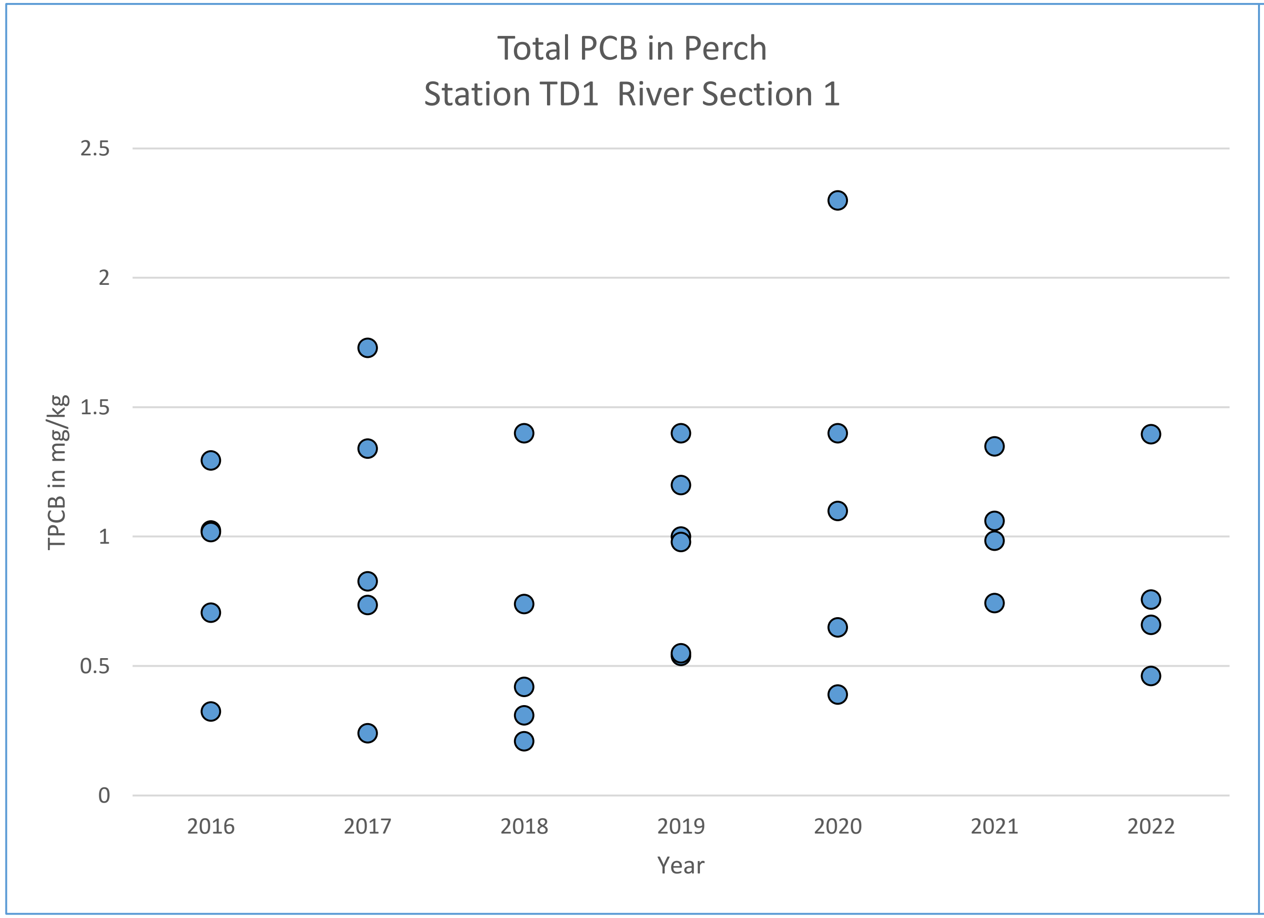
TD1 Bullhead Mean Total PCB and Mean Lipid Based PCB

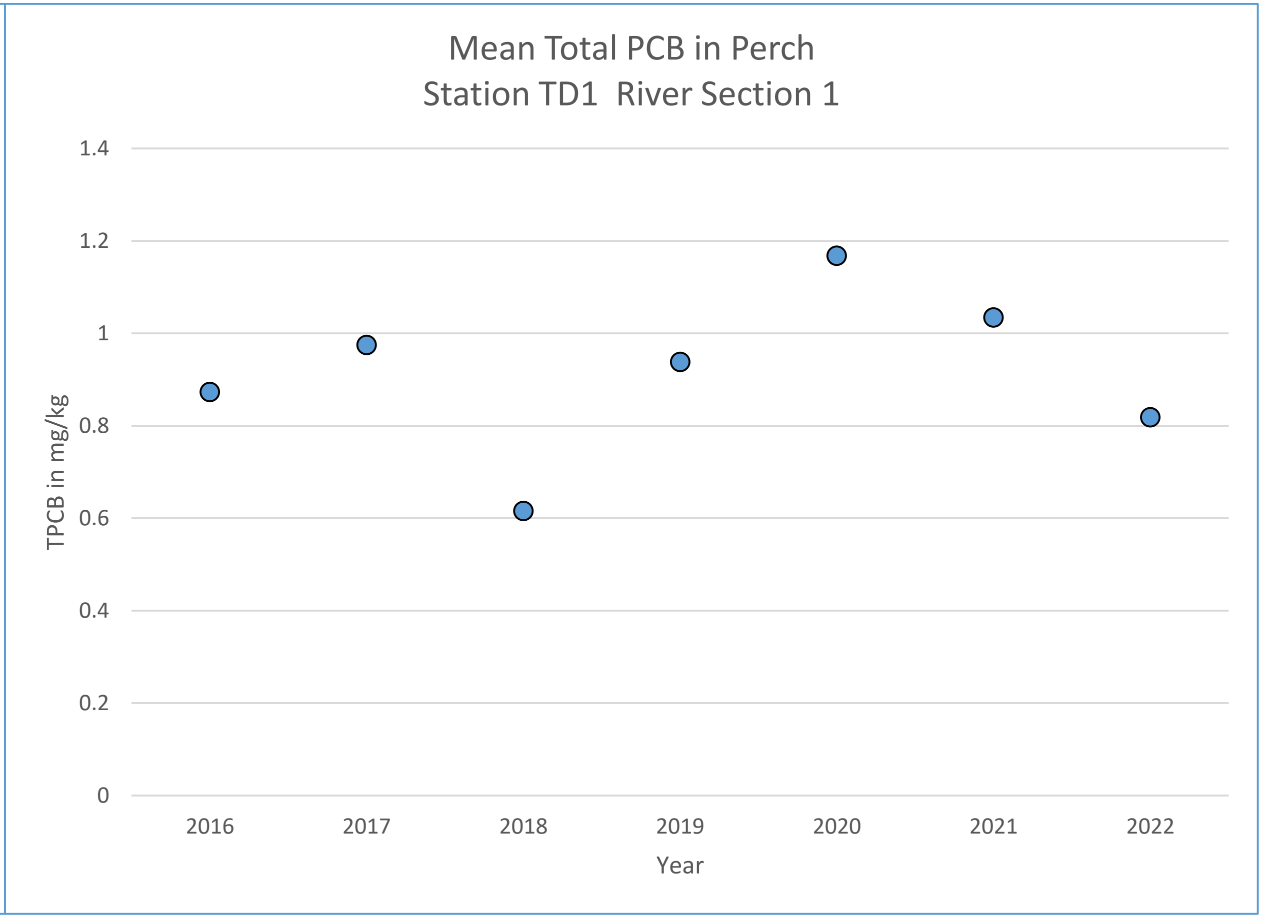




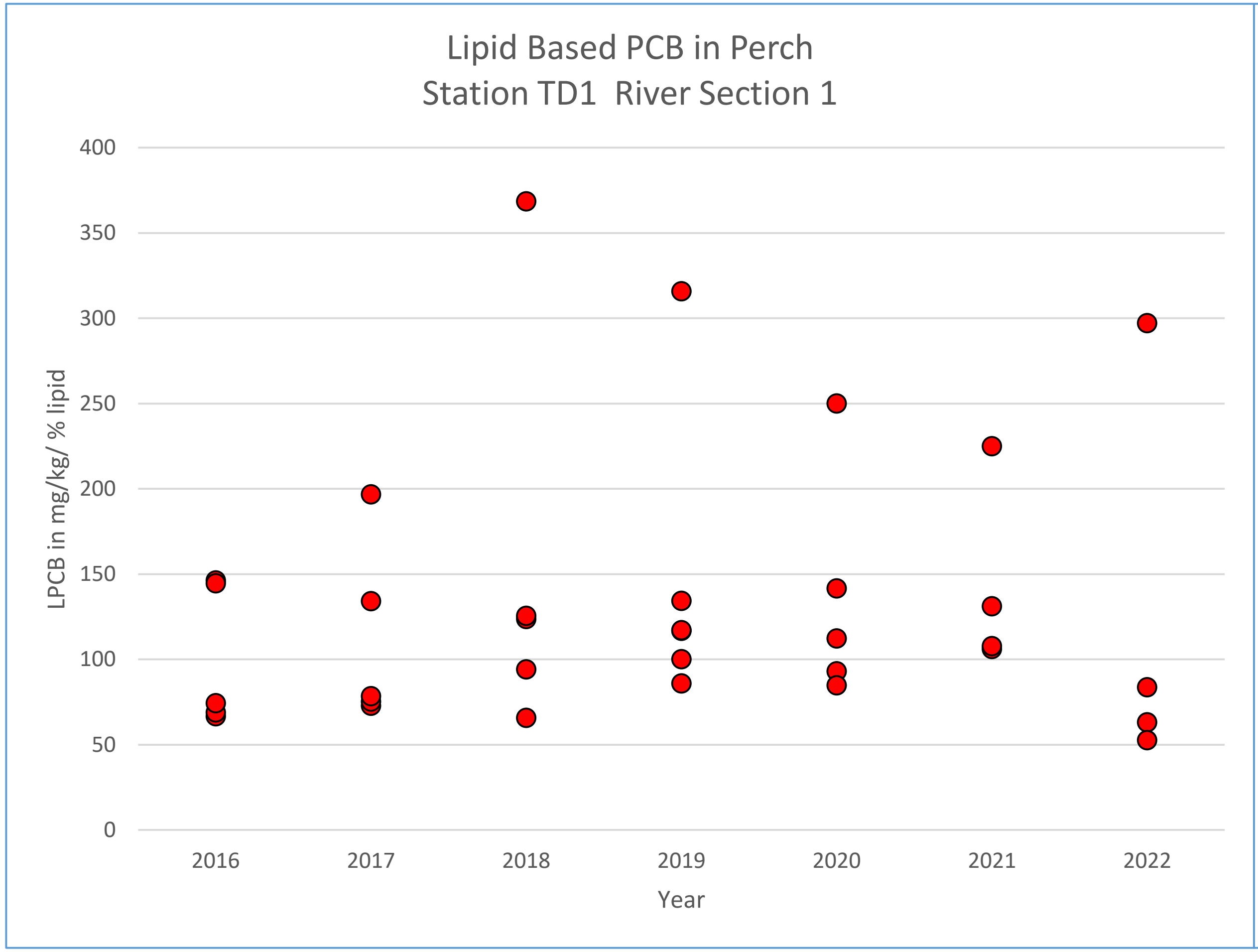
TD1 Perch Data

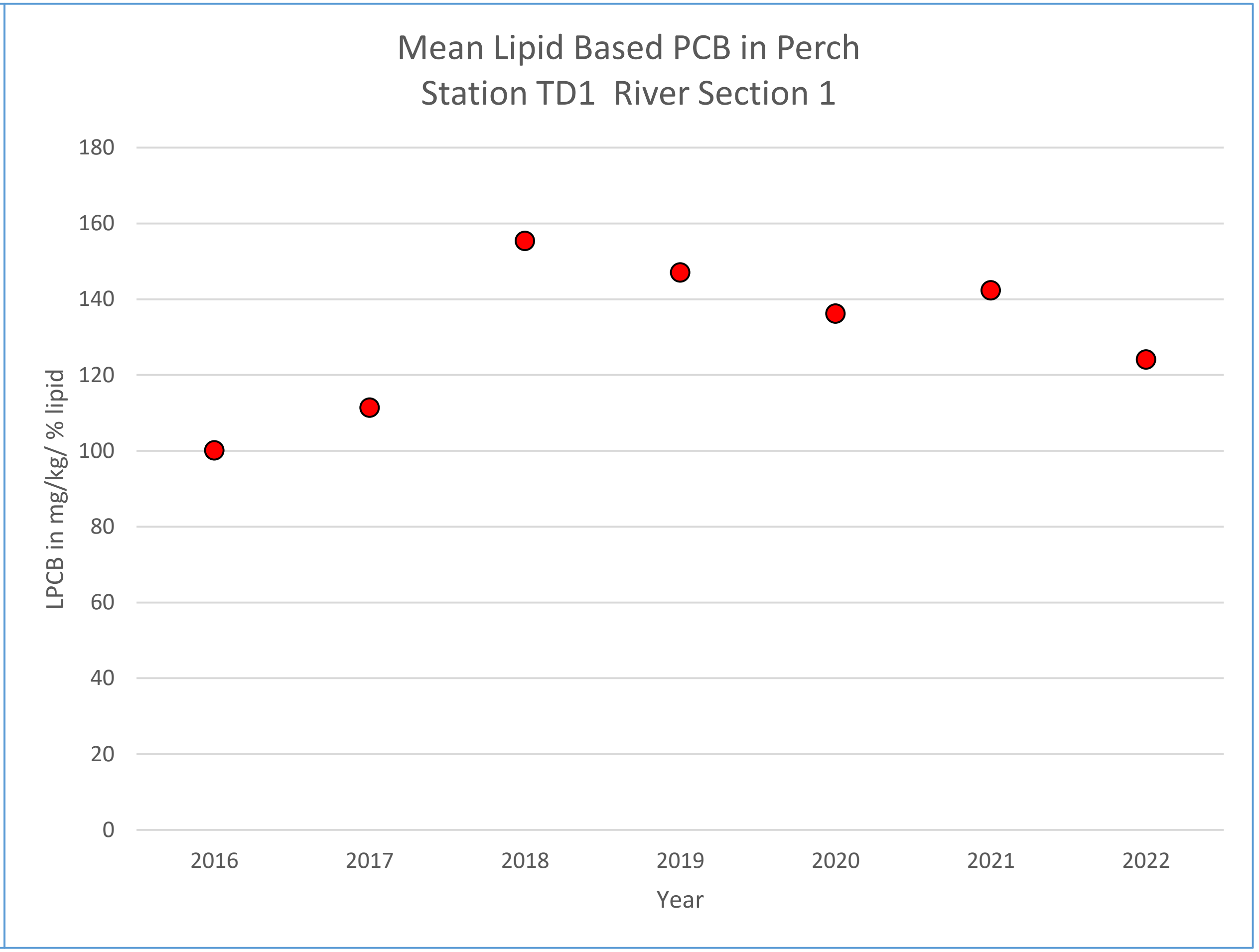
TD1 Perch Total PCB



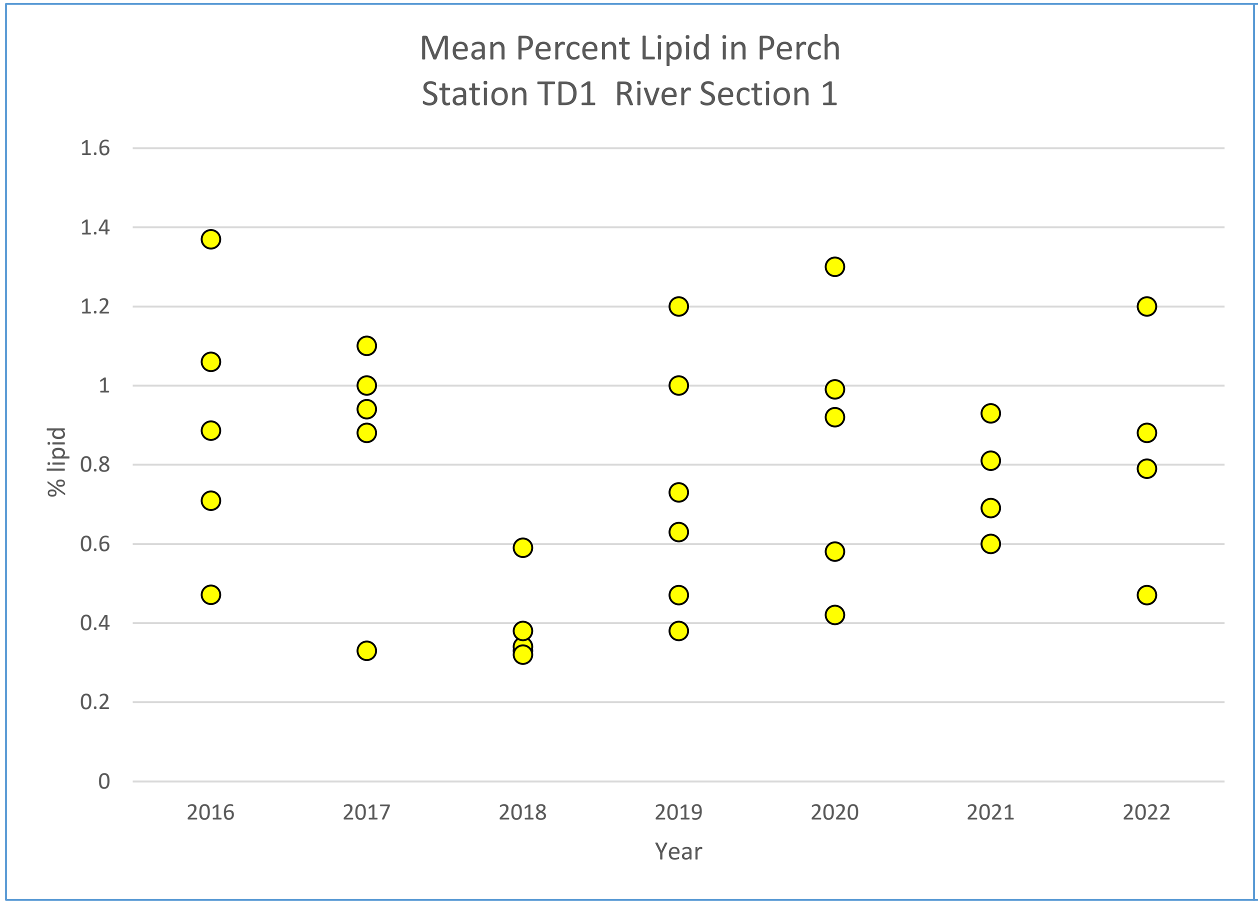


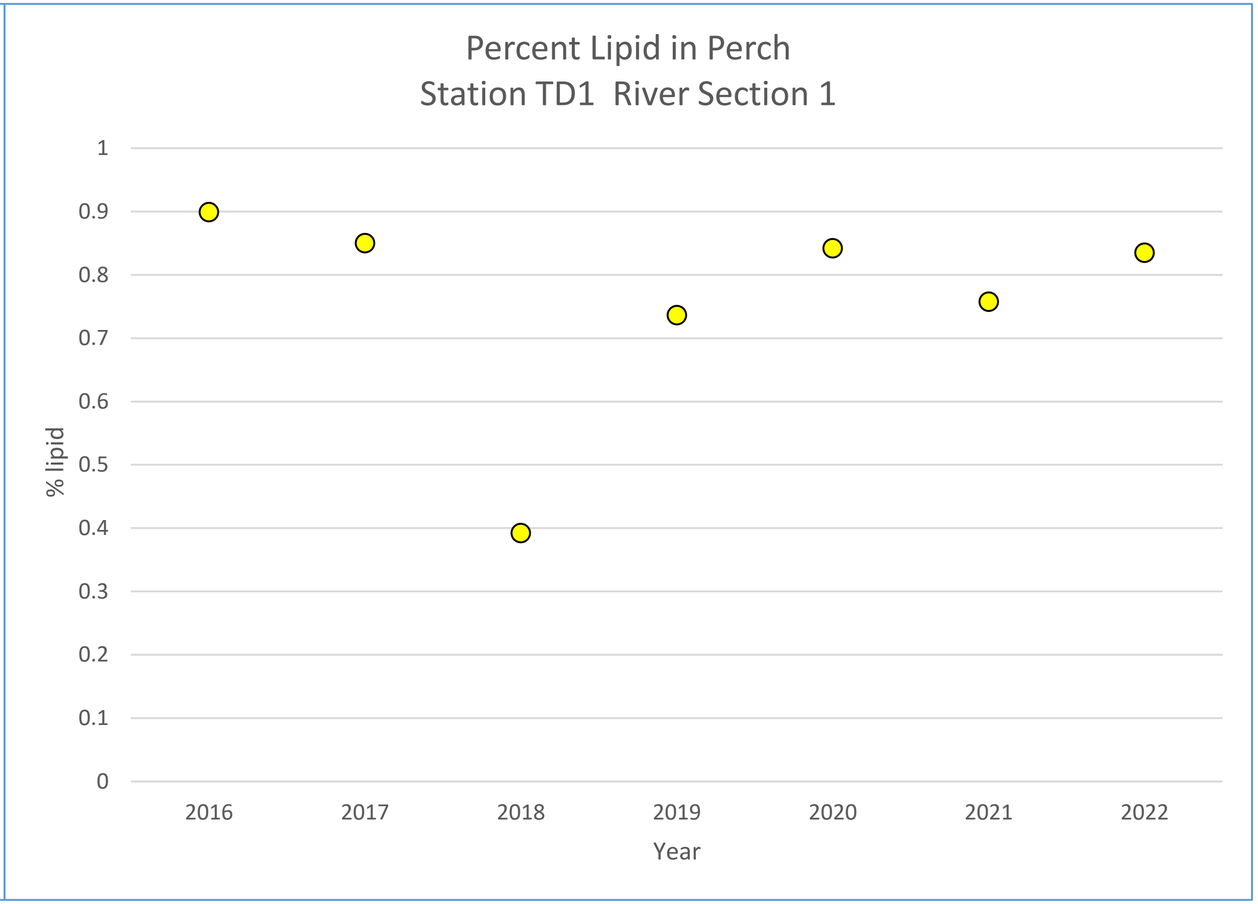
TD1 Perch Lipid Based PCB



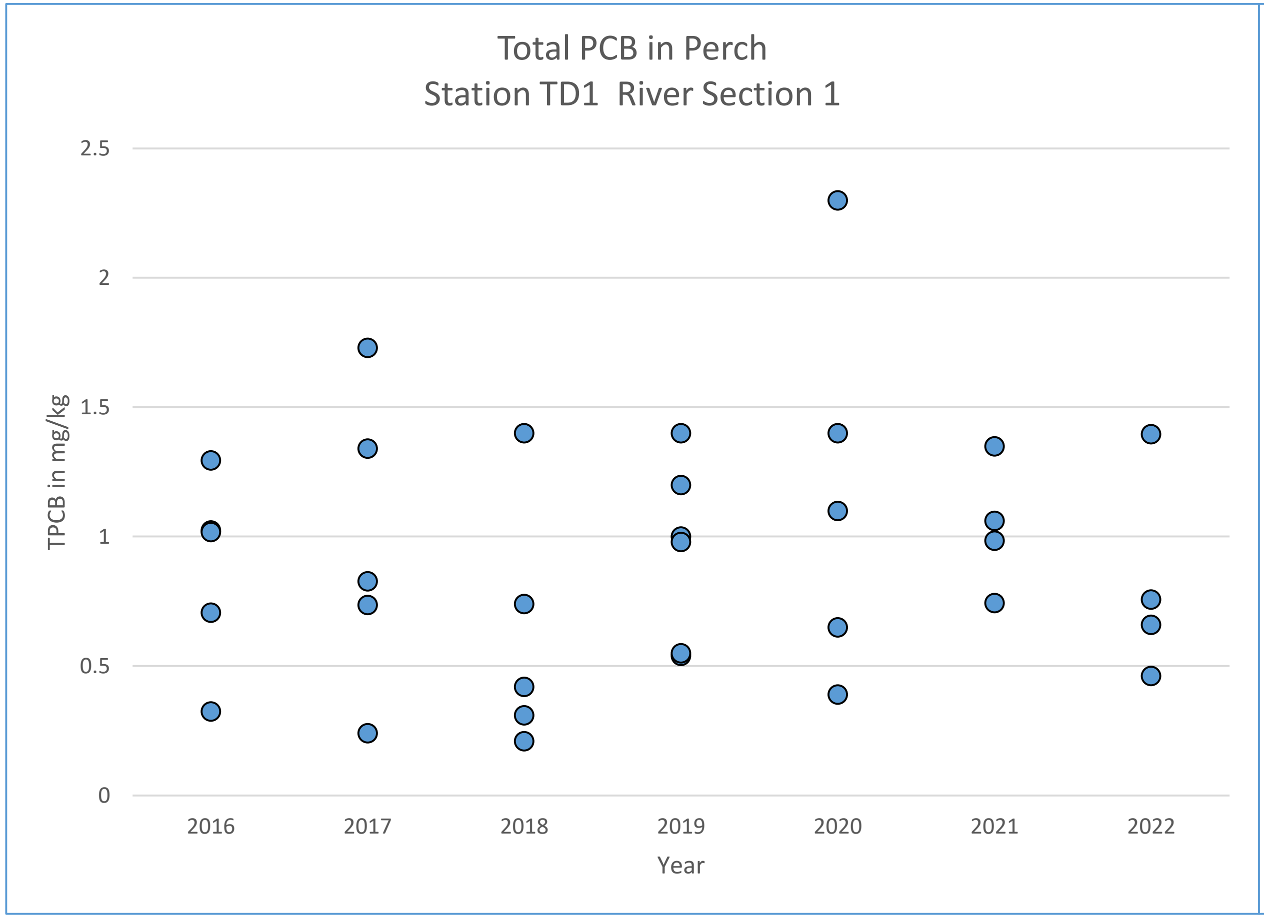


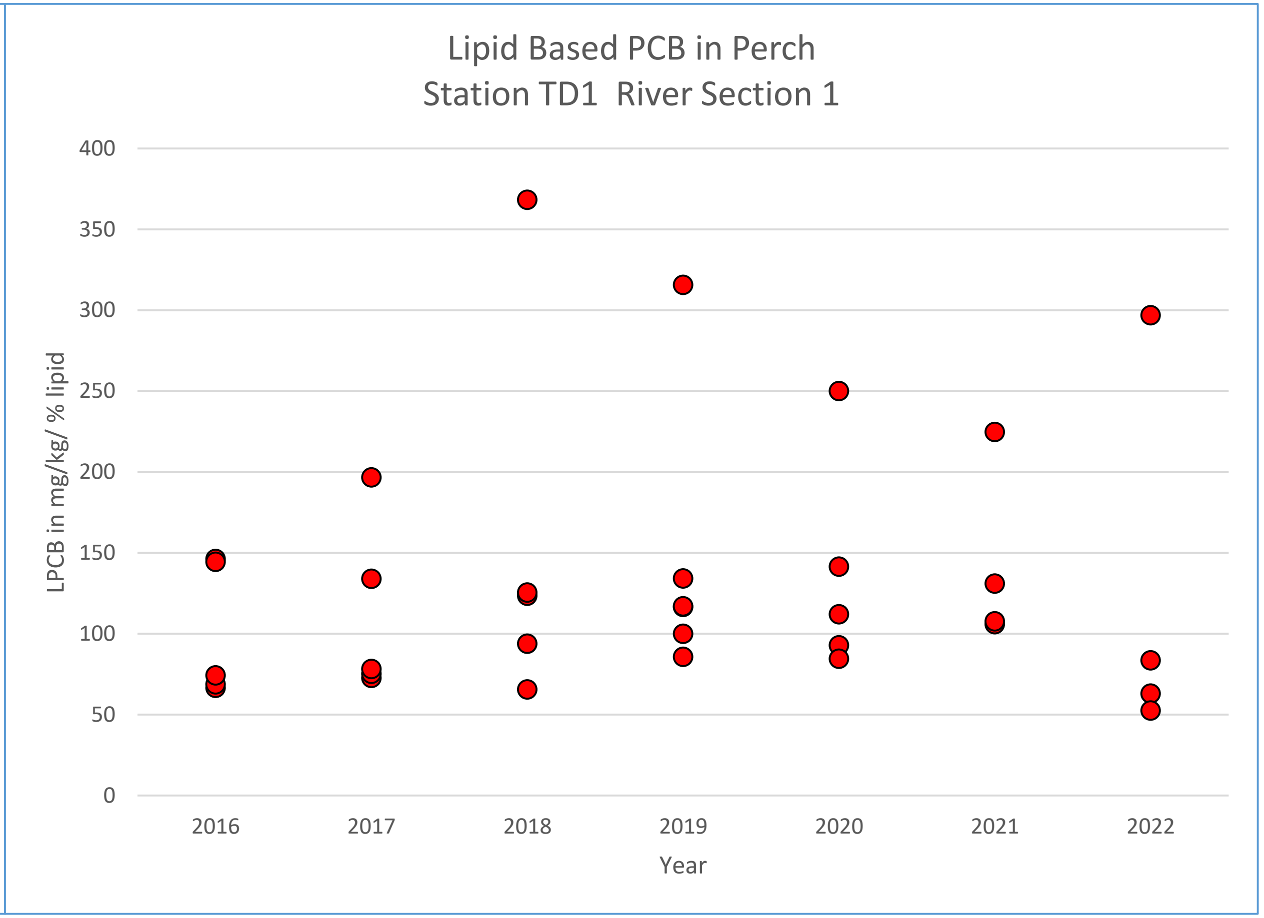
TD1 Perch Percent Lipid



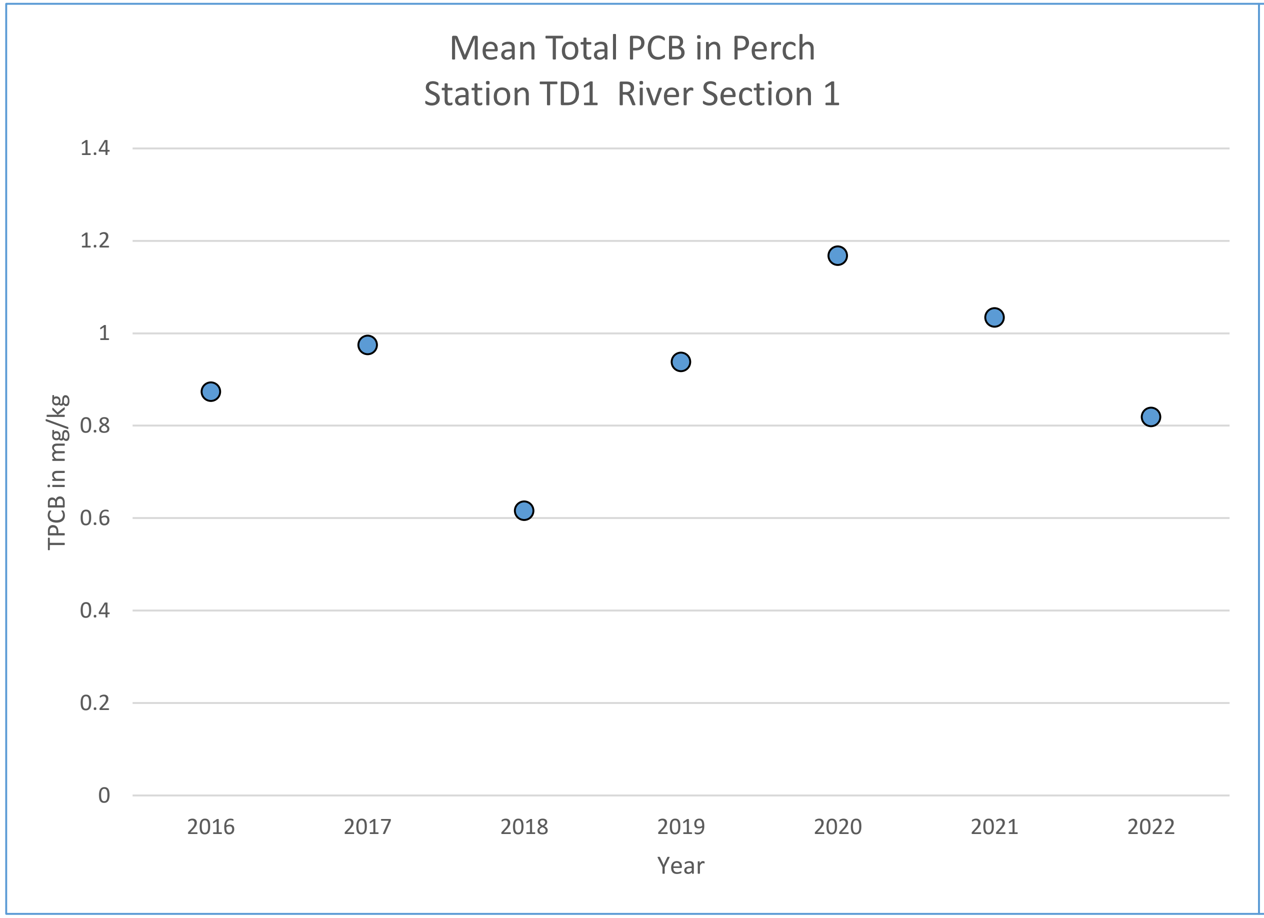


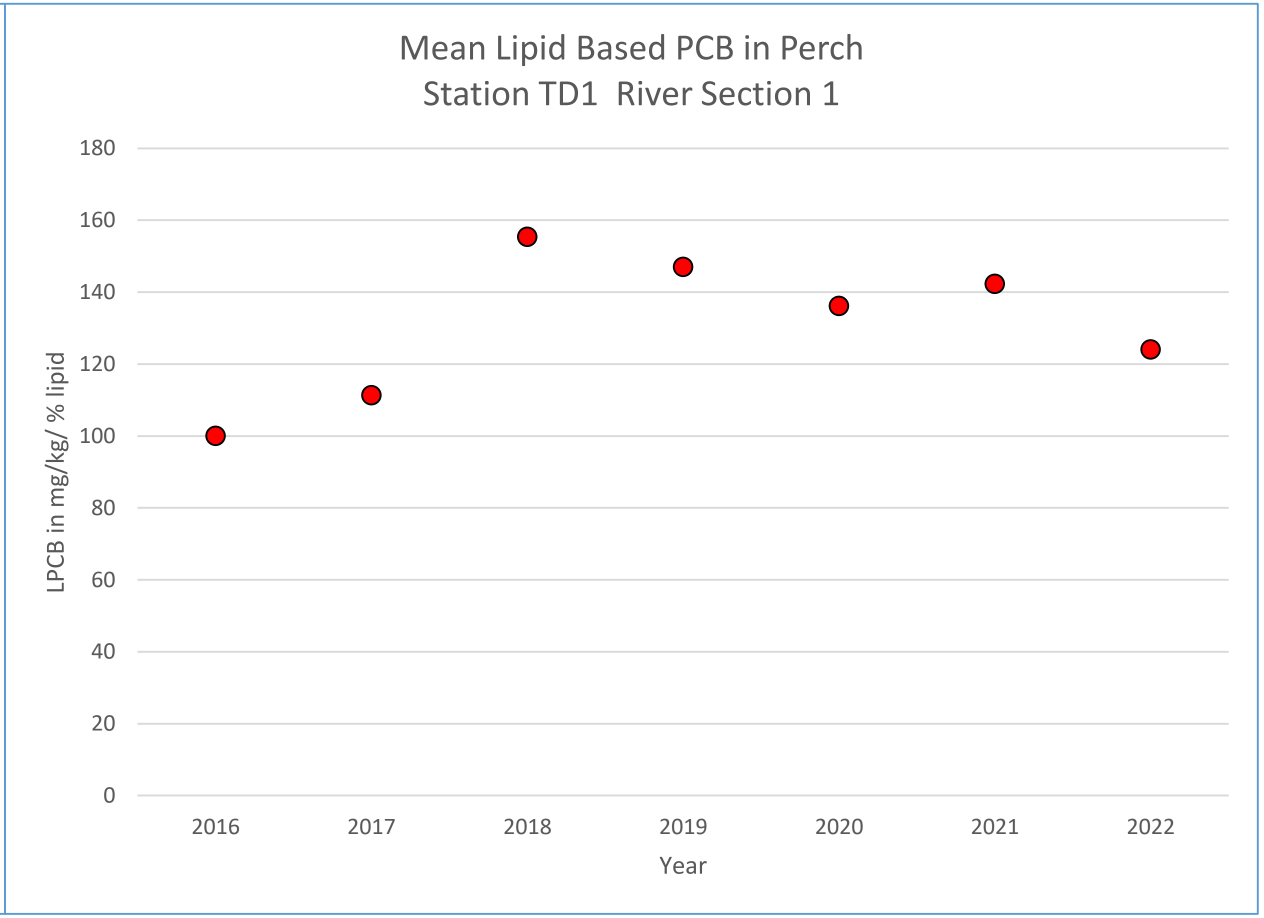
TD1 Perch Total PCB and Lipid Based PCB





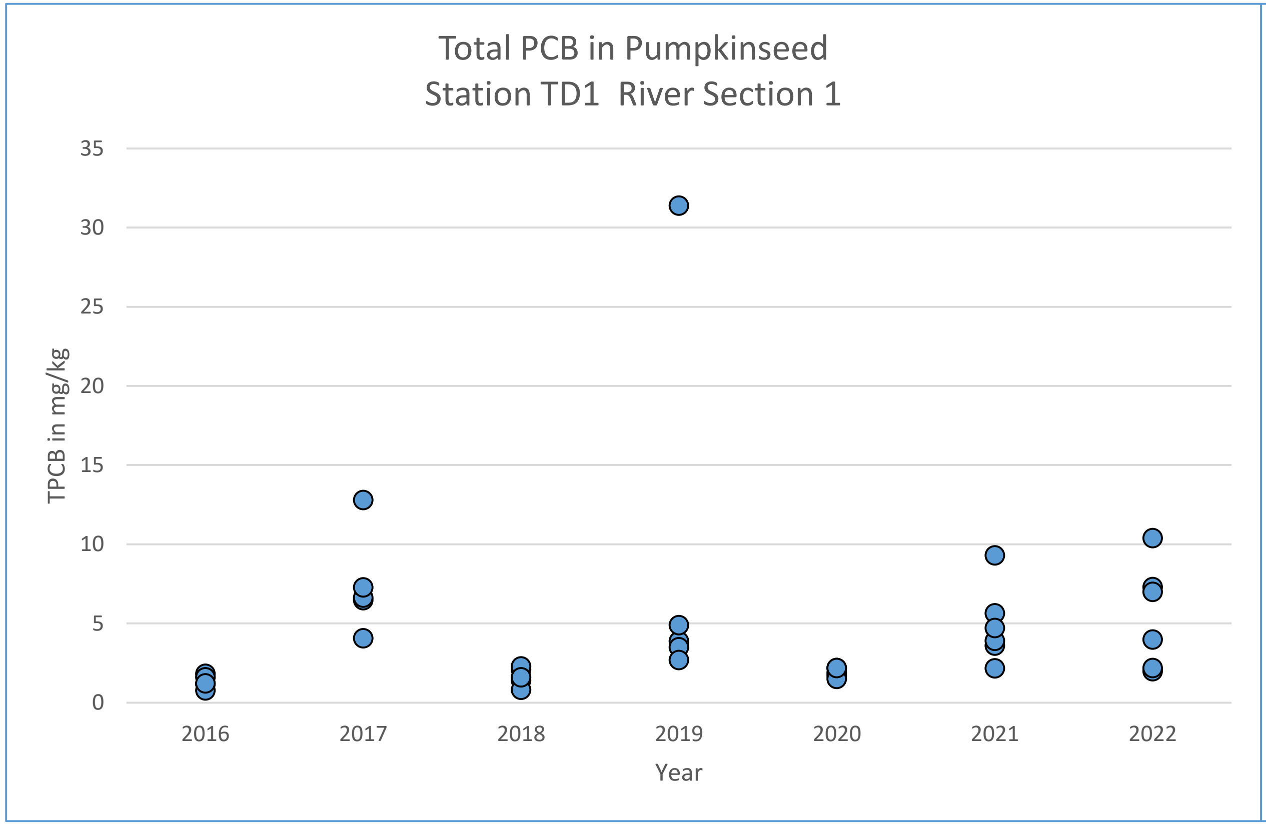
TD1 Perch Mean Total PCB and Mean Lipid Based PCB

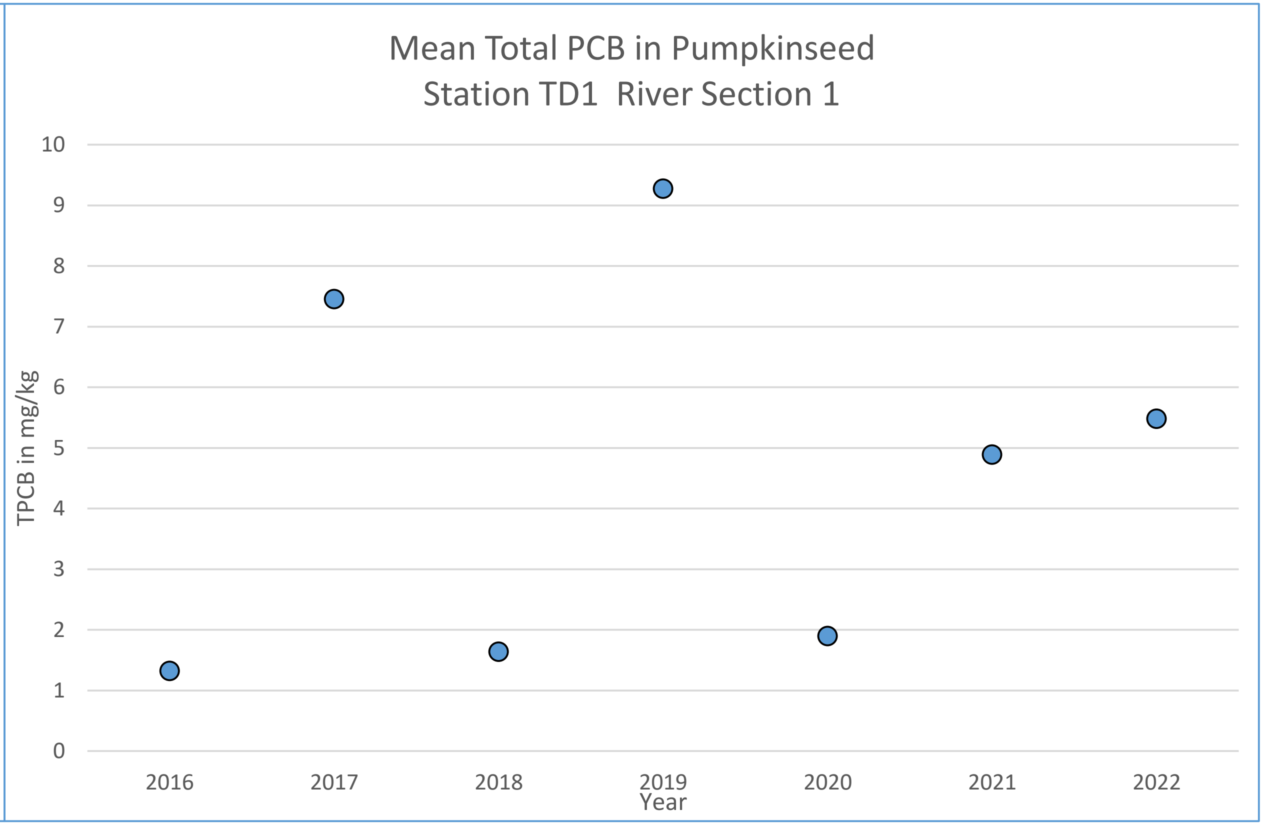




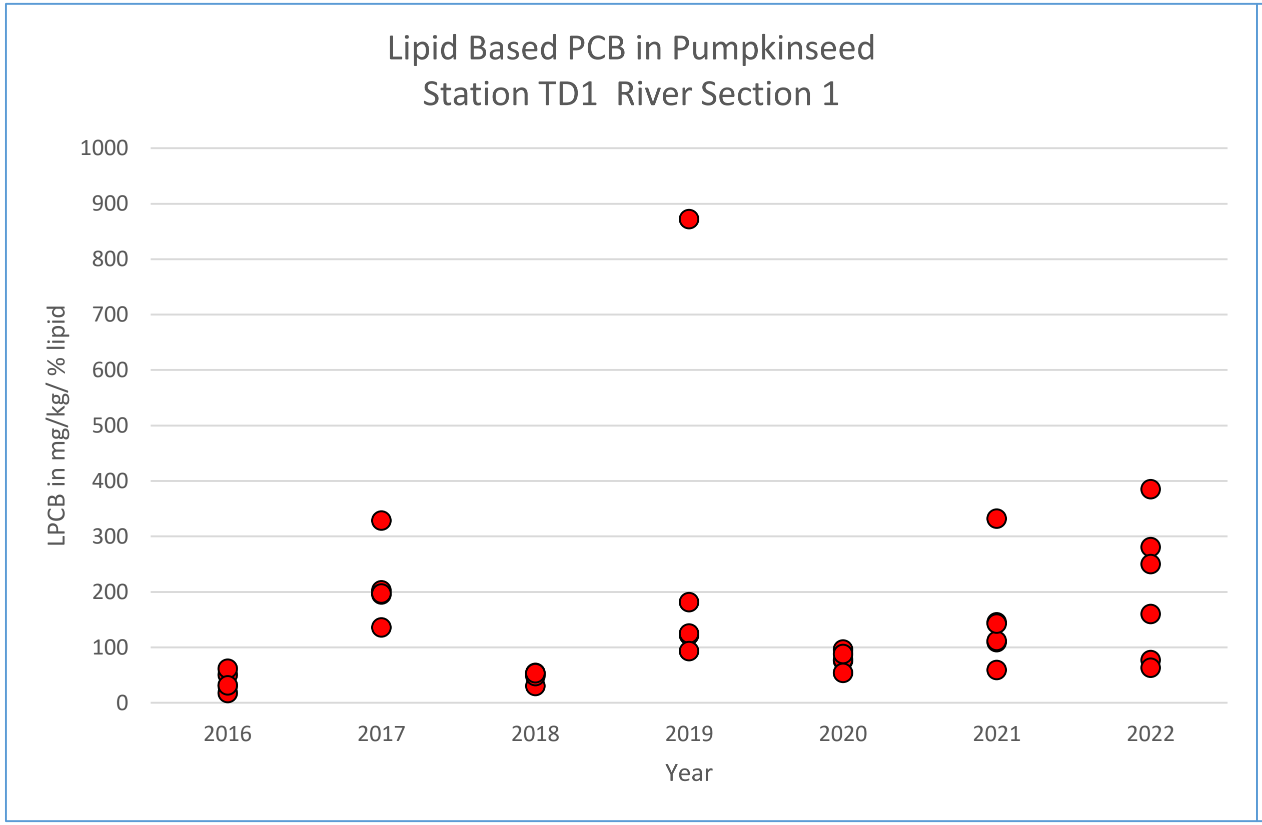
TD1 Pumpkinseed Data

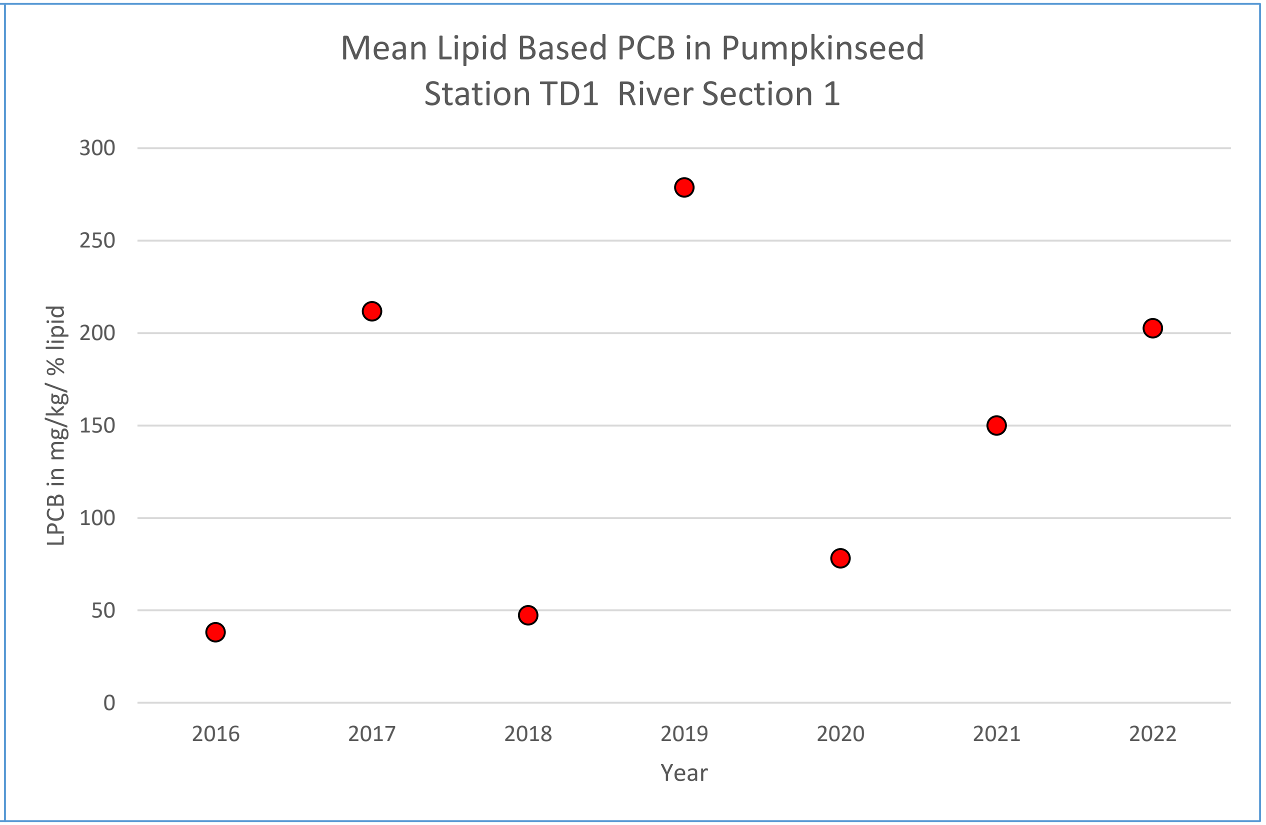
TD1 Pumpkinseed Total PCB



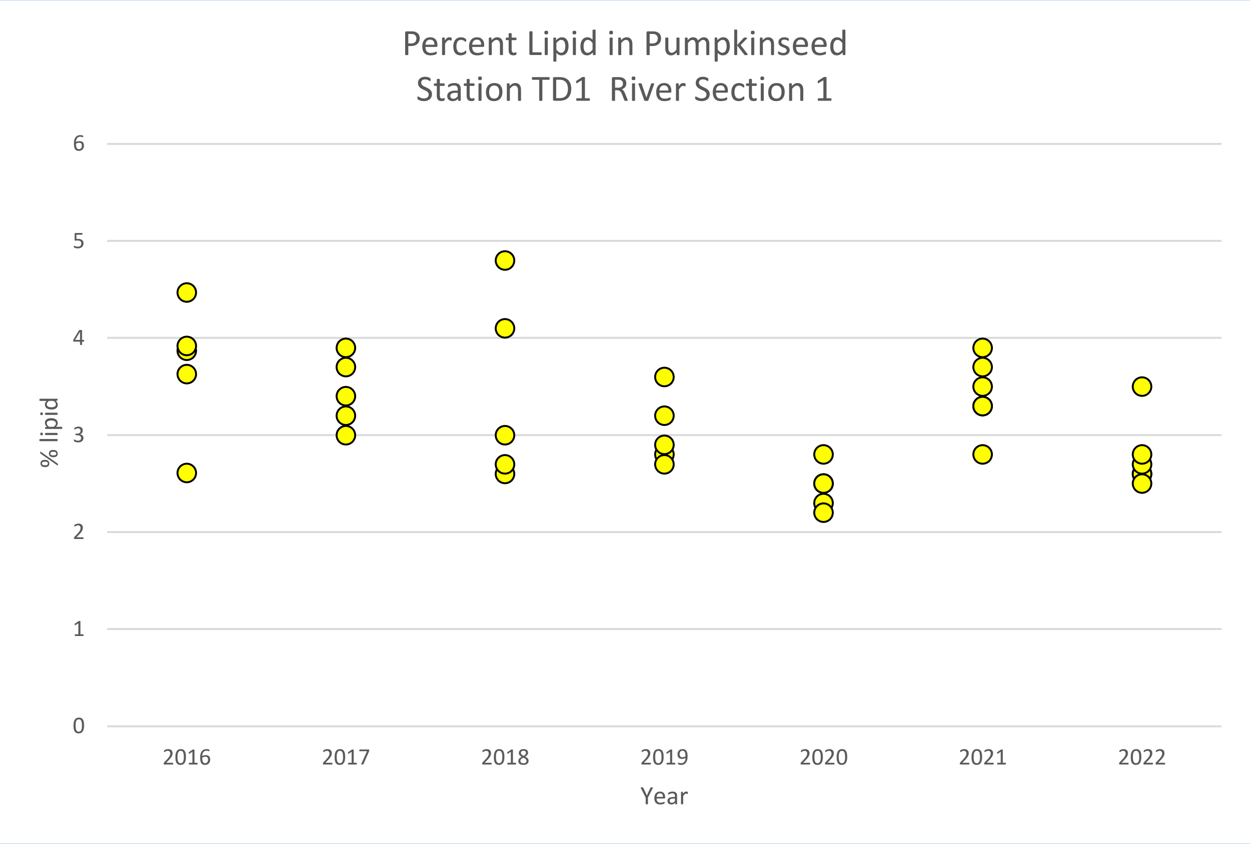


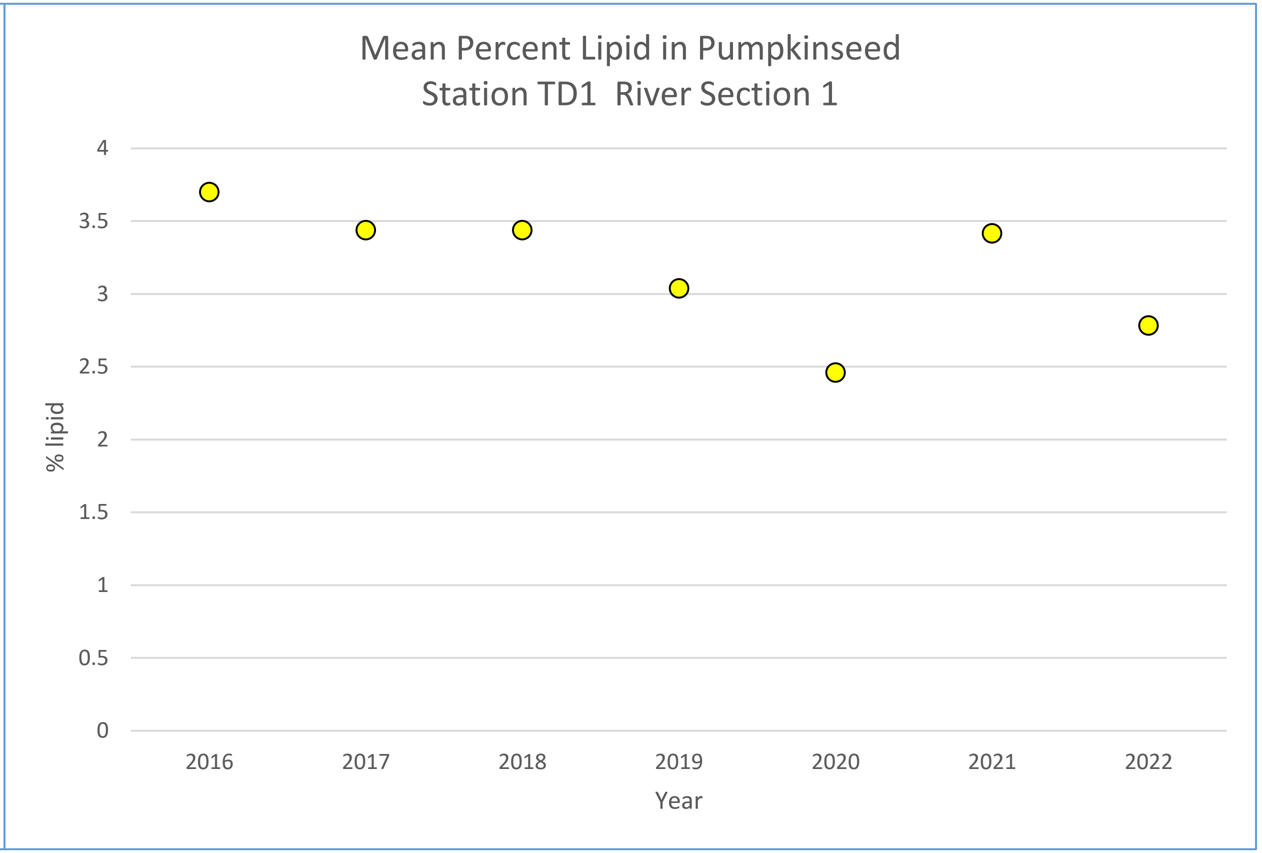
TD1 Pumpkinseed Lipid Based PCB



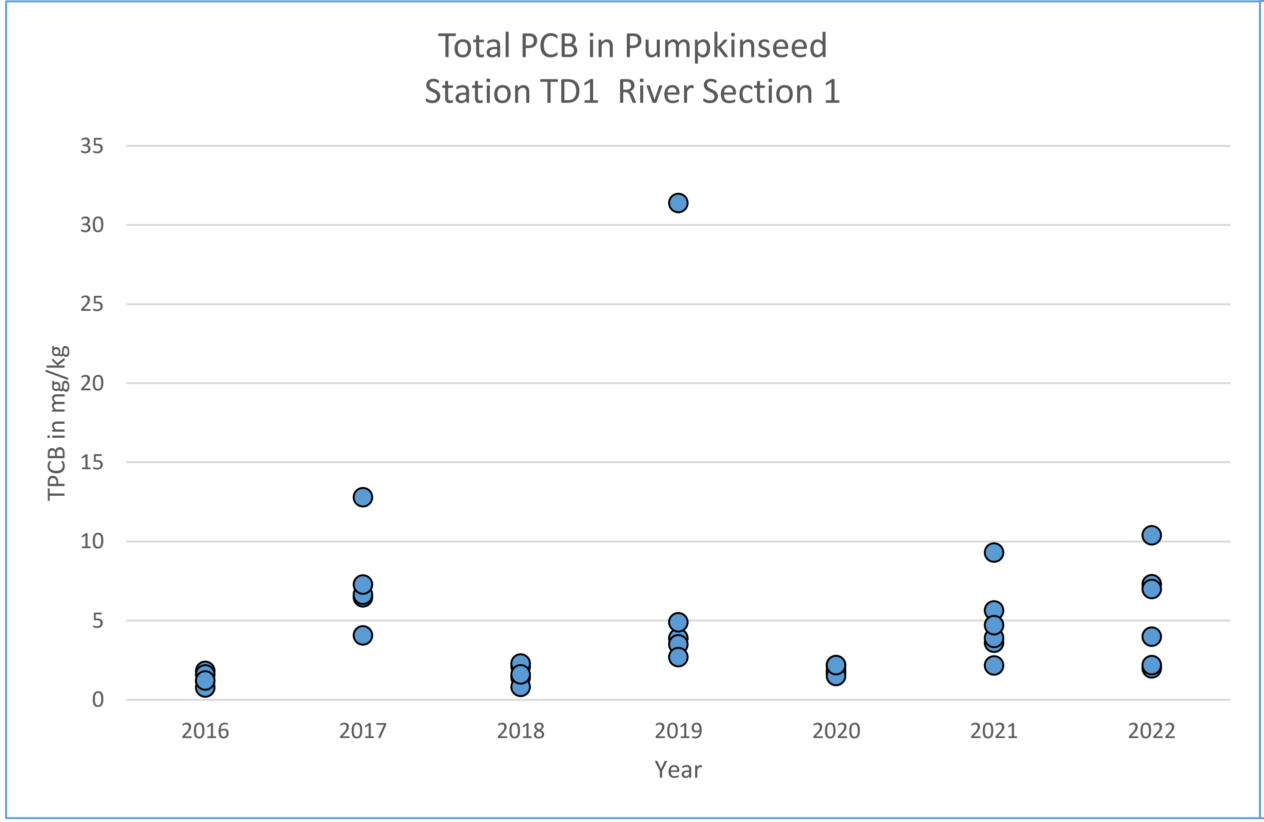


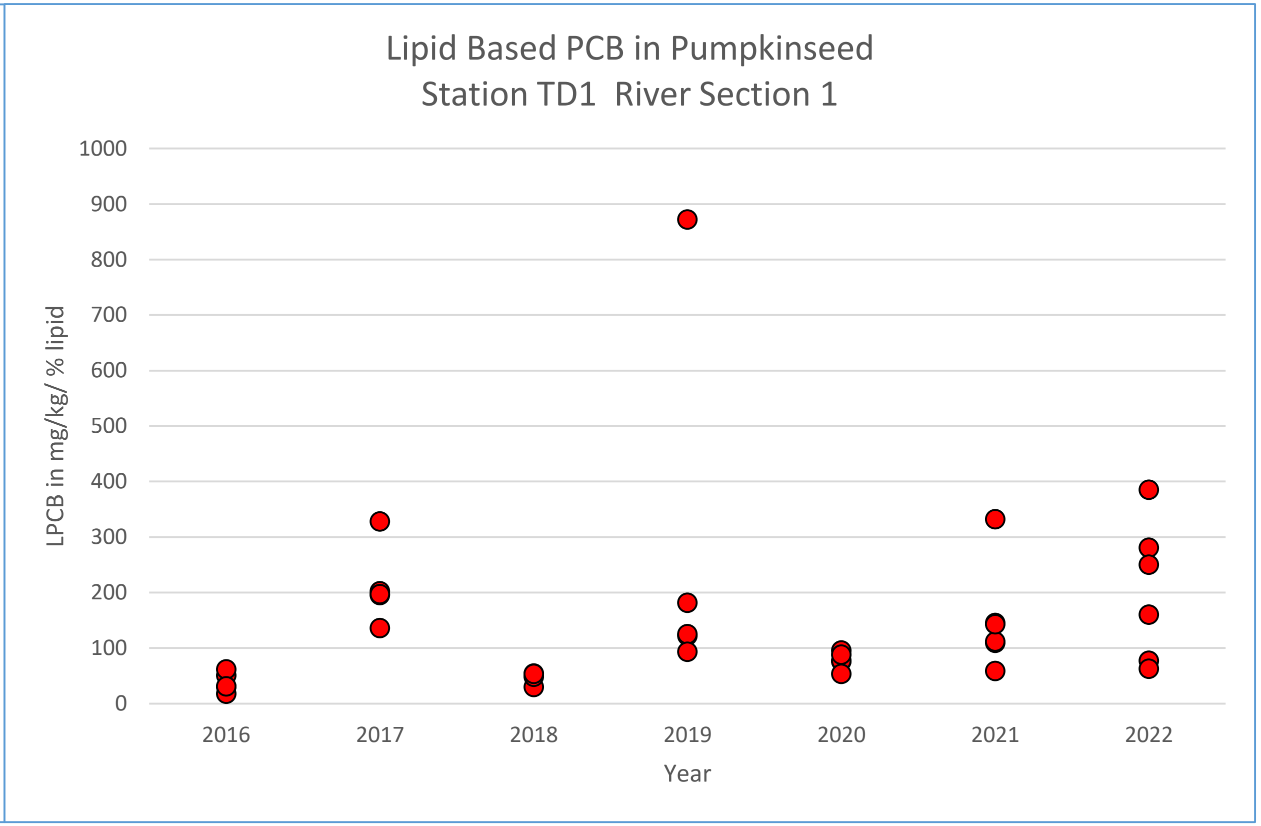
TD1 Pumpkinseed Percent Lipid





TD1 Pumpkinseed Total PCB and Lipid Based PCB





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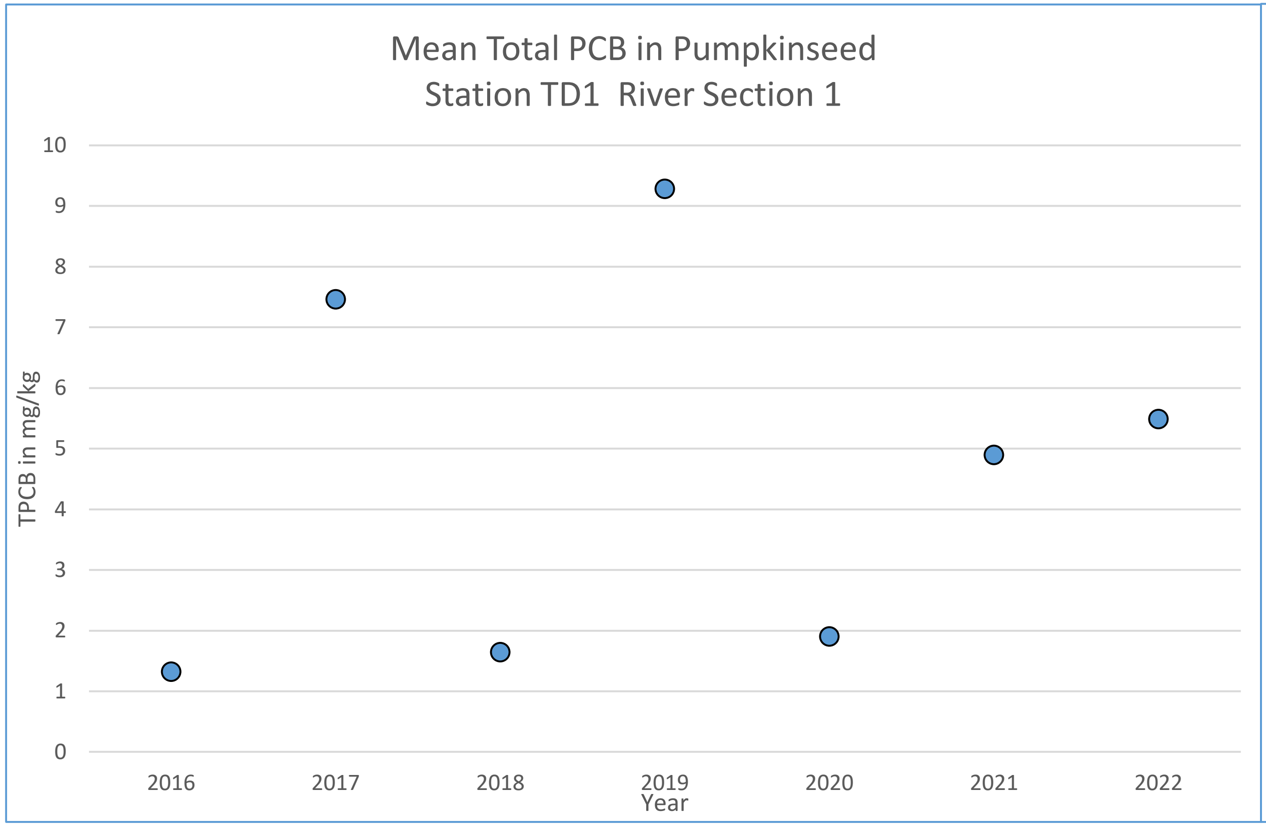
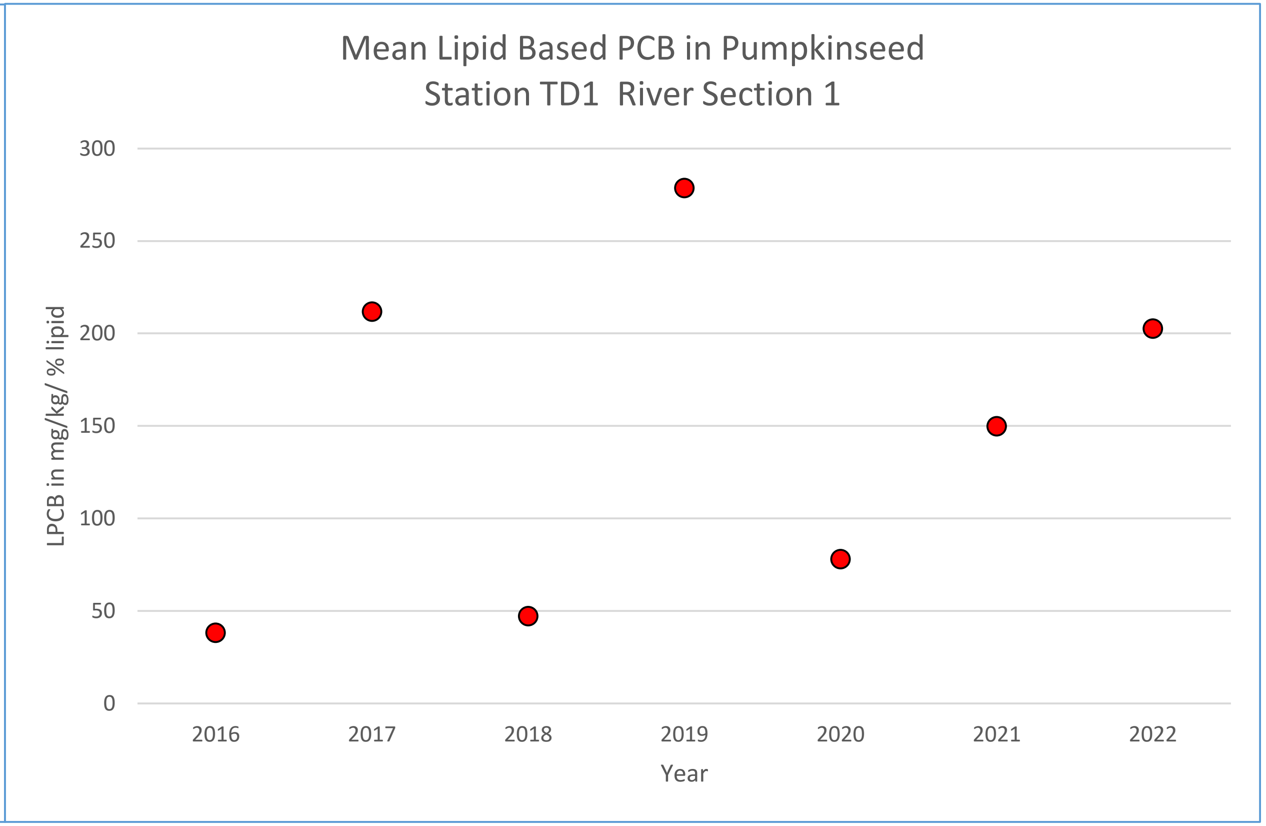
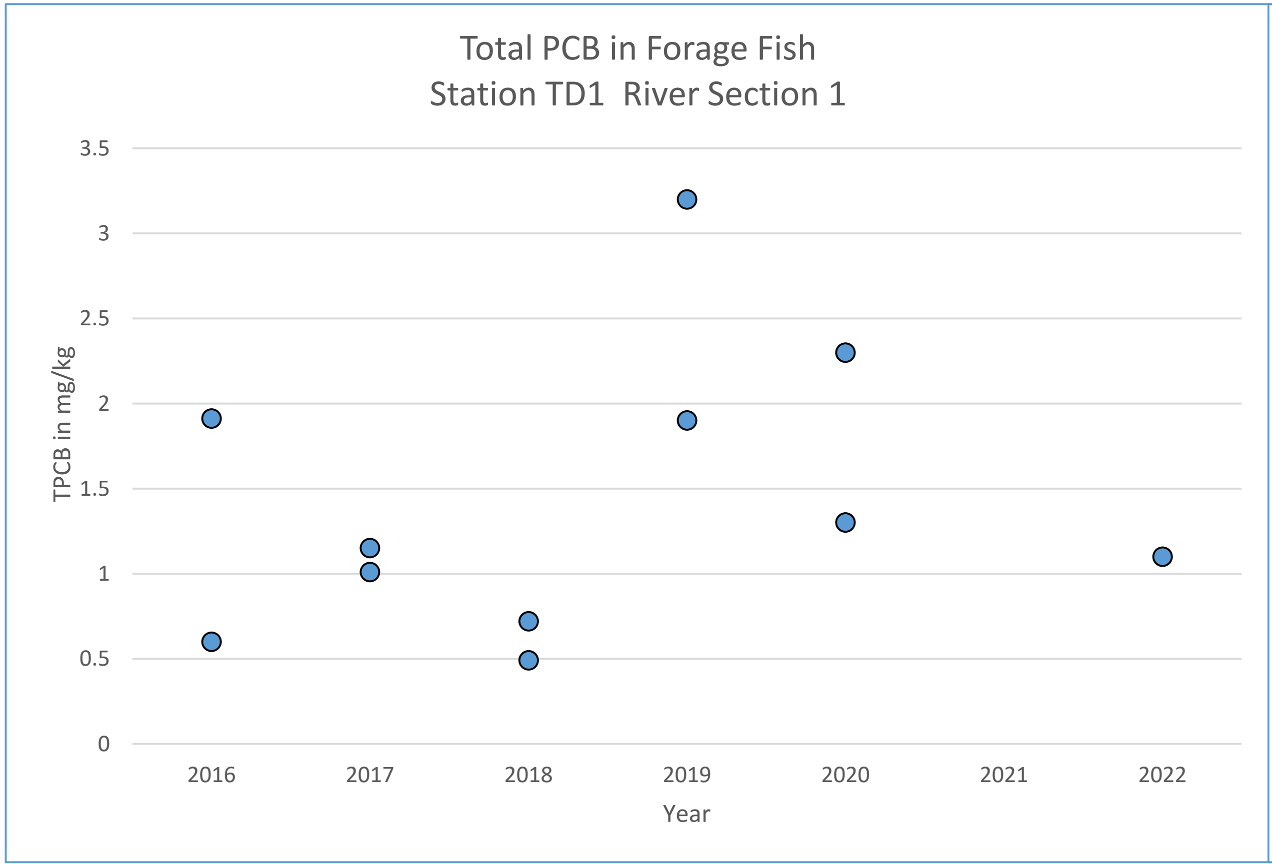
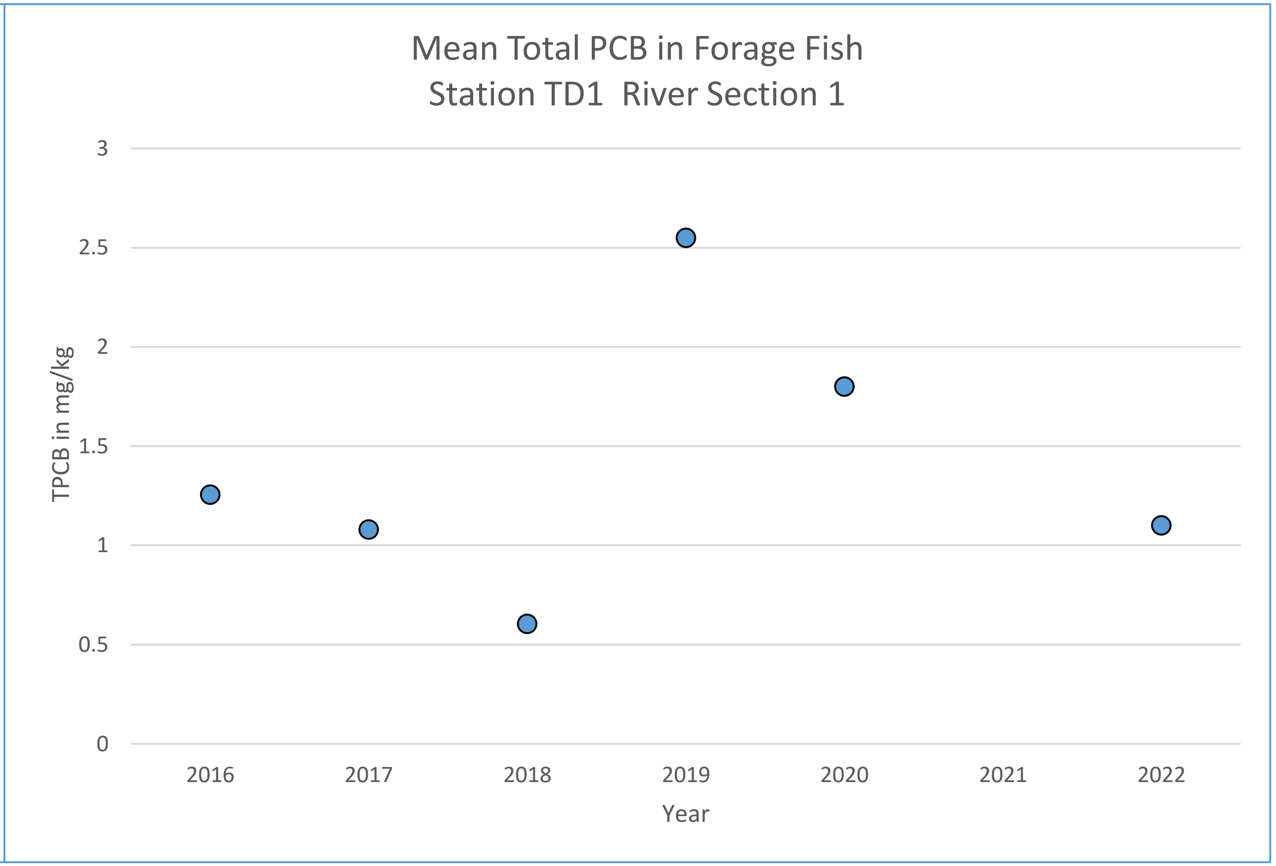




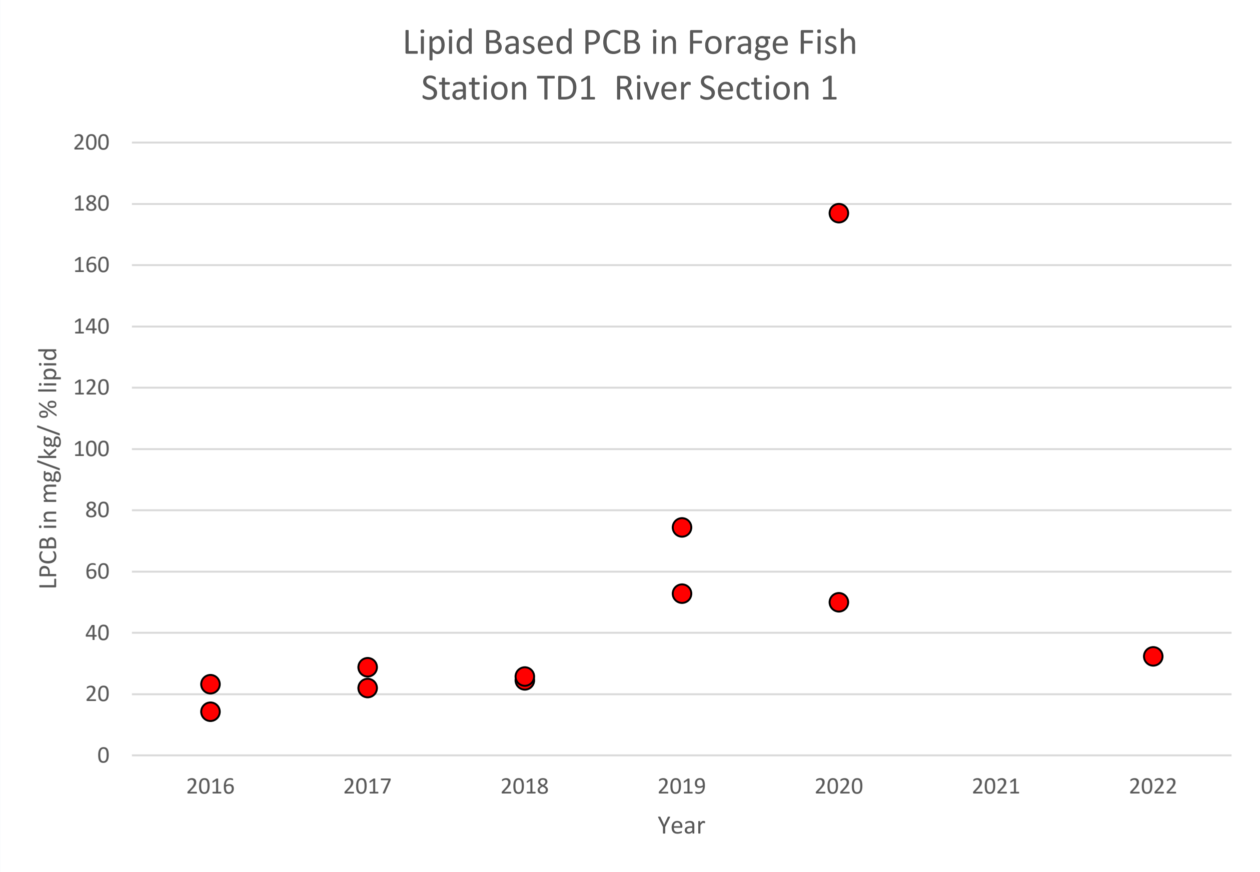
TD1 Forage Fish Data

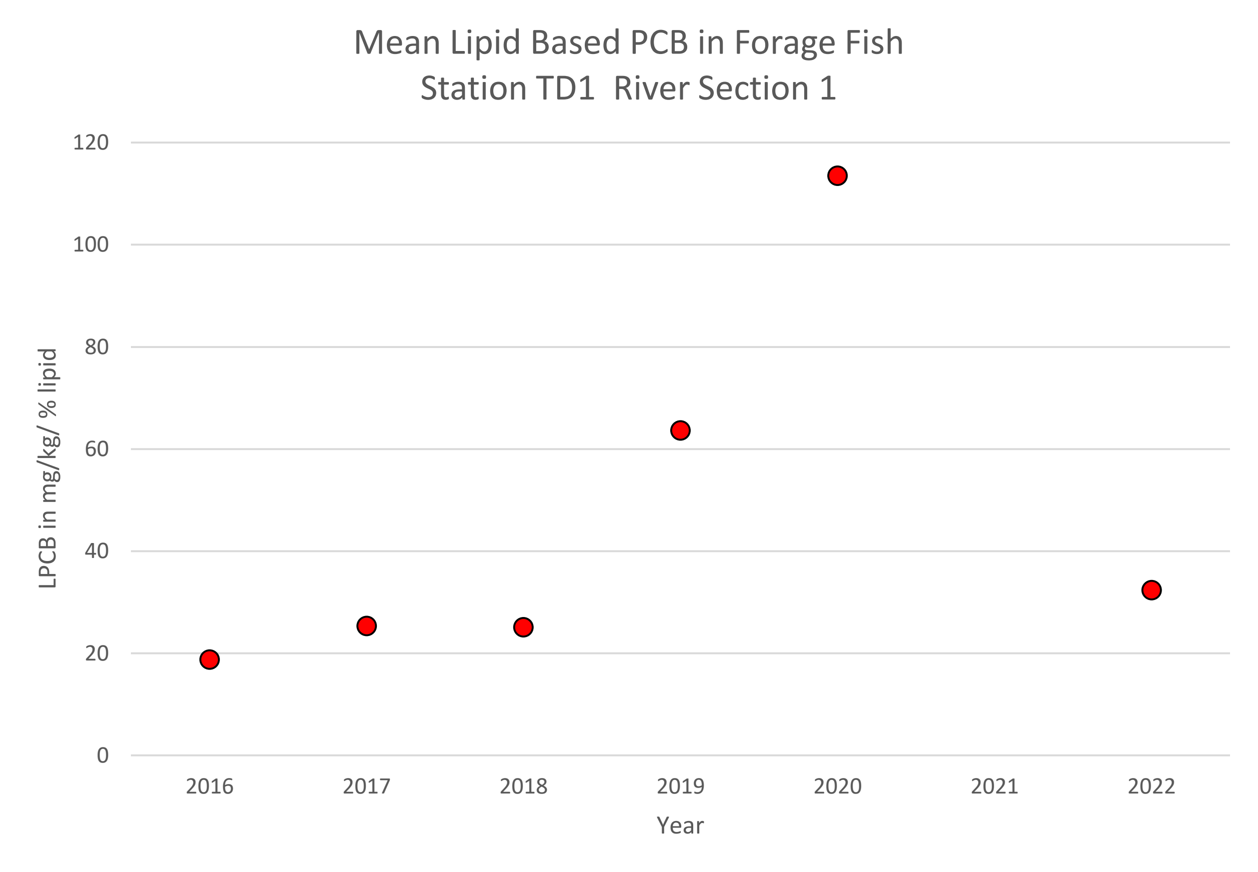
TD1 Forage Fish Total PCB



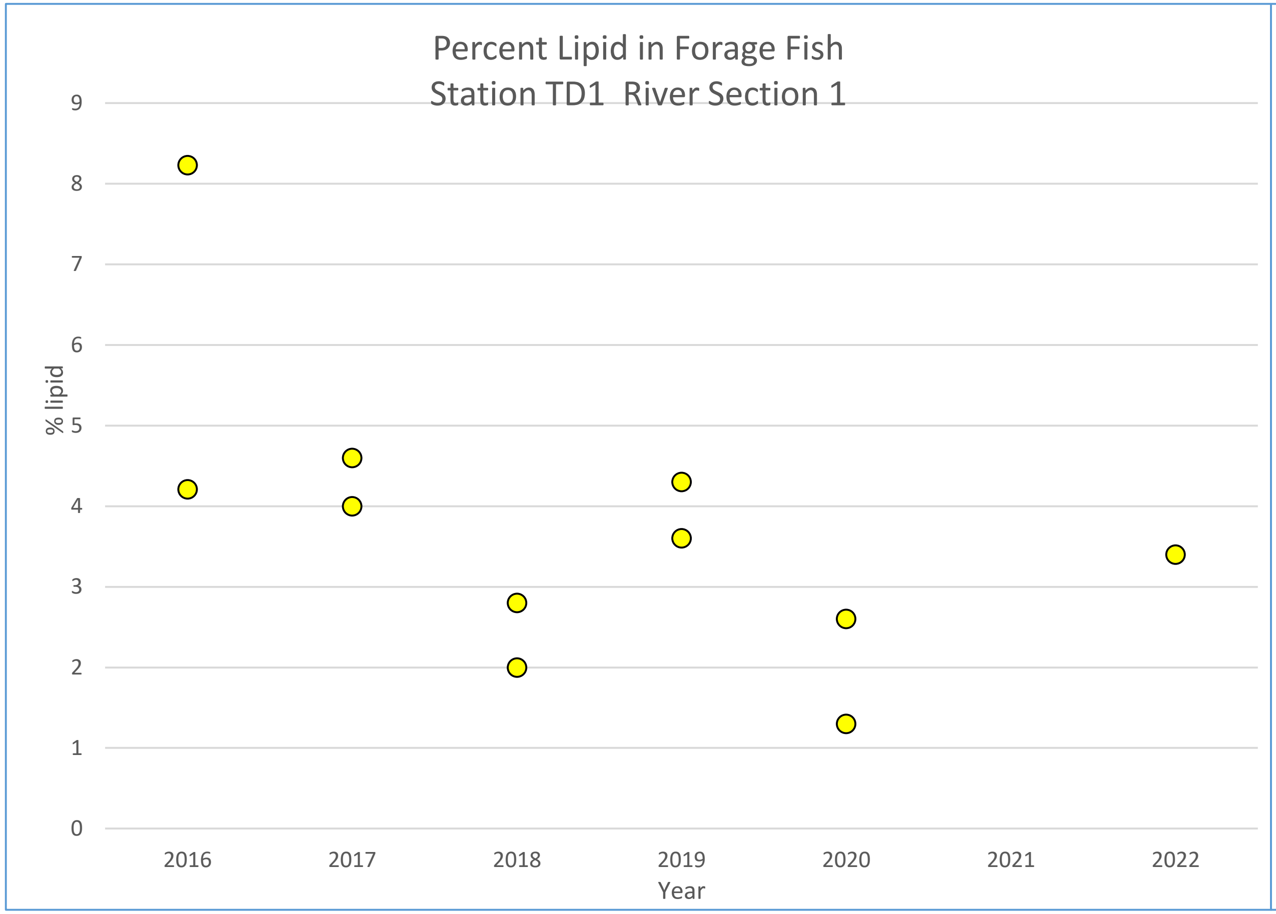


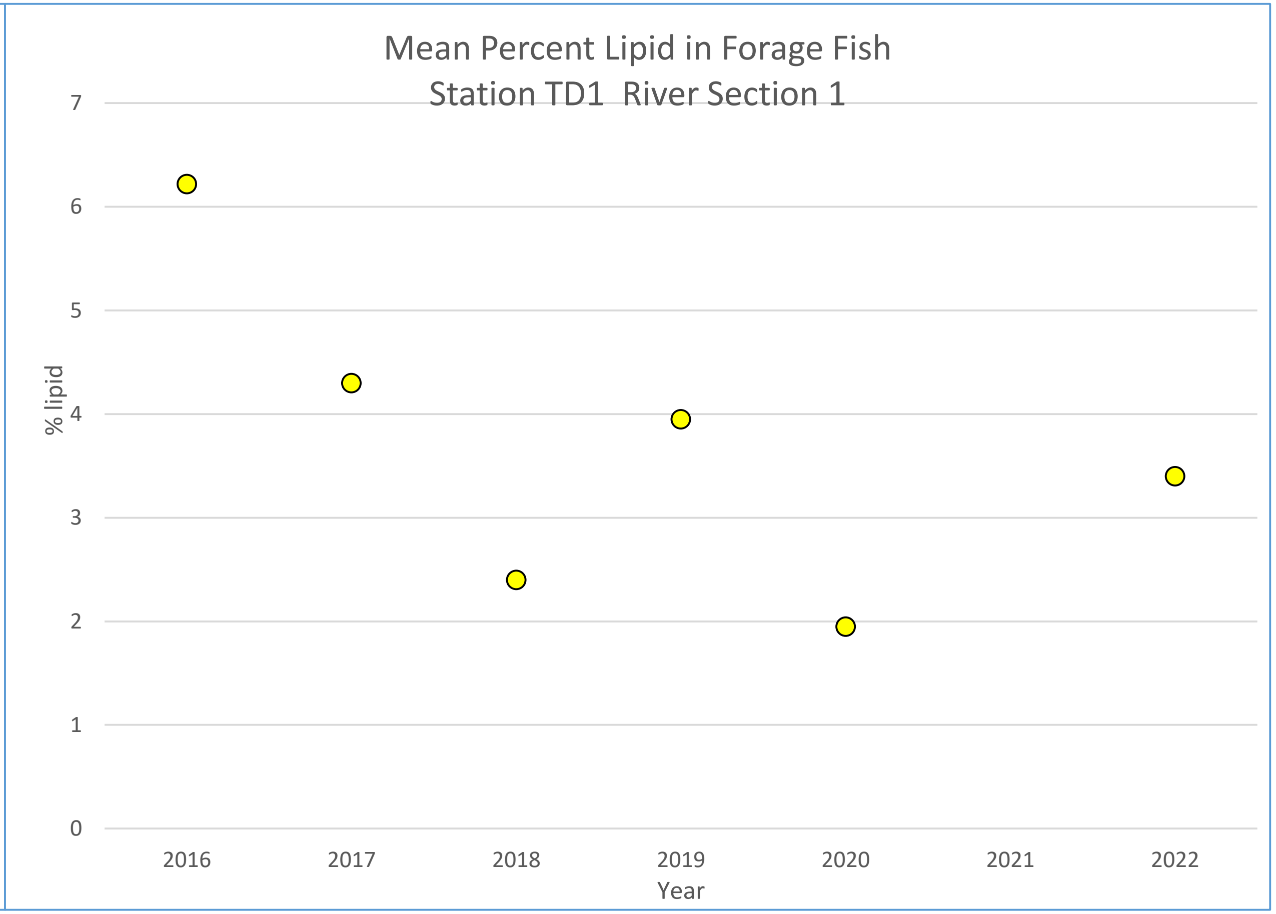
TD1 Forage Fish Lipid Based PCB



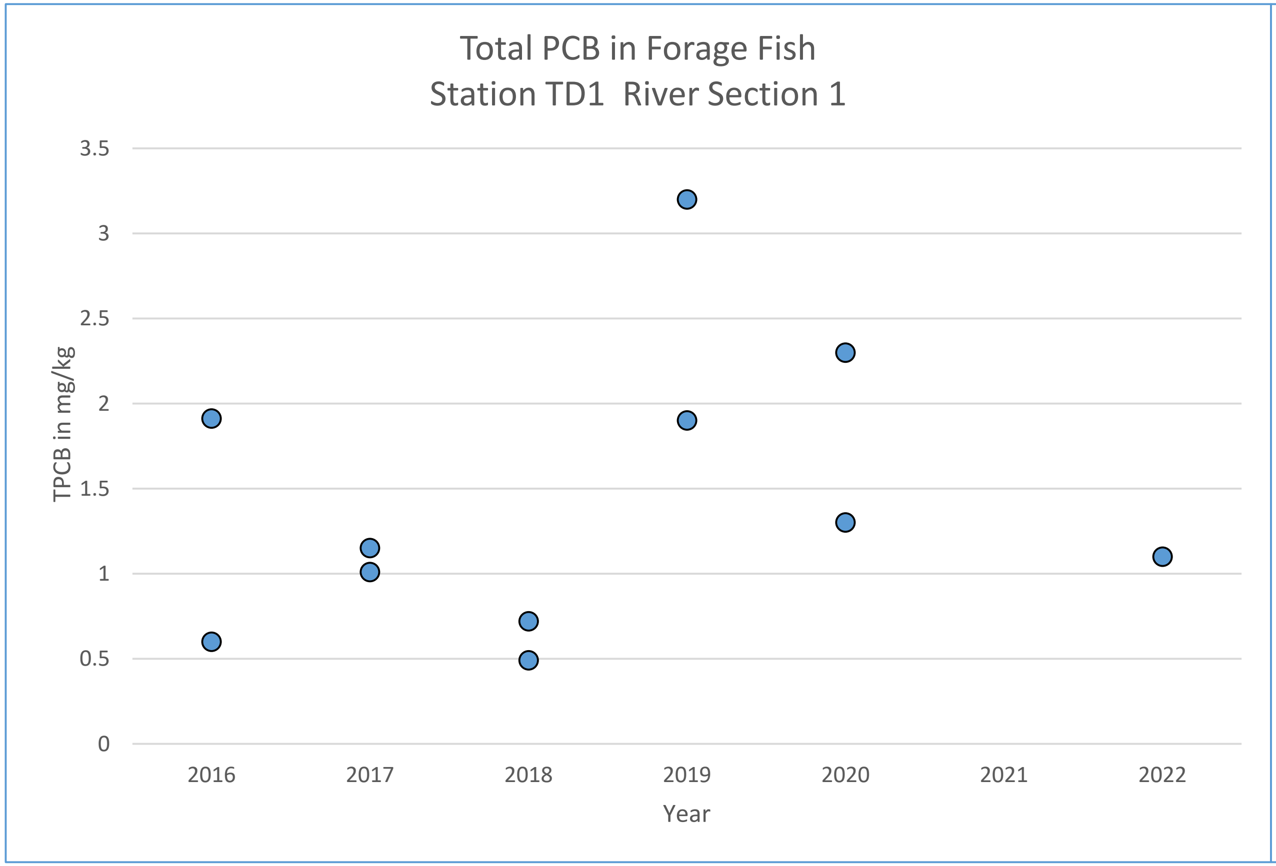


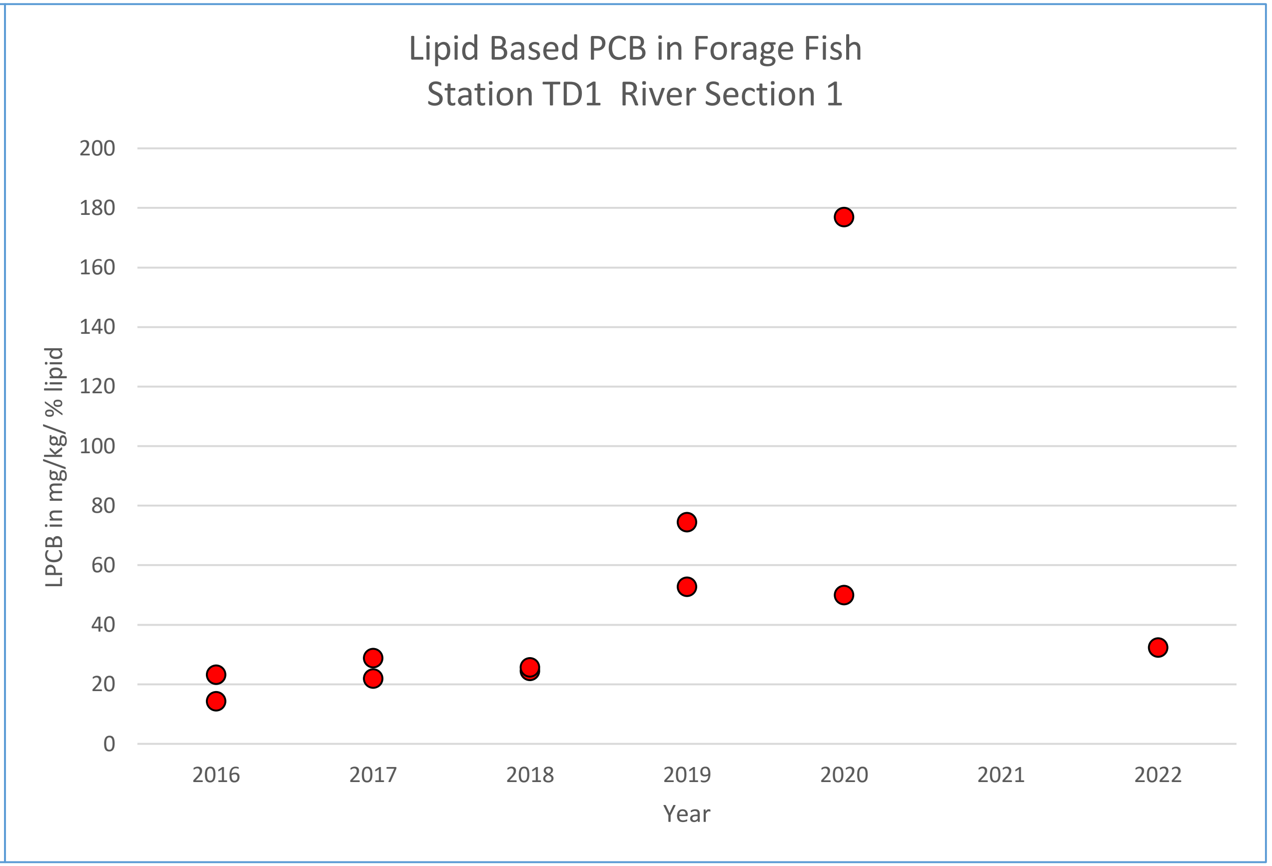
TD1 Forage Fish Percent Lipid



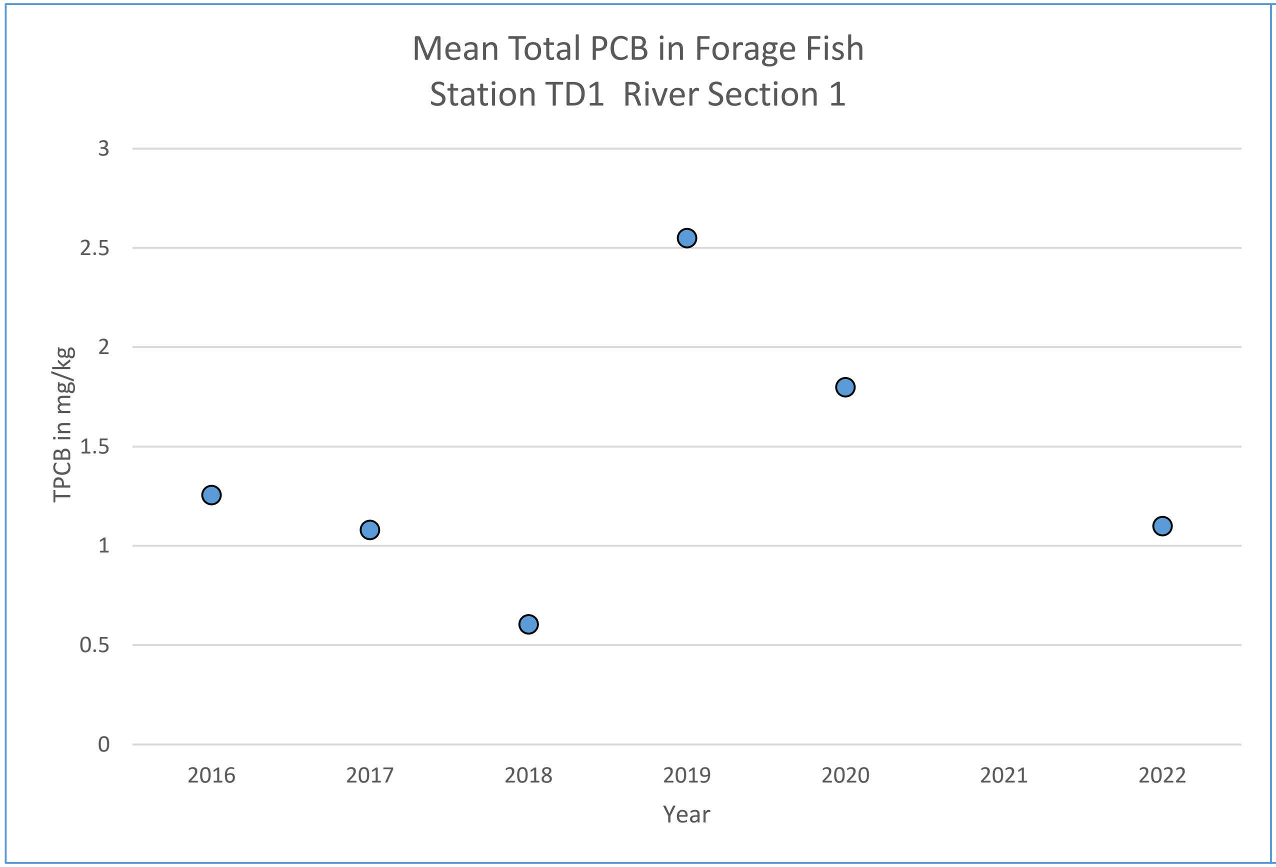


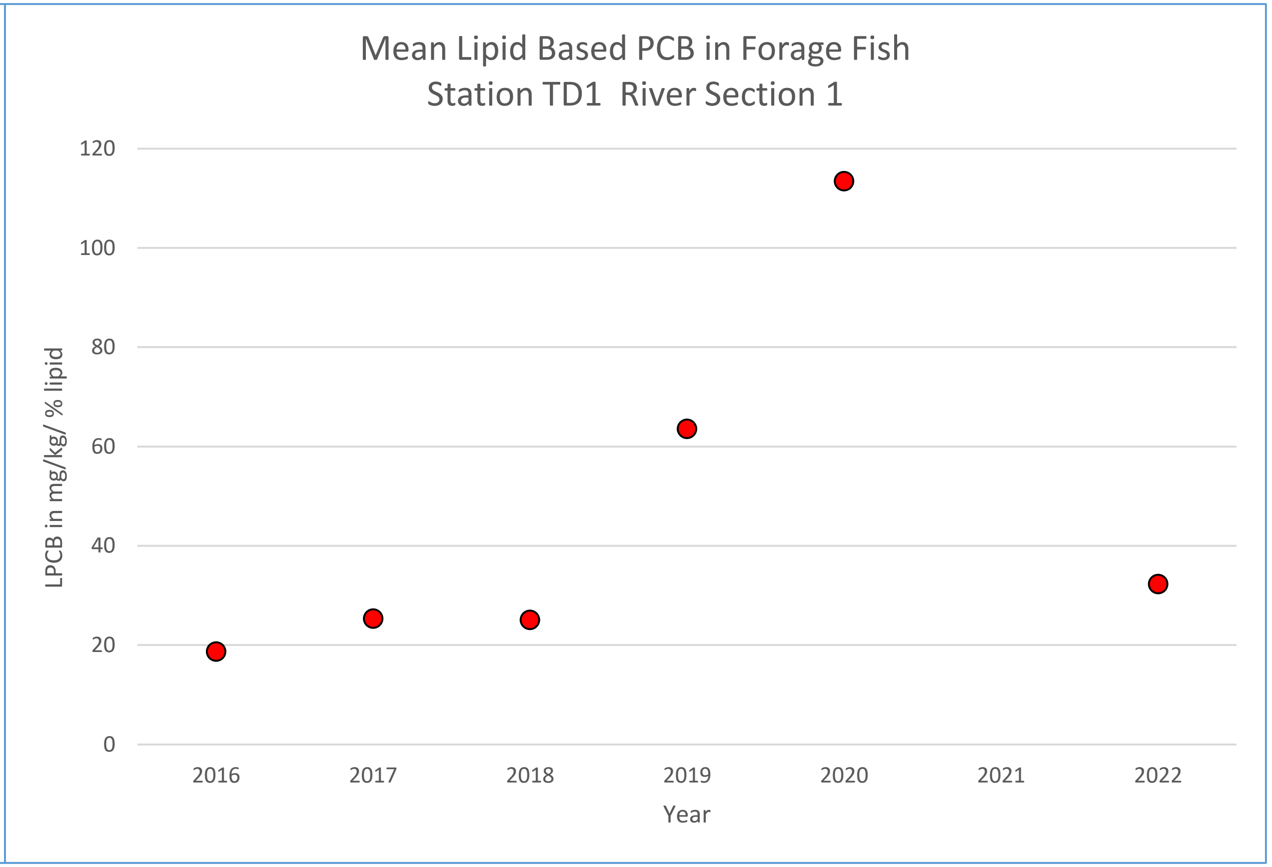
TD1 Forage Fish Total PCB and Lipid Based PCB





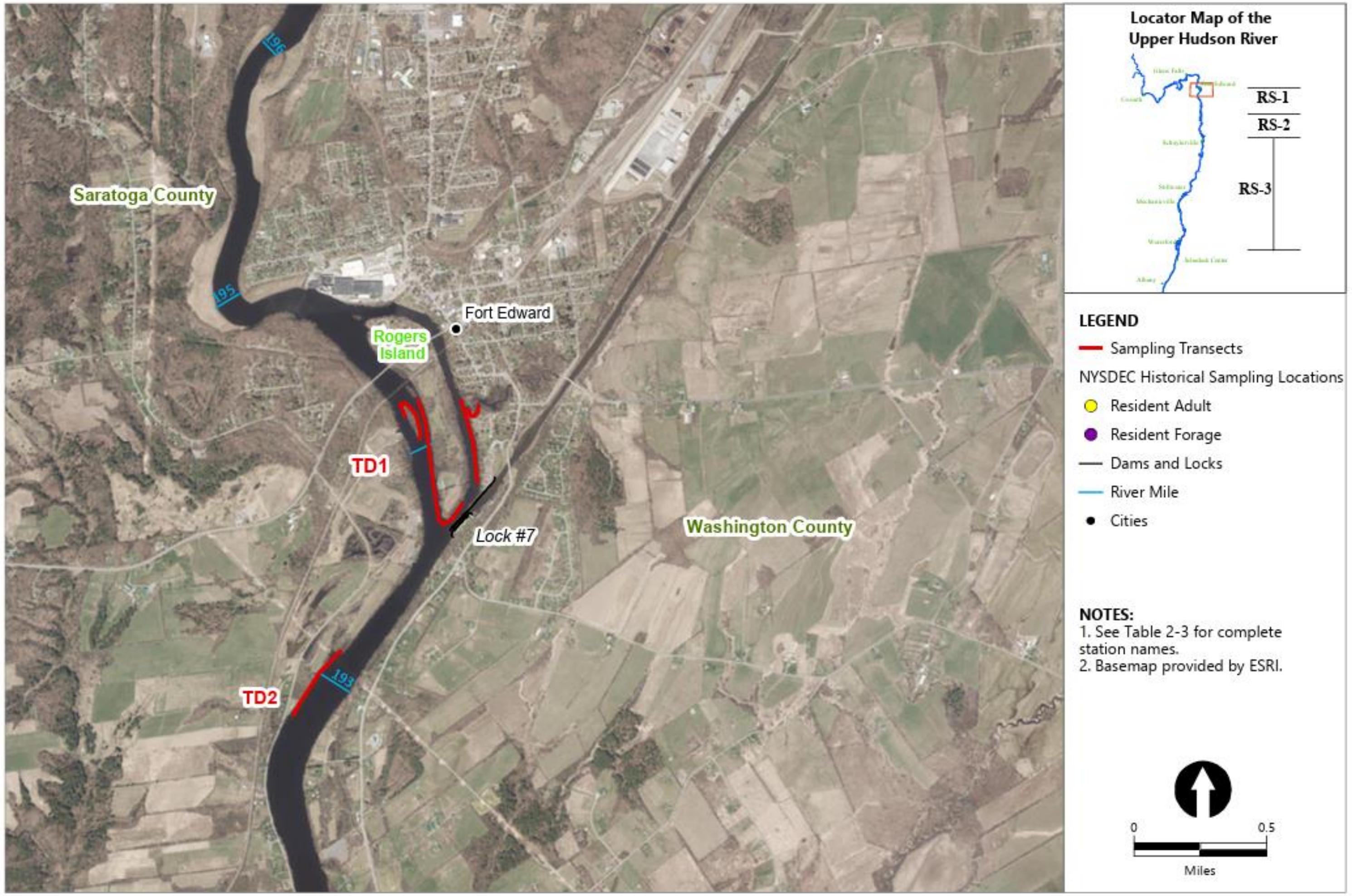
TD1 Forage Fish Mean Total PCB and Mean Lipid Based PCB





Station TD2

Stations TD1 and TD2



Publish Date: 2019/11/27, 10:56 AM | User: MBell-Rosof
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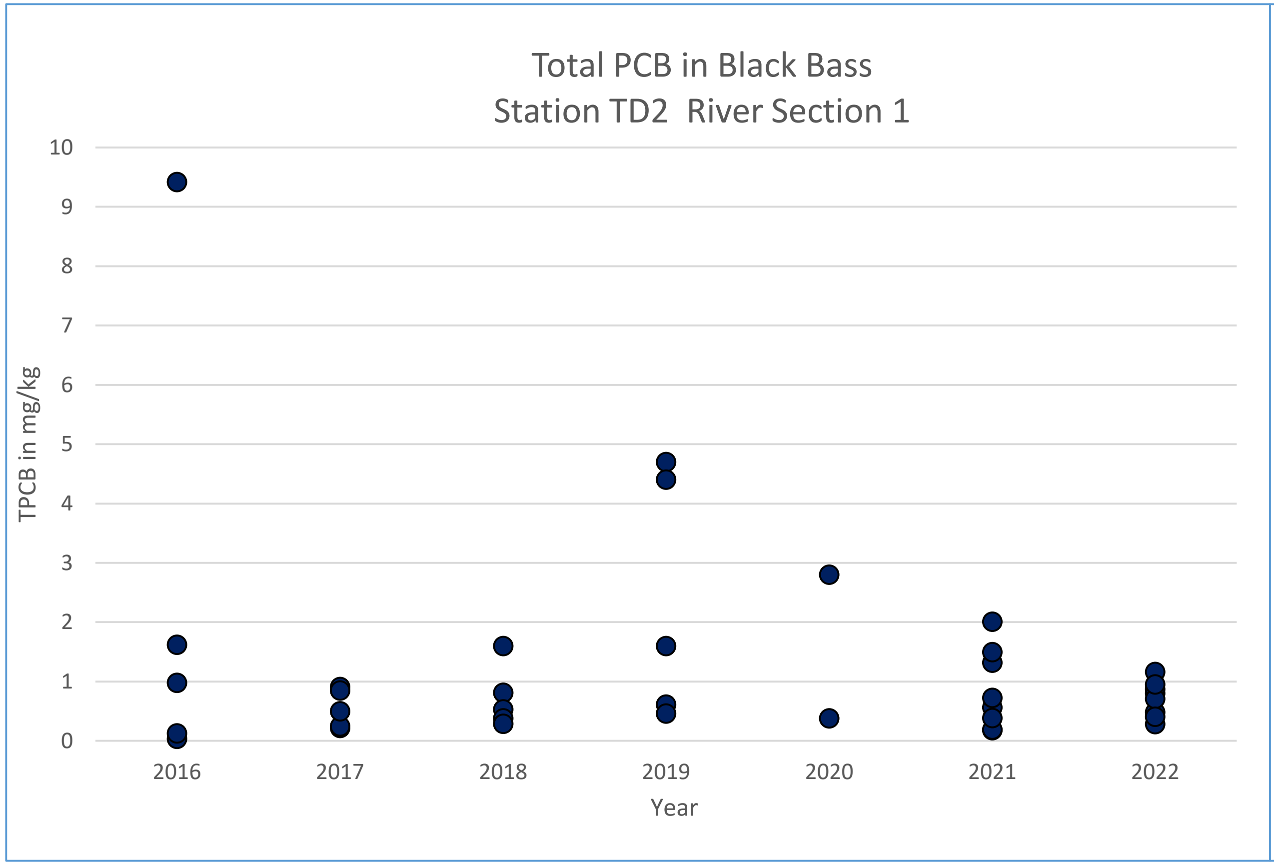
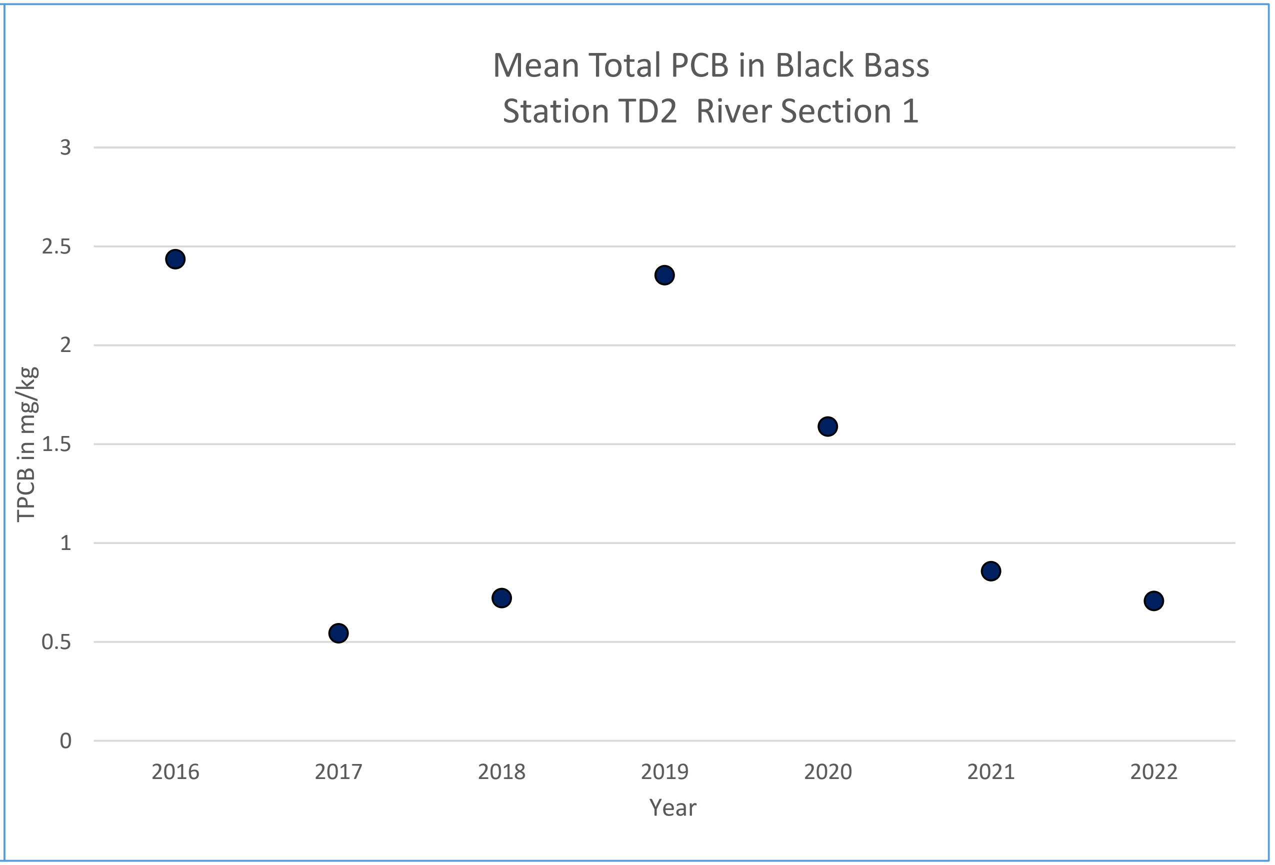
Figure 2-2b
Spring 2018 Fish Sampling Locations
2018 Water and Fish Data Summary Report
Prepared for the General Electric Company

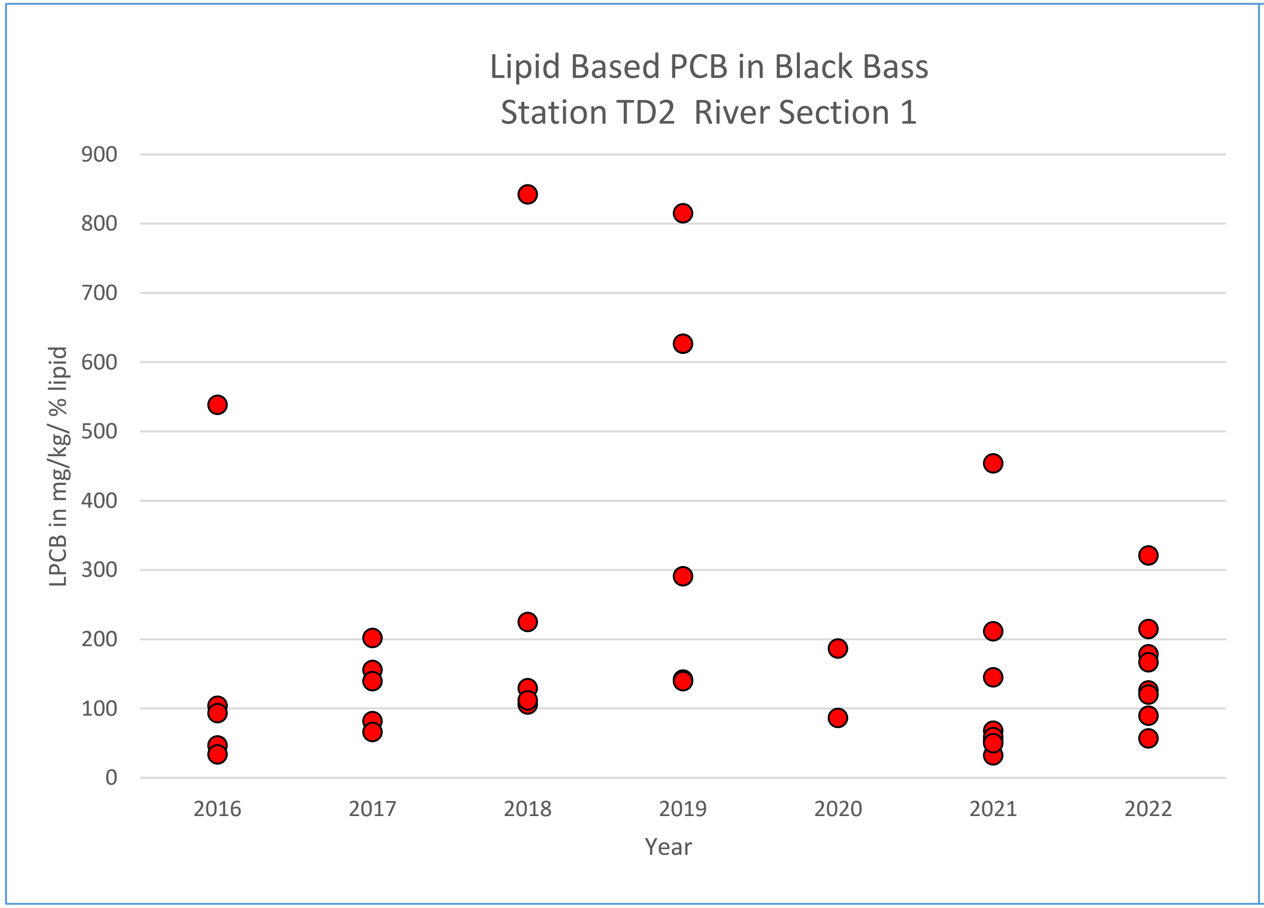
TD2 Black Bass Data

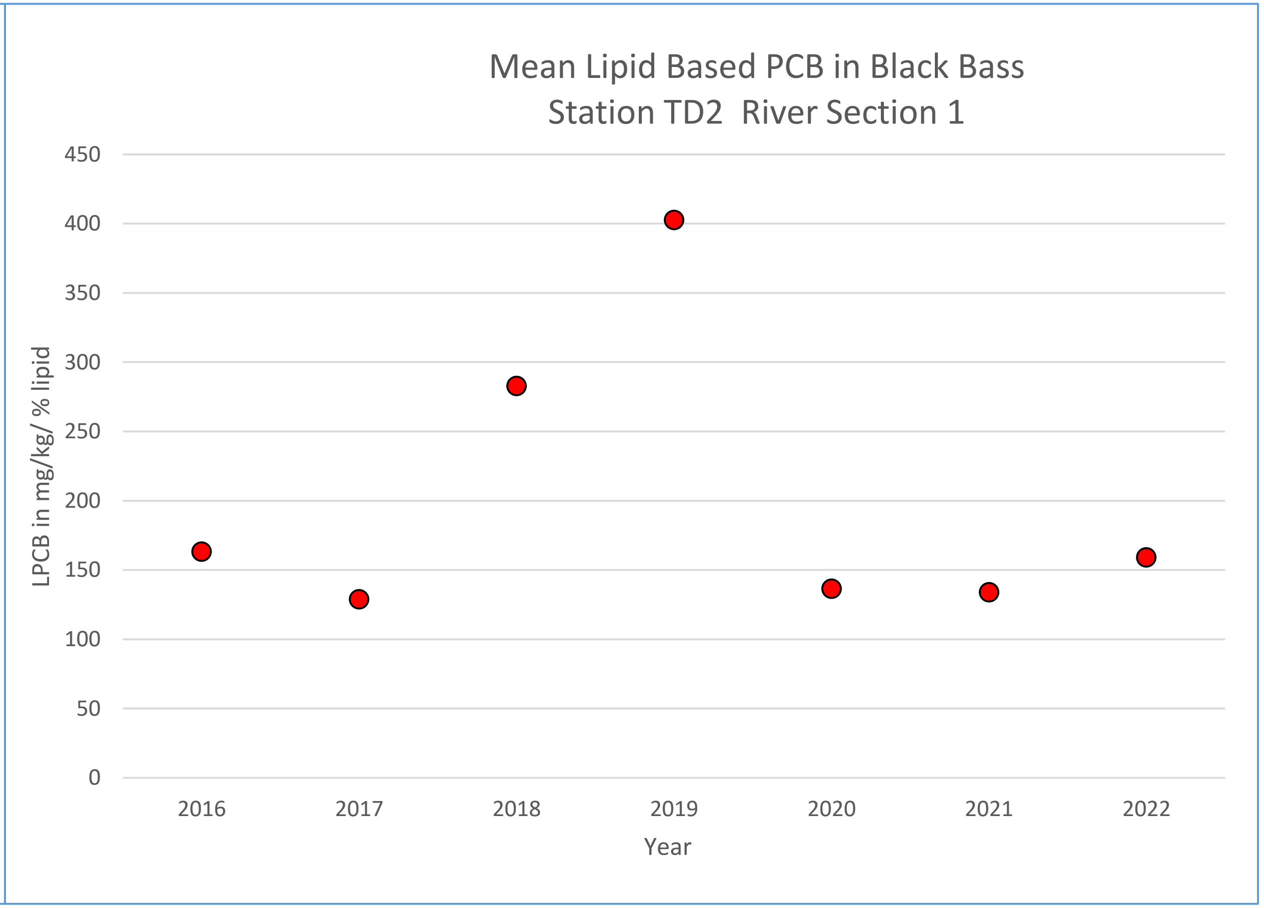
TD2 Black Bass Total PCB



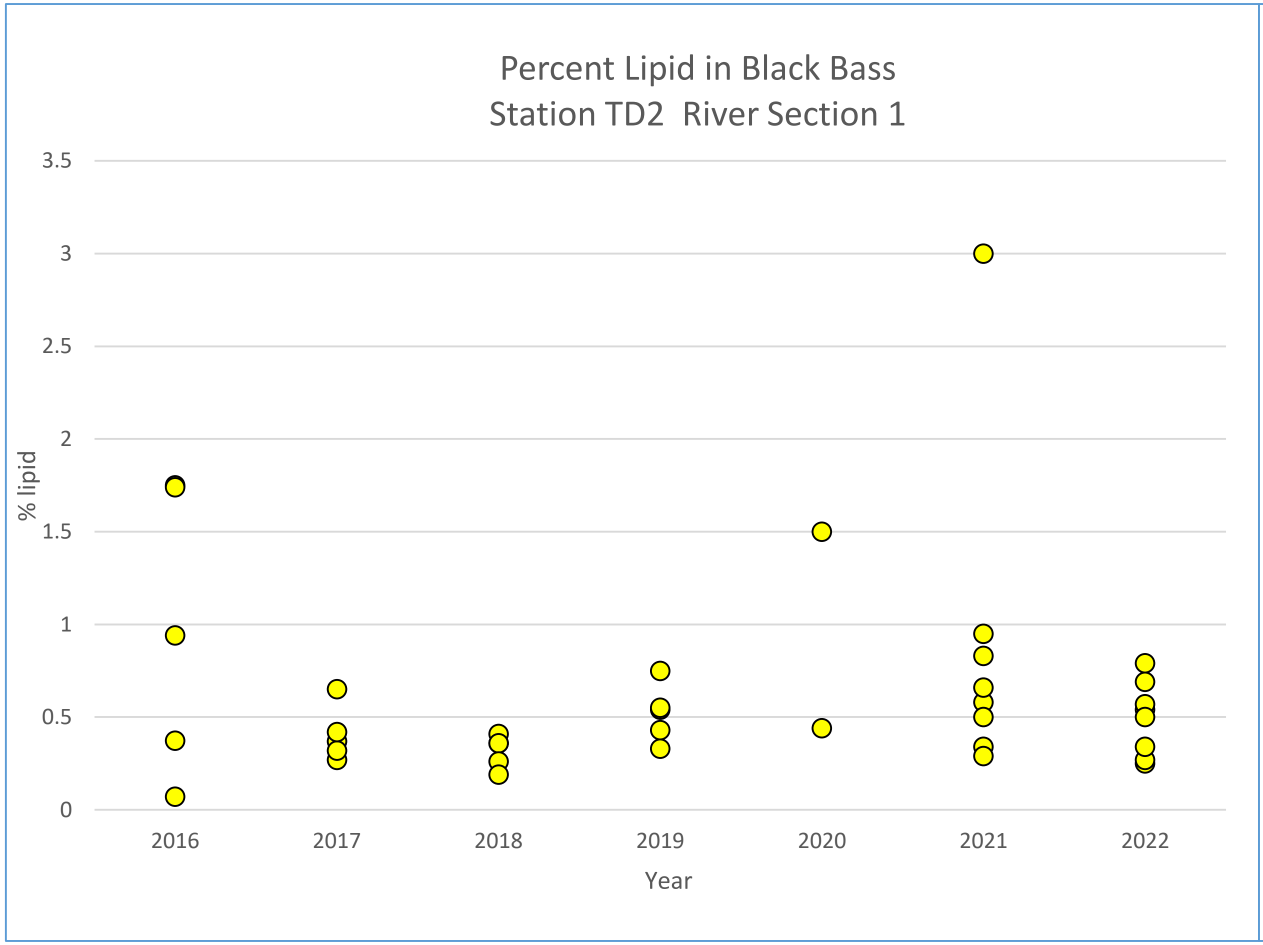


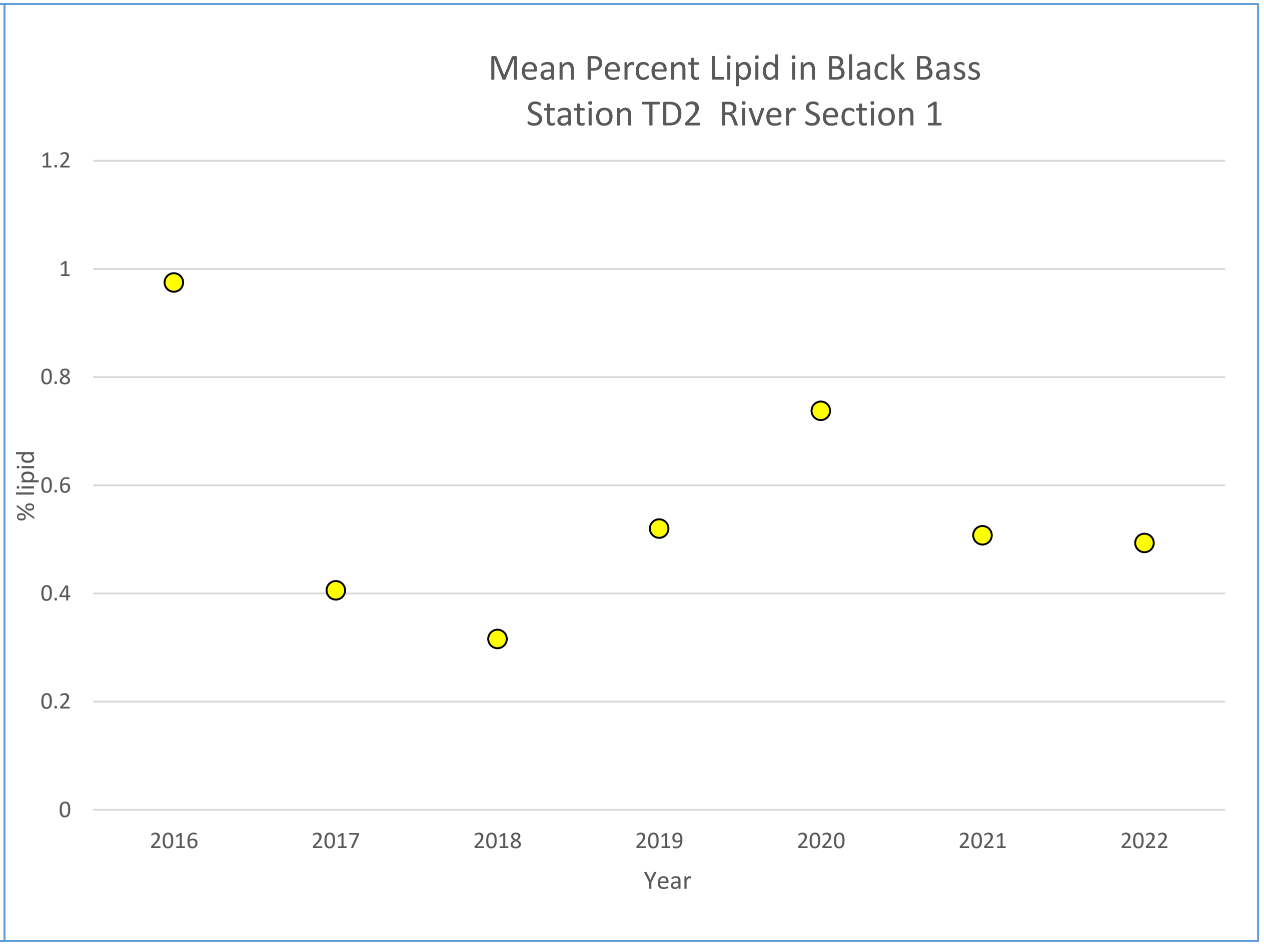
TD2 Black Bass Lipid Based PCB



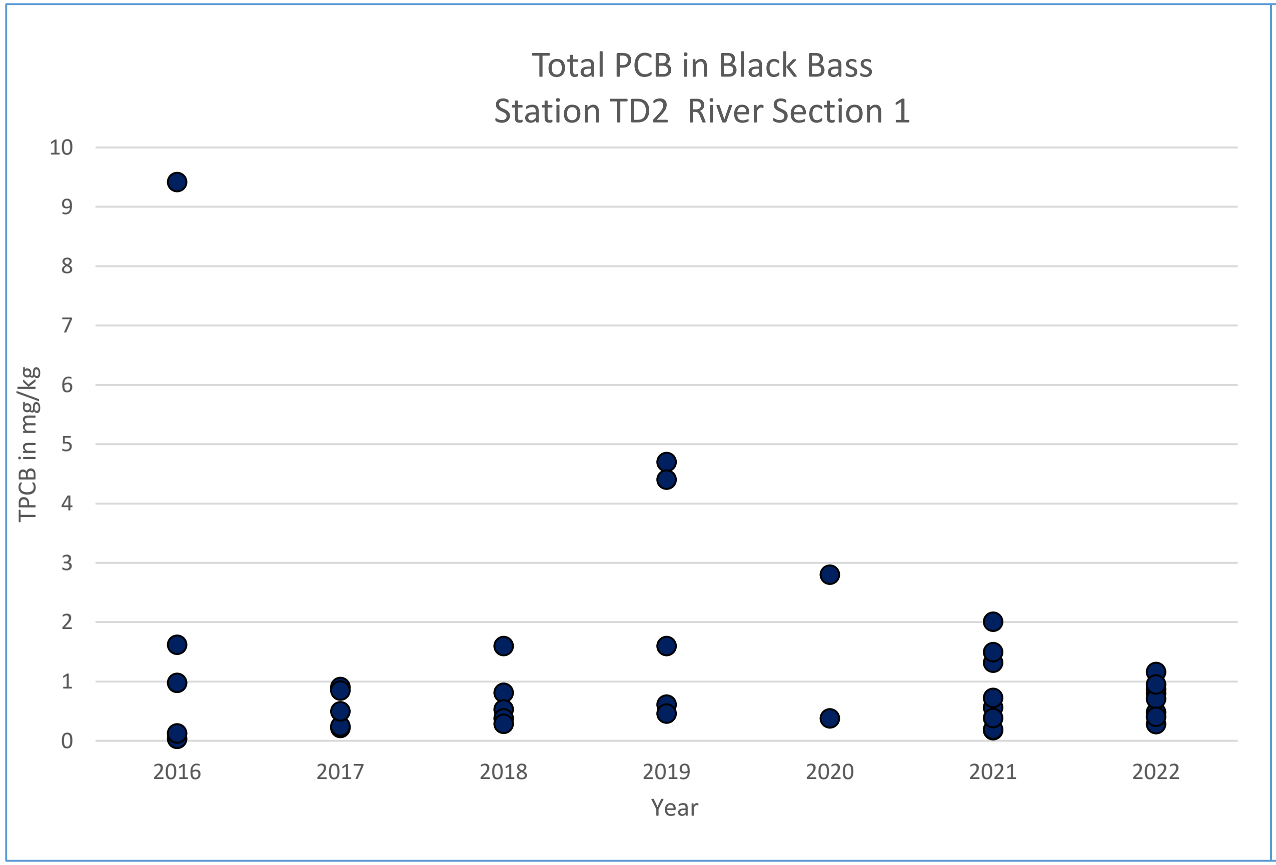


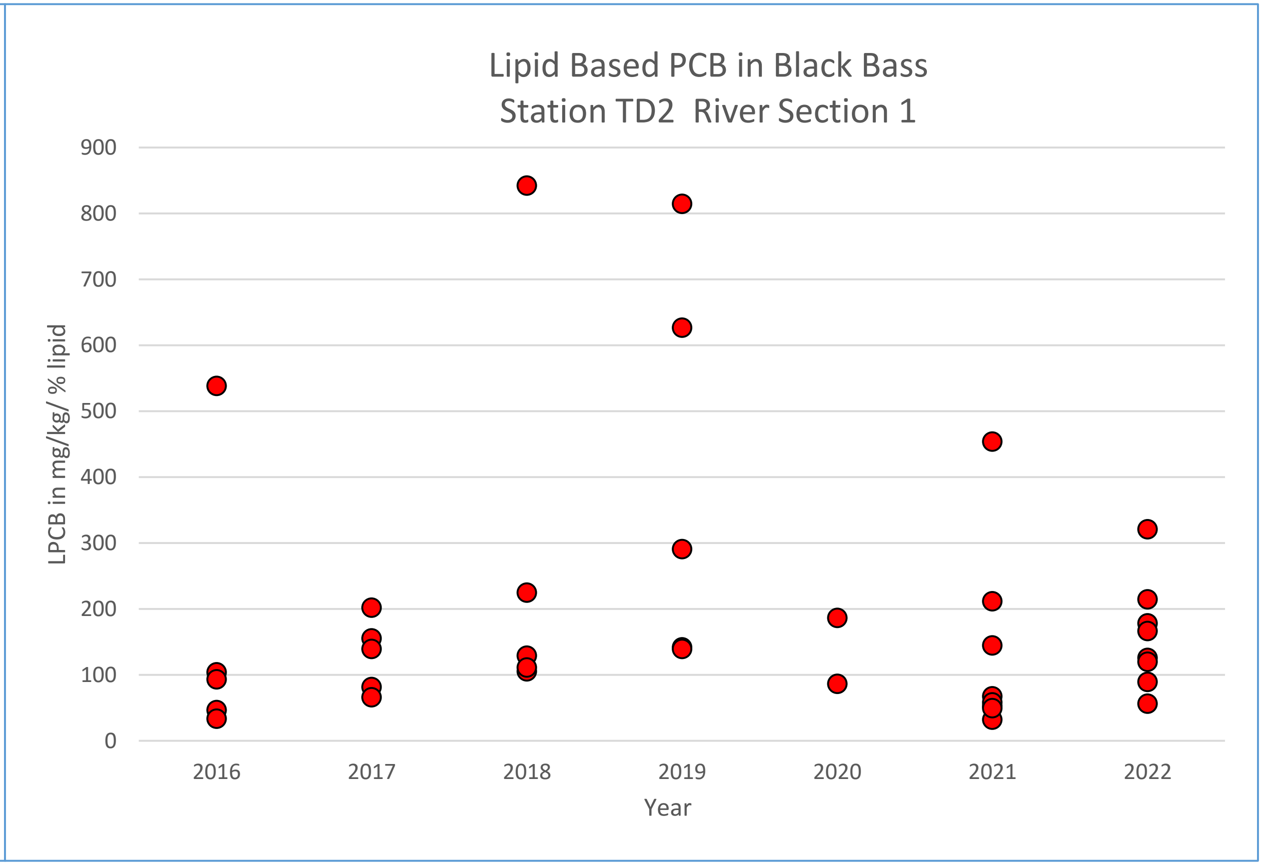
TD2 Black Bass Percent Lipid



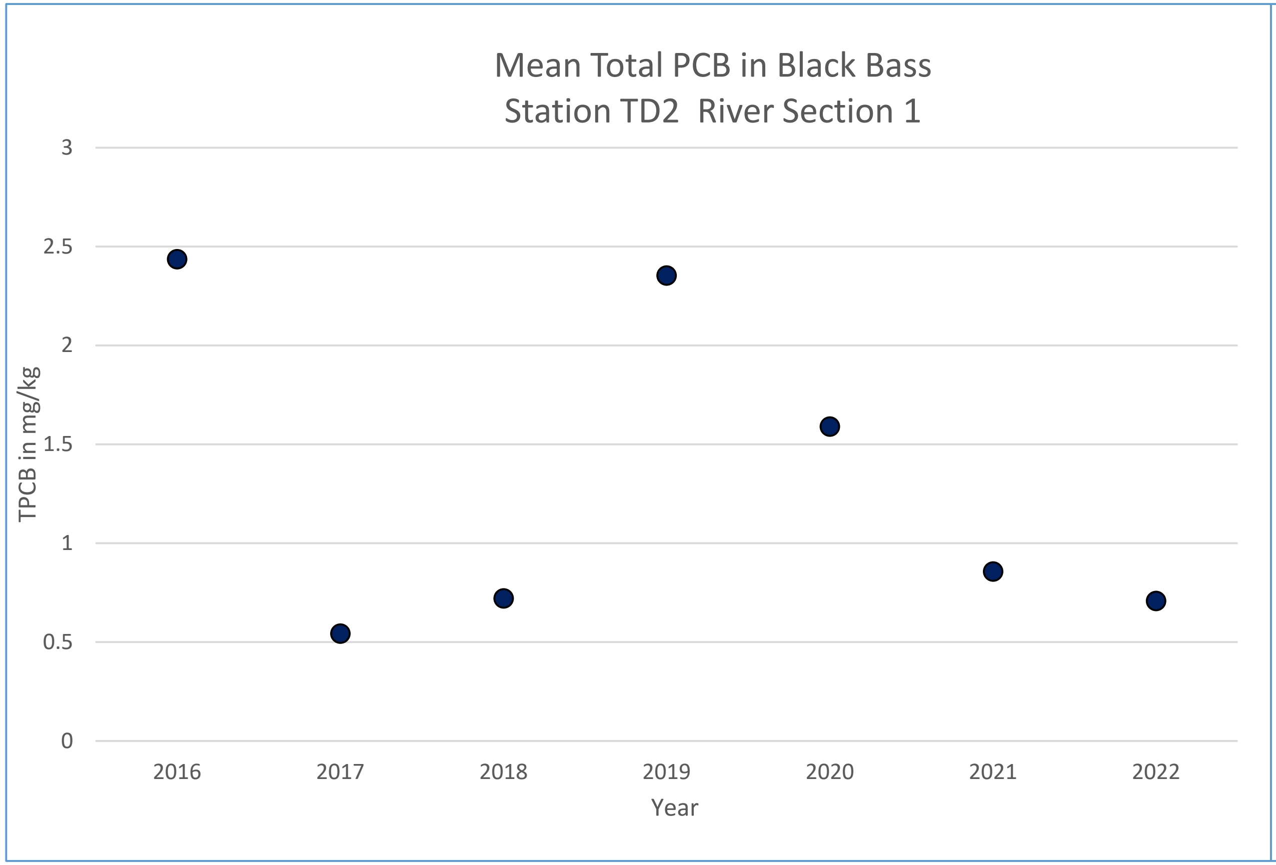


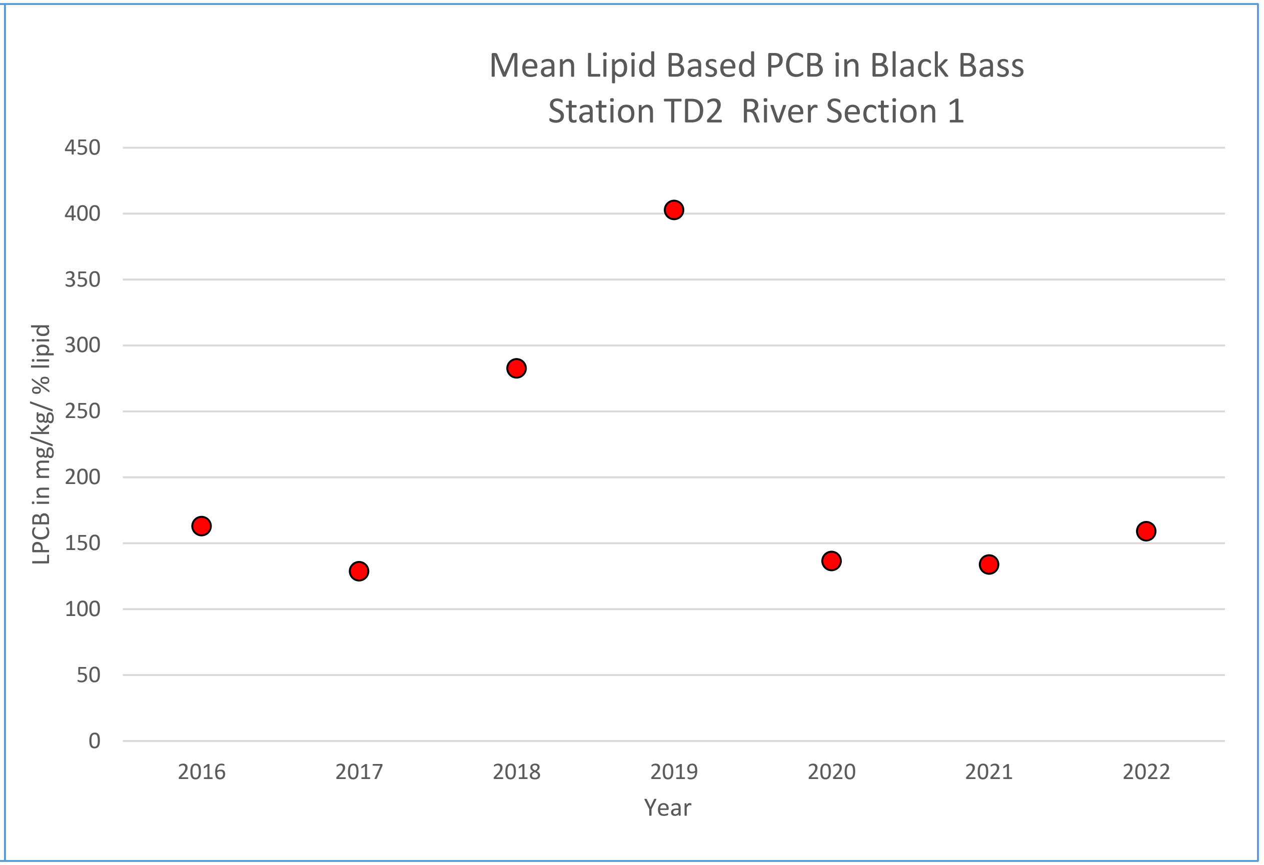
TD2 Black Bass Total PCB and Lipid Based PCB





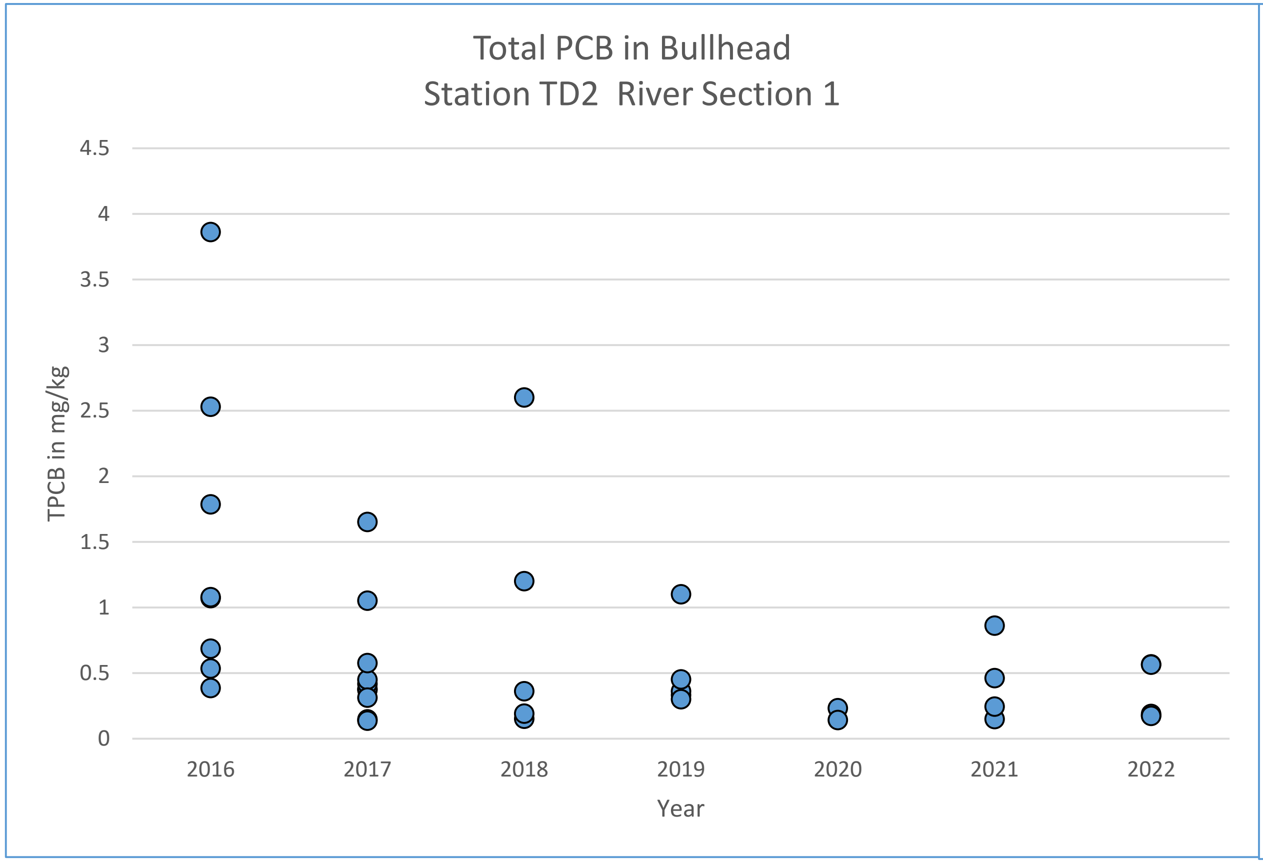
TD2 Black Bass Mean Total PCB and Mean Lipid Based PCB

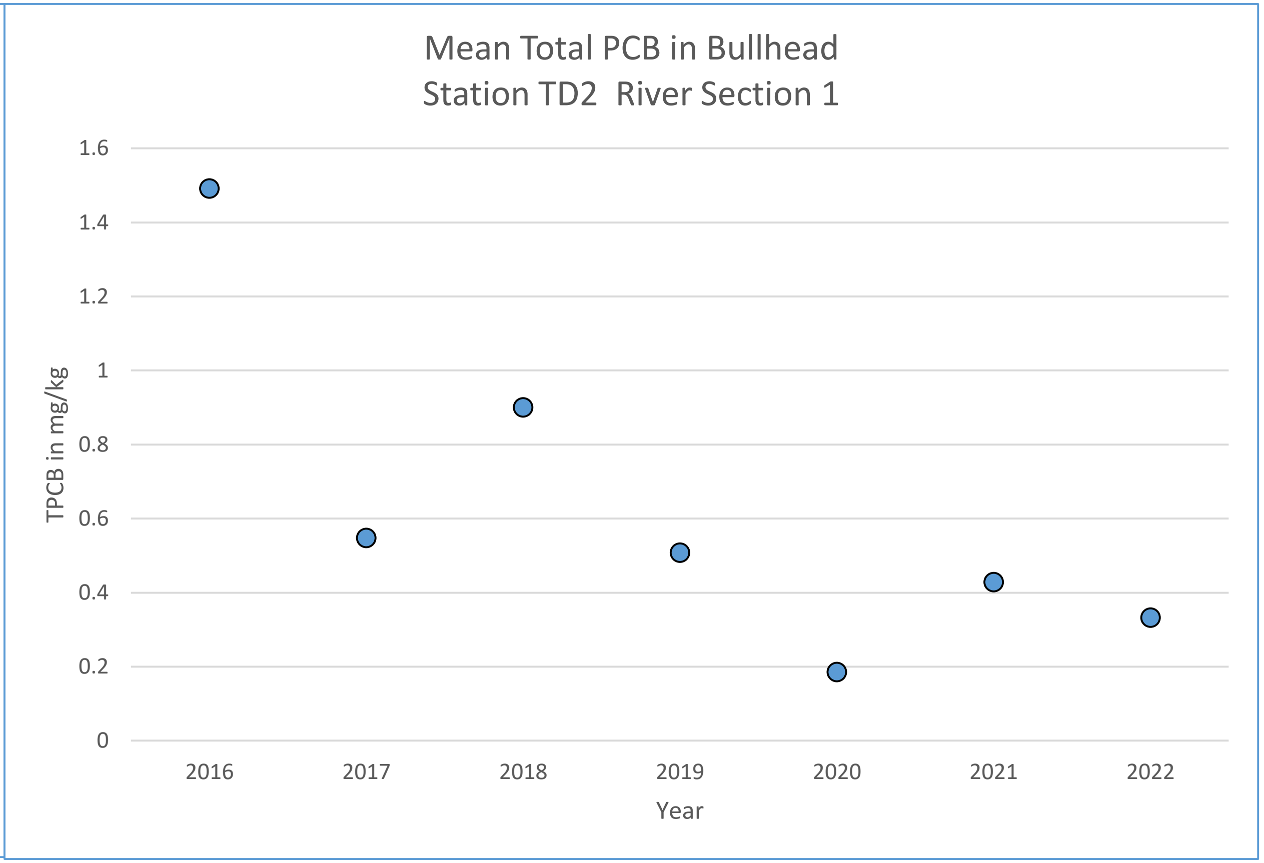




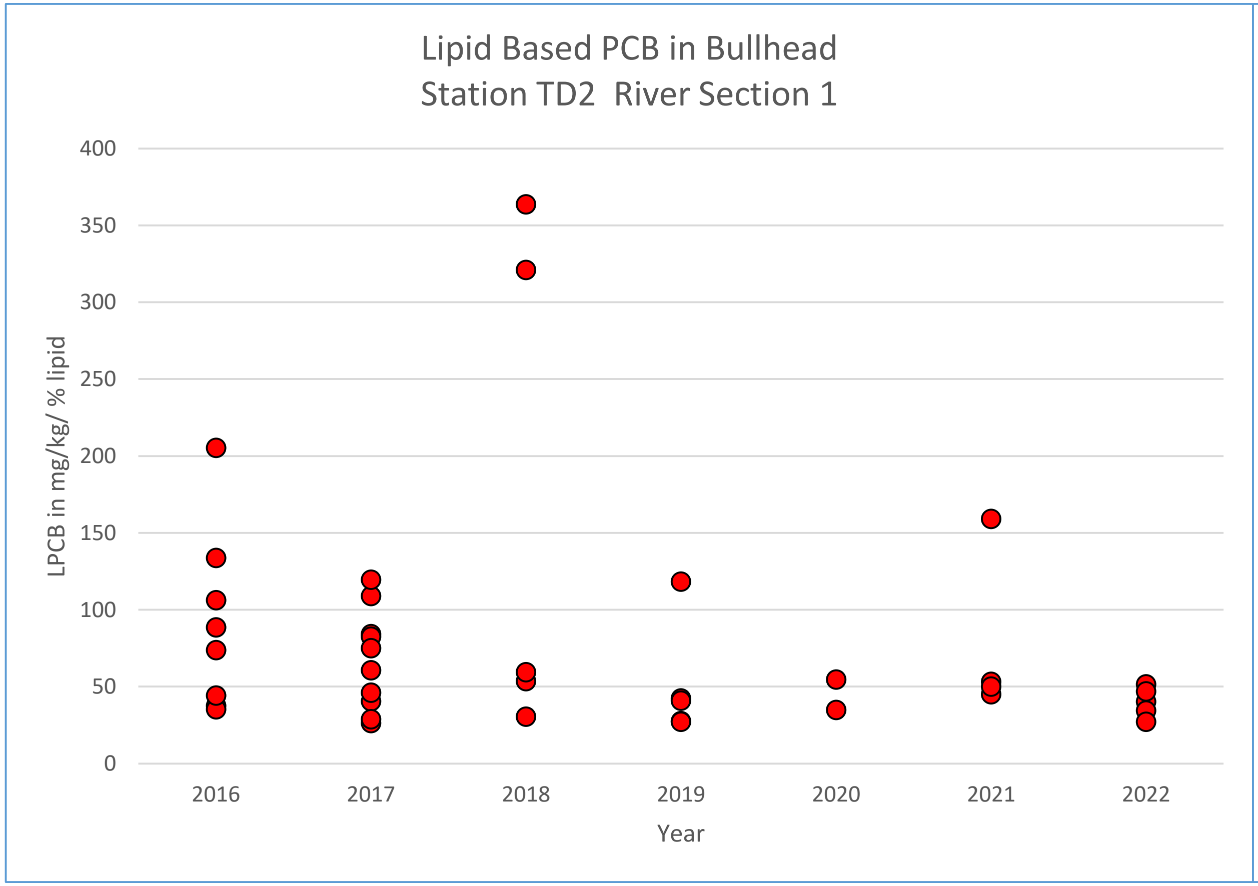
TD2 Bullhead Data

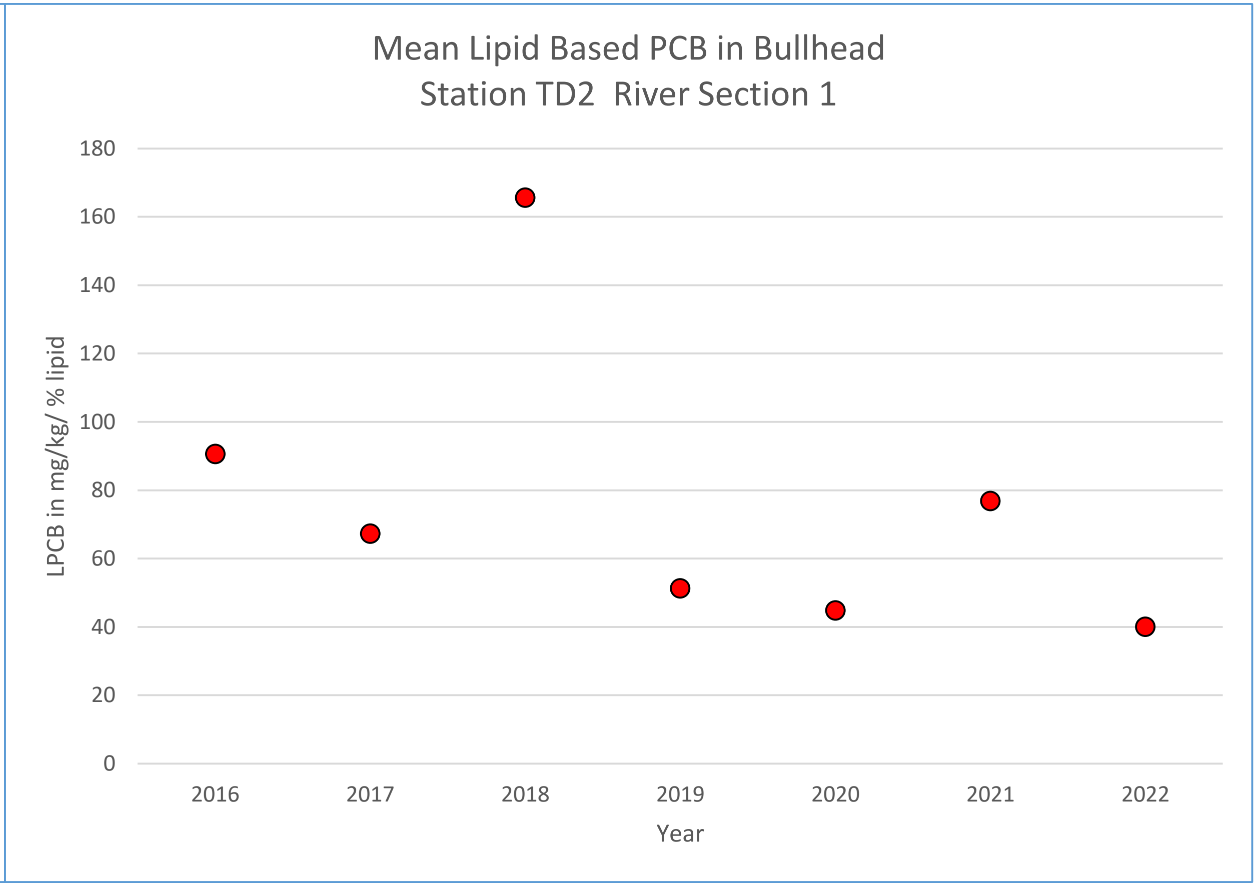
TD2 Bullhead Total PCB



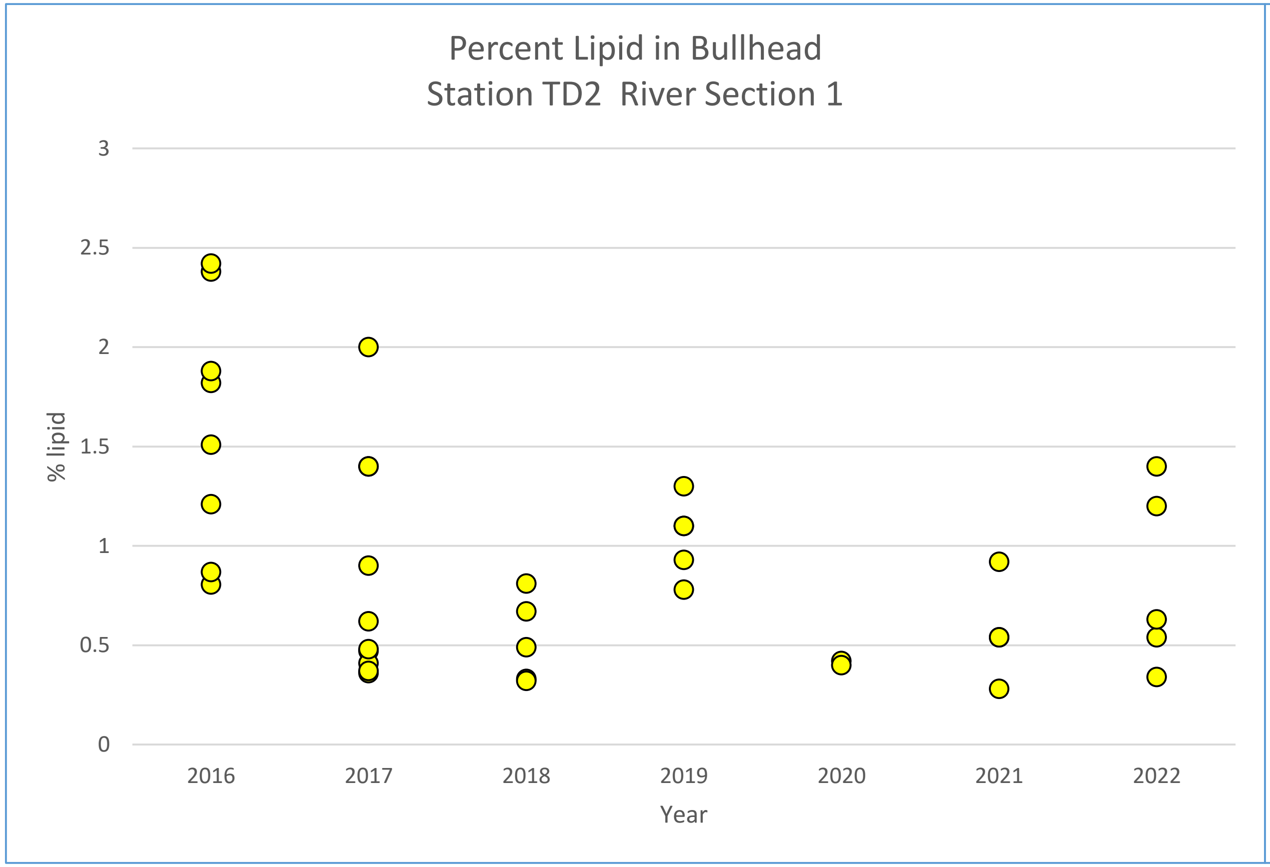


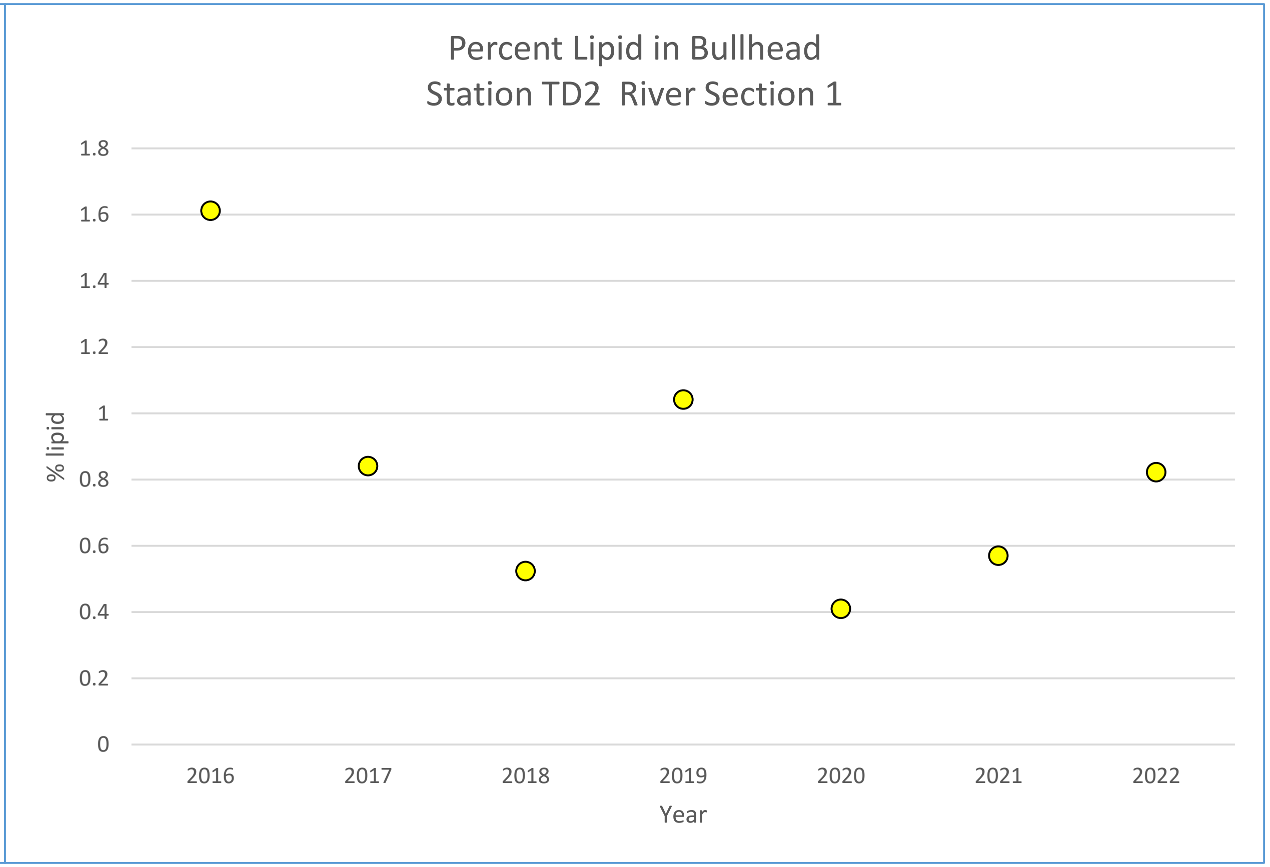
TD2 Bullhead Lipid Based PCB



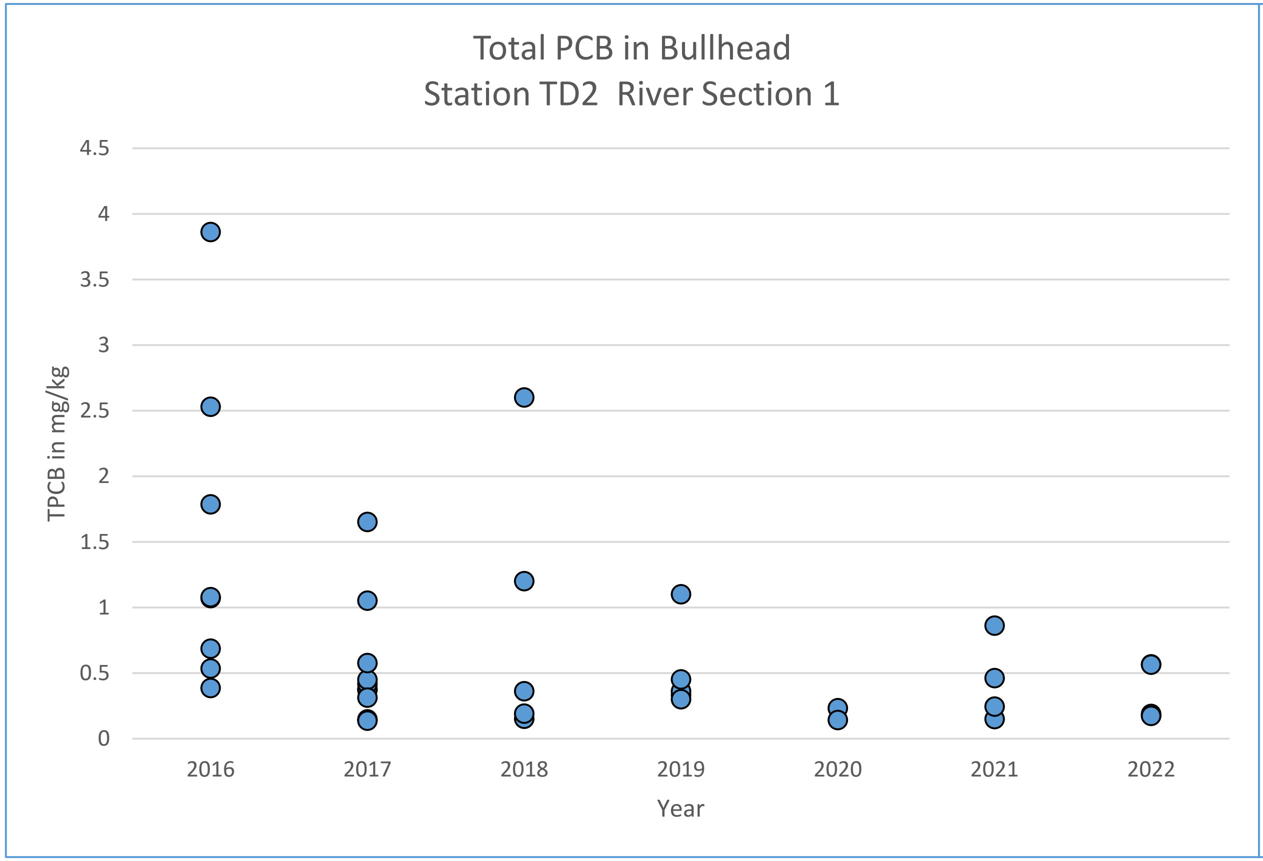


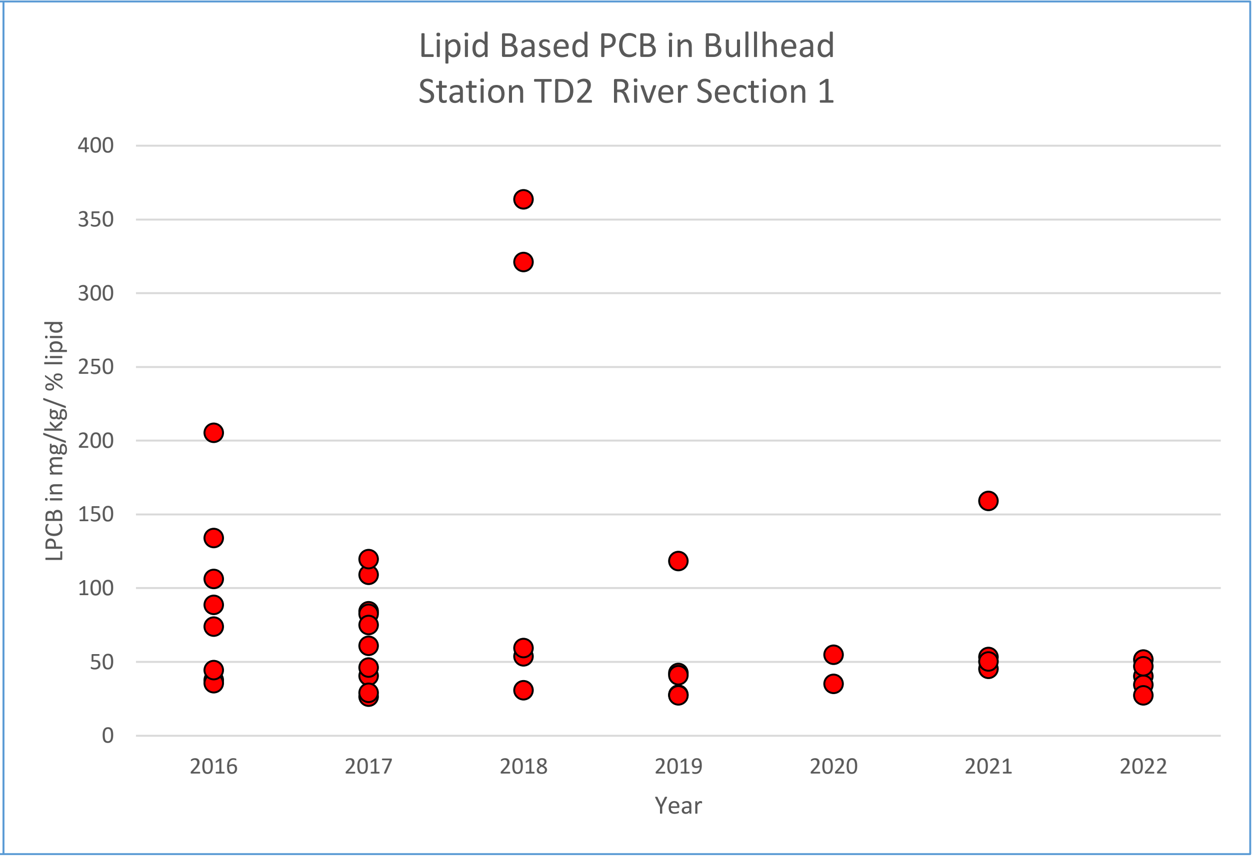
TD2 Bullhead Percent Lipid



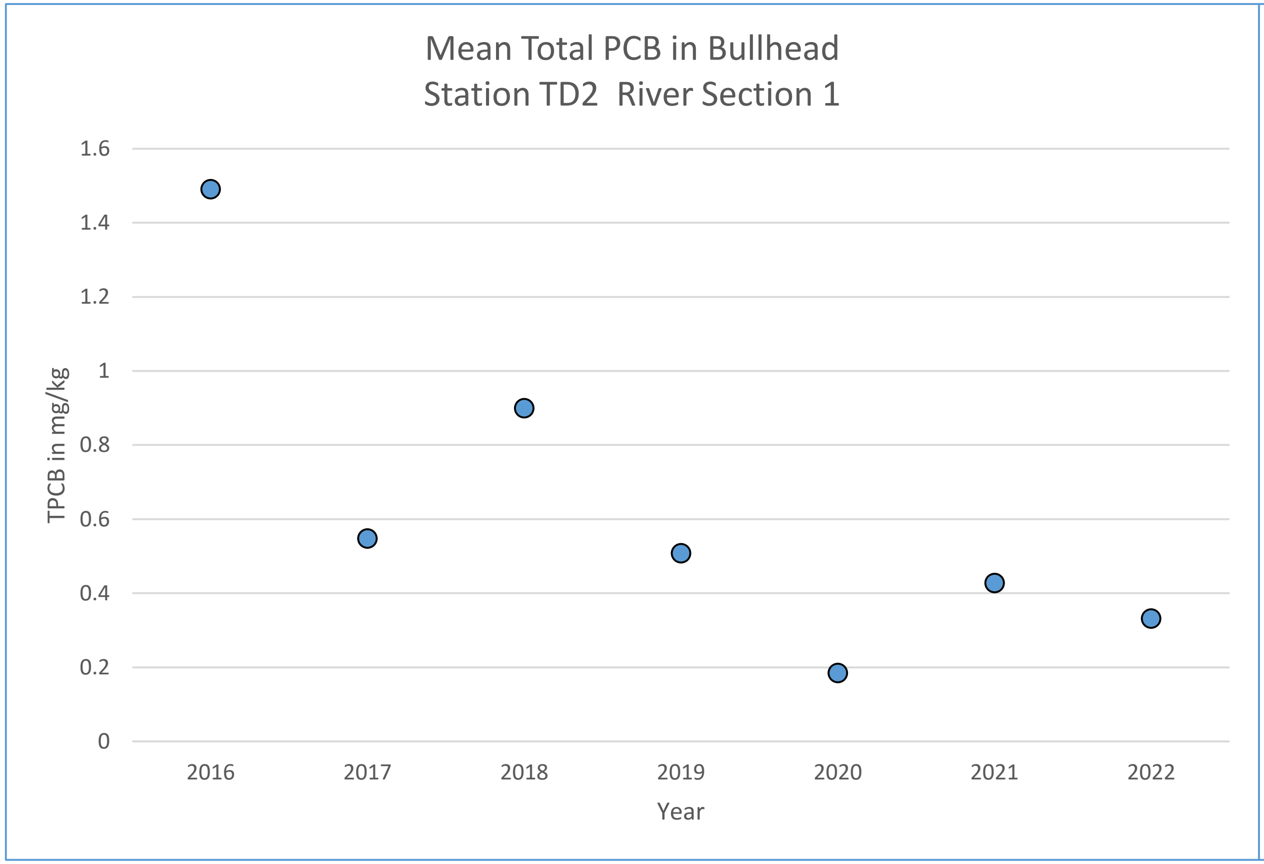


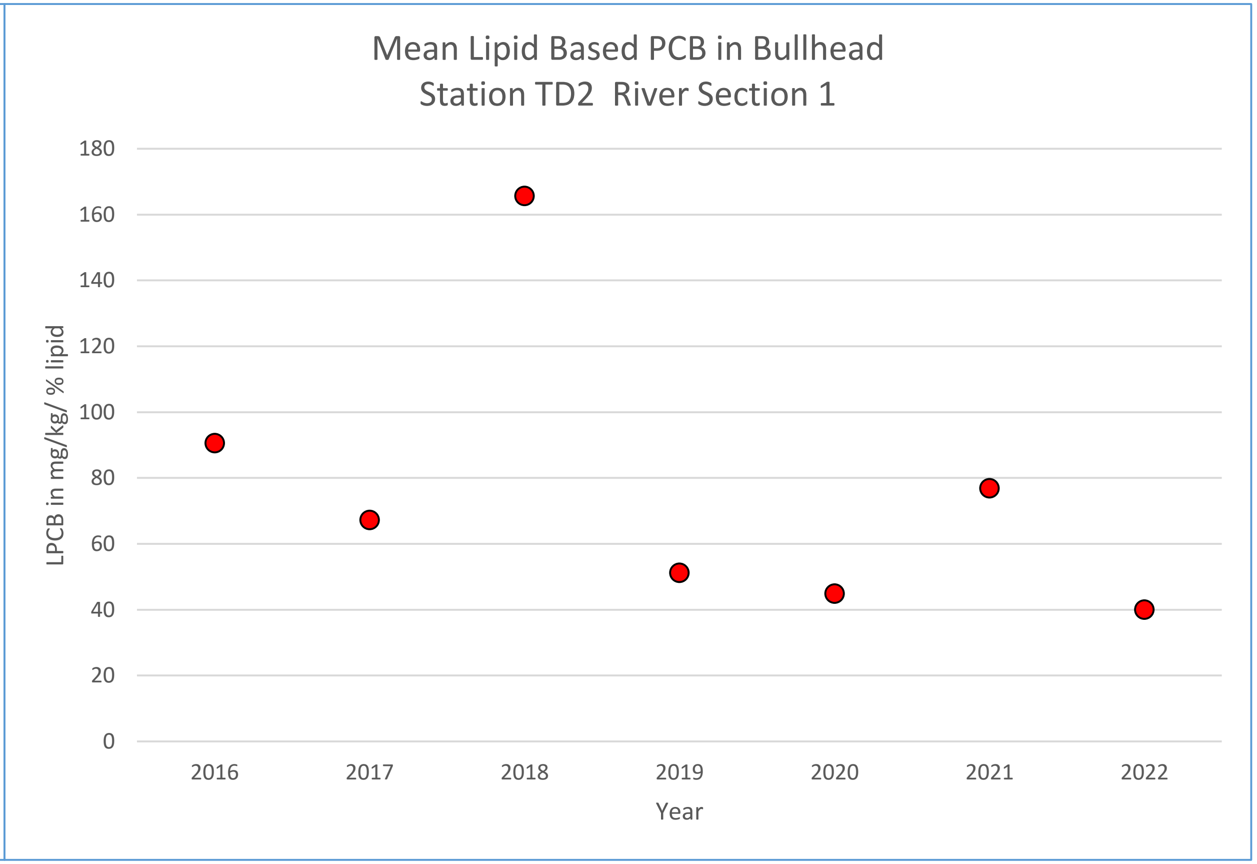
TD2 Bullhead Total PCB and Lipid Based PCB





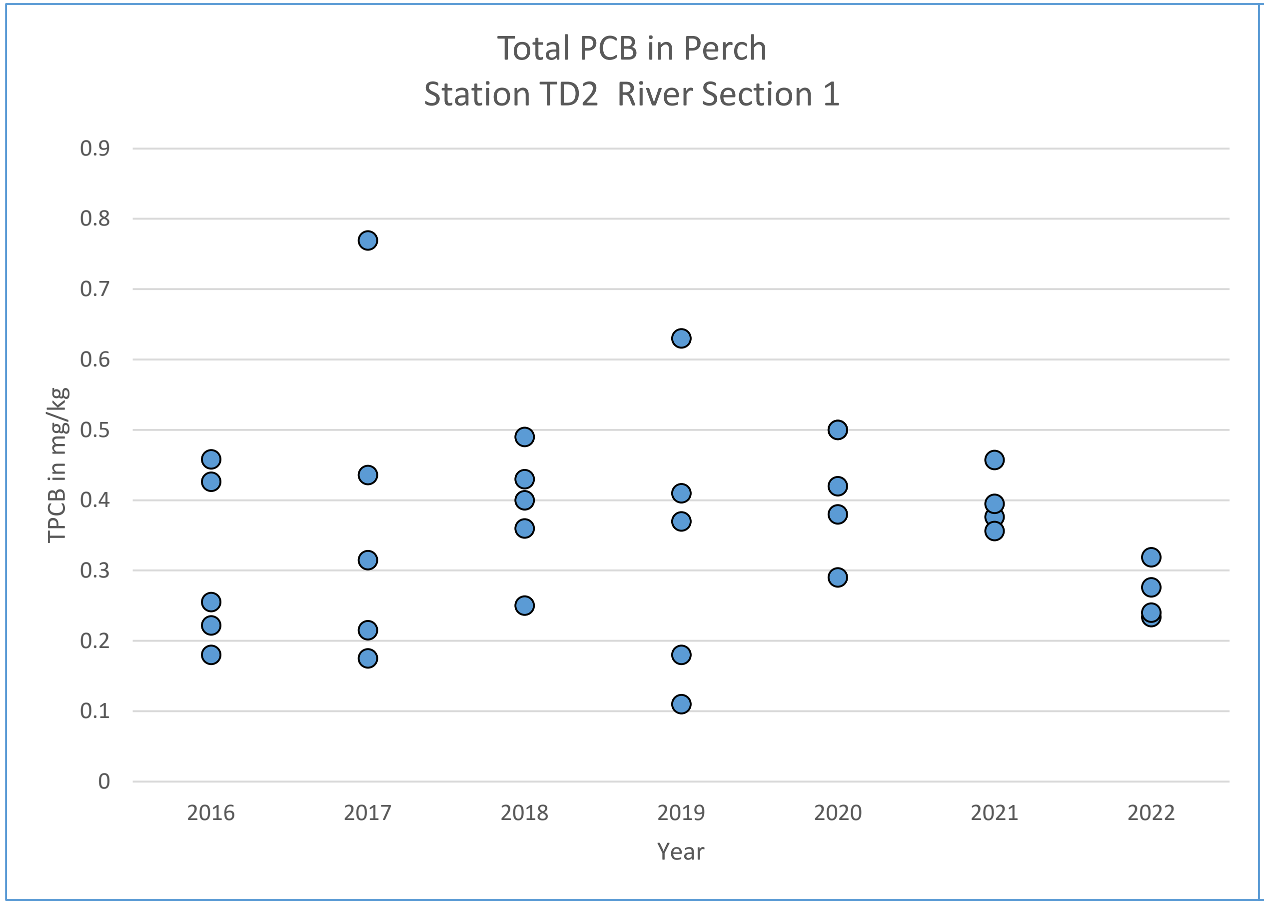
TD2 Bullhead Mean Total PCB and Mean Lipid Based PCB

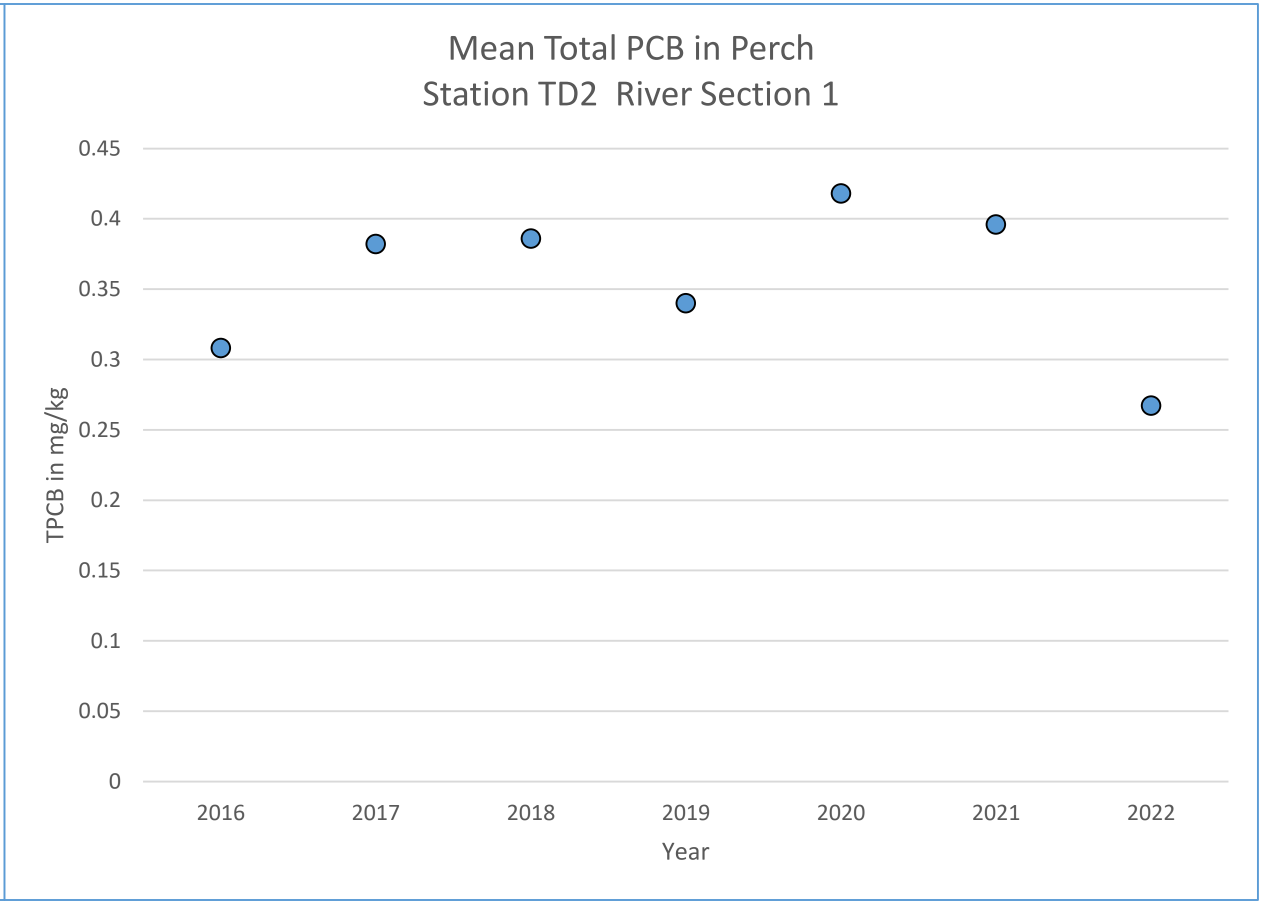




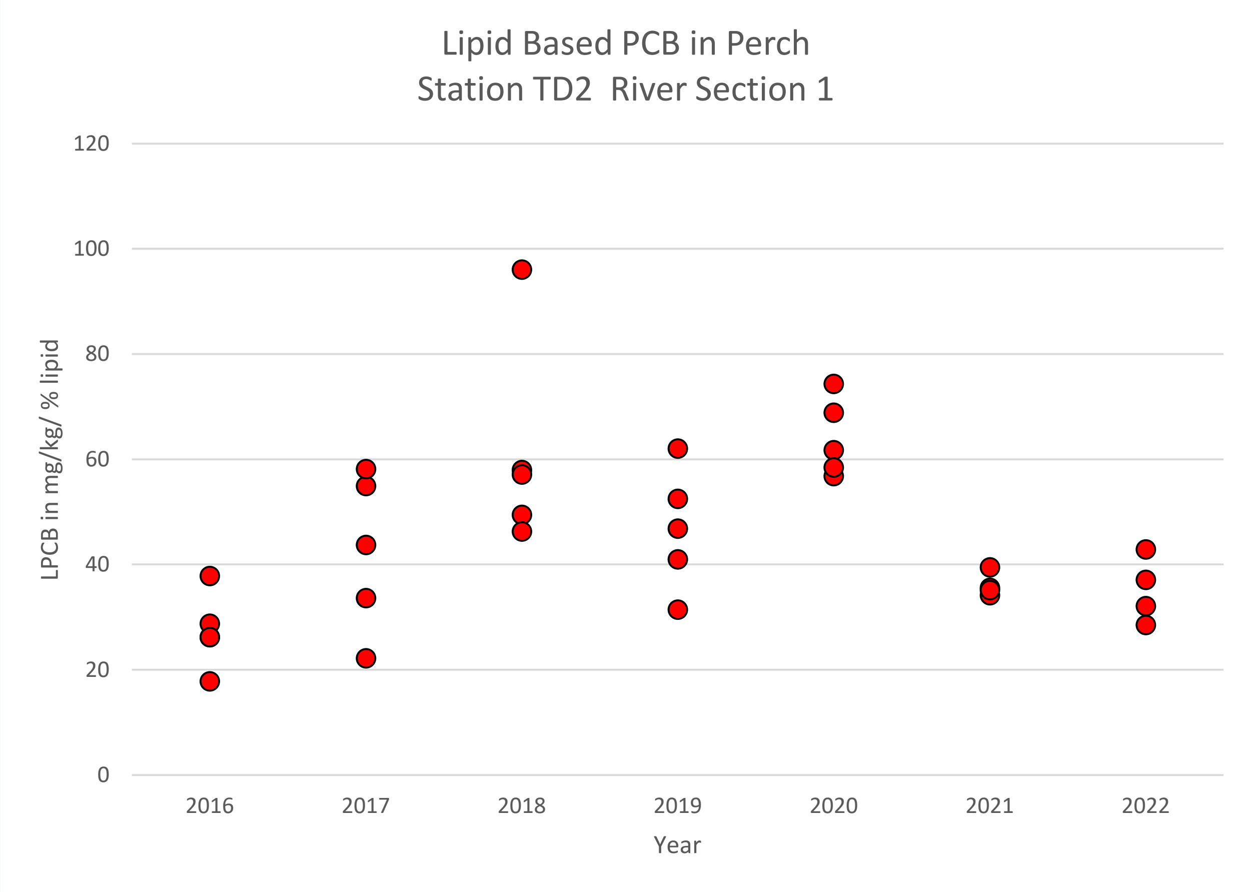
TD2 Perch Data

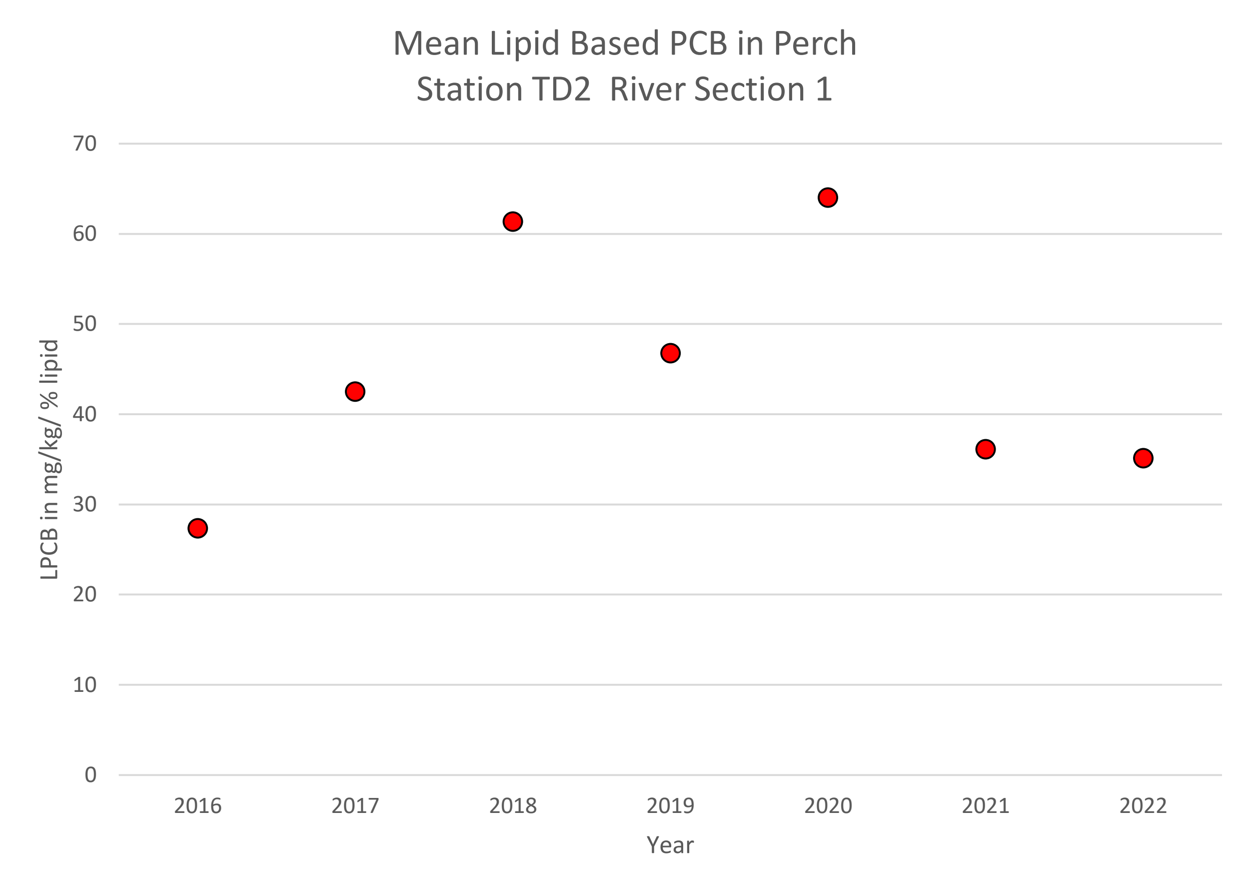
TD2 Perch Total PCB



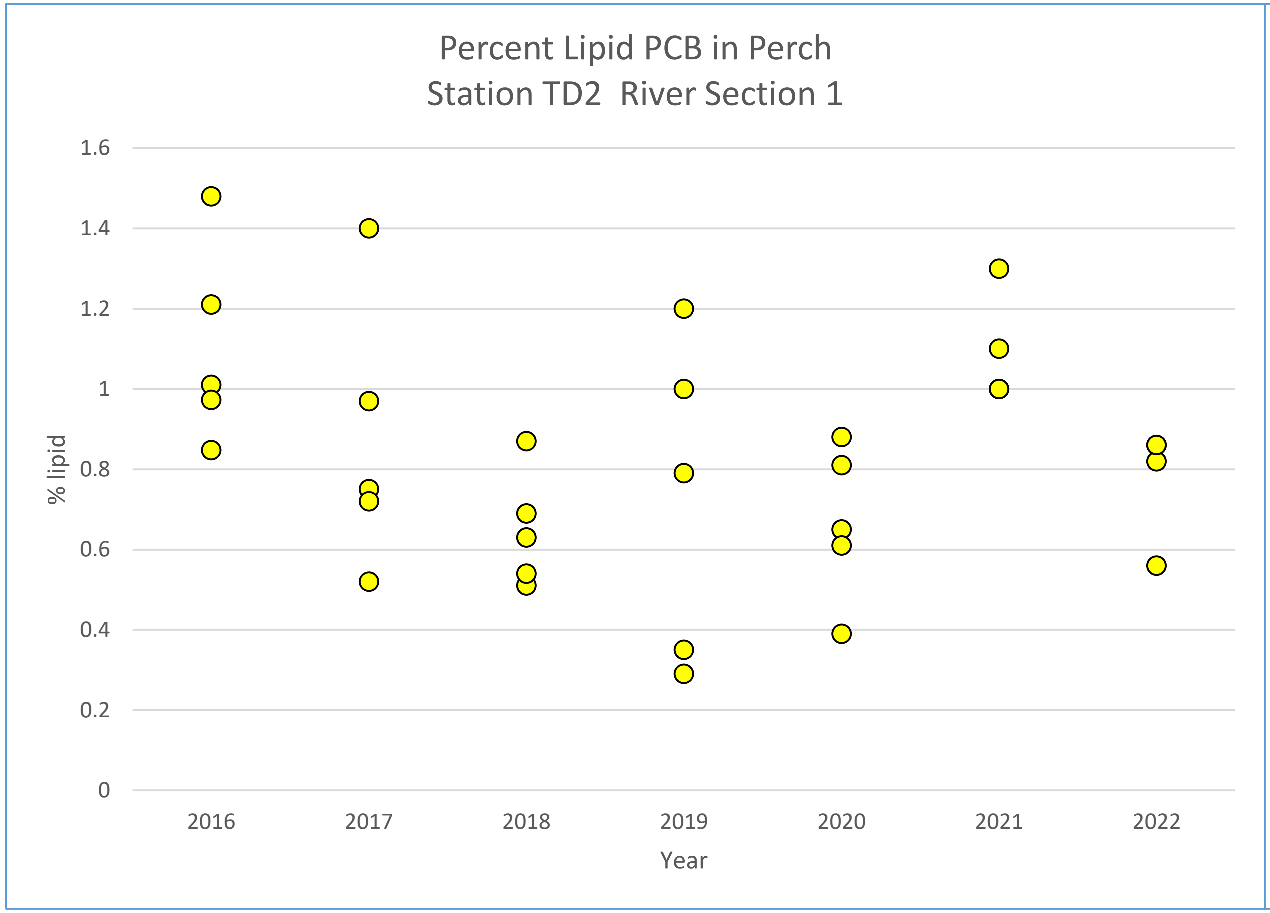


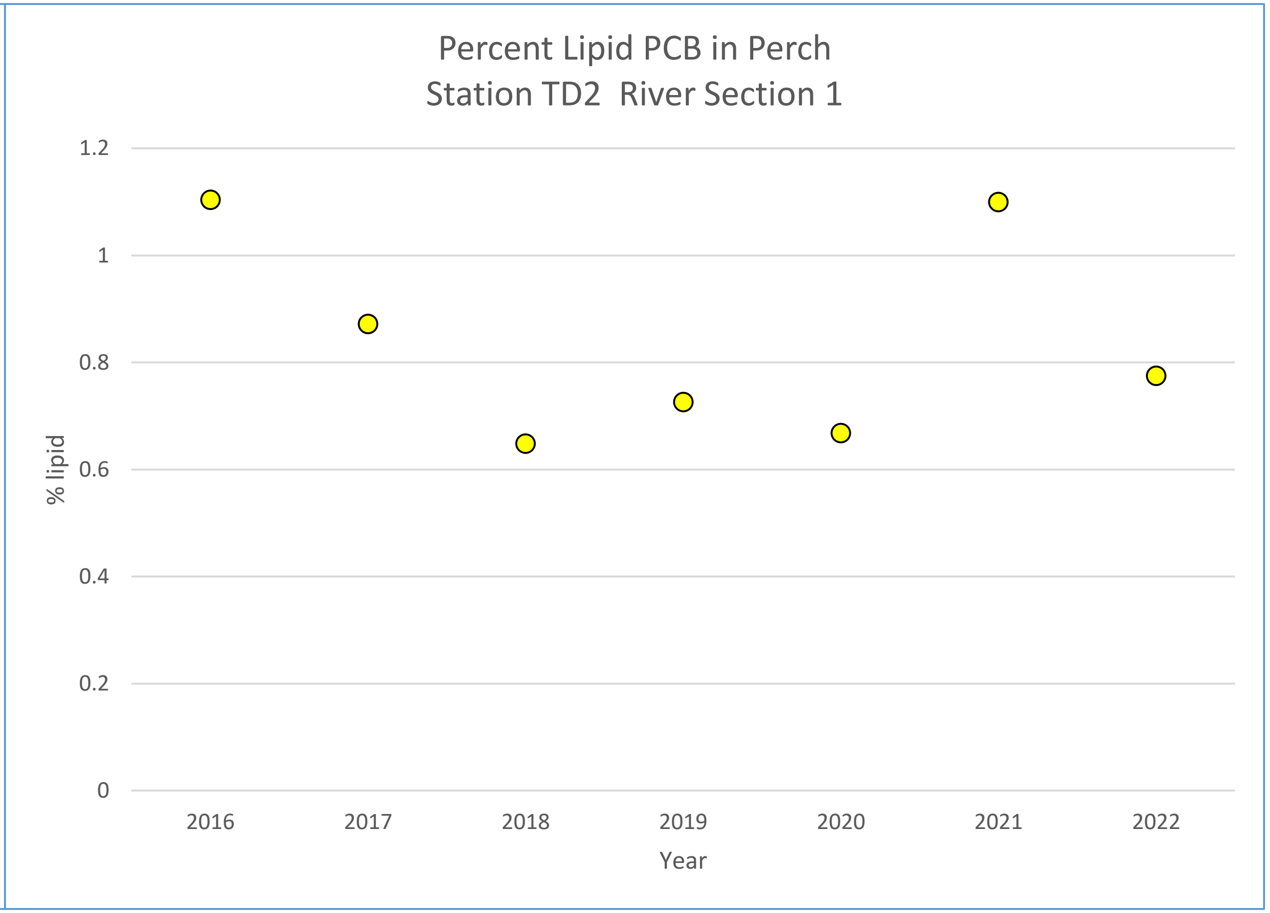
TD2 Perch Lipid Based PCB



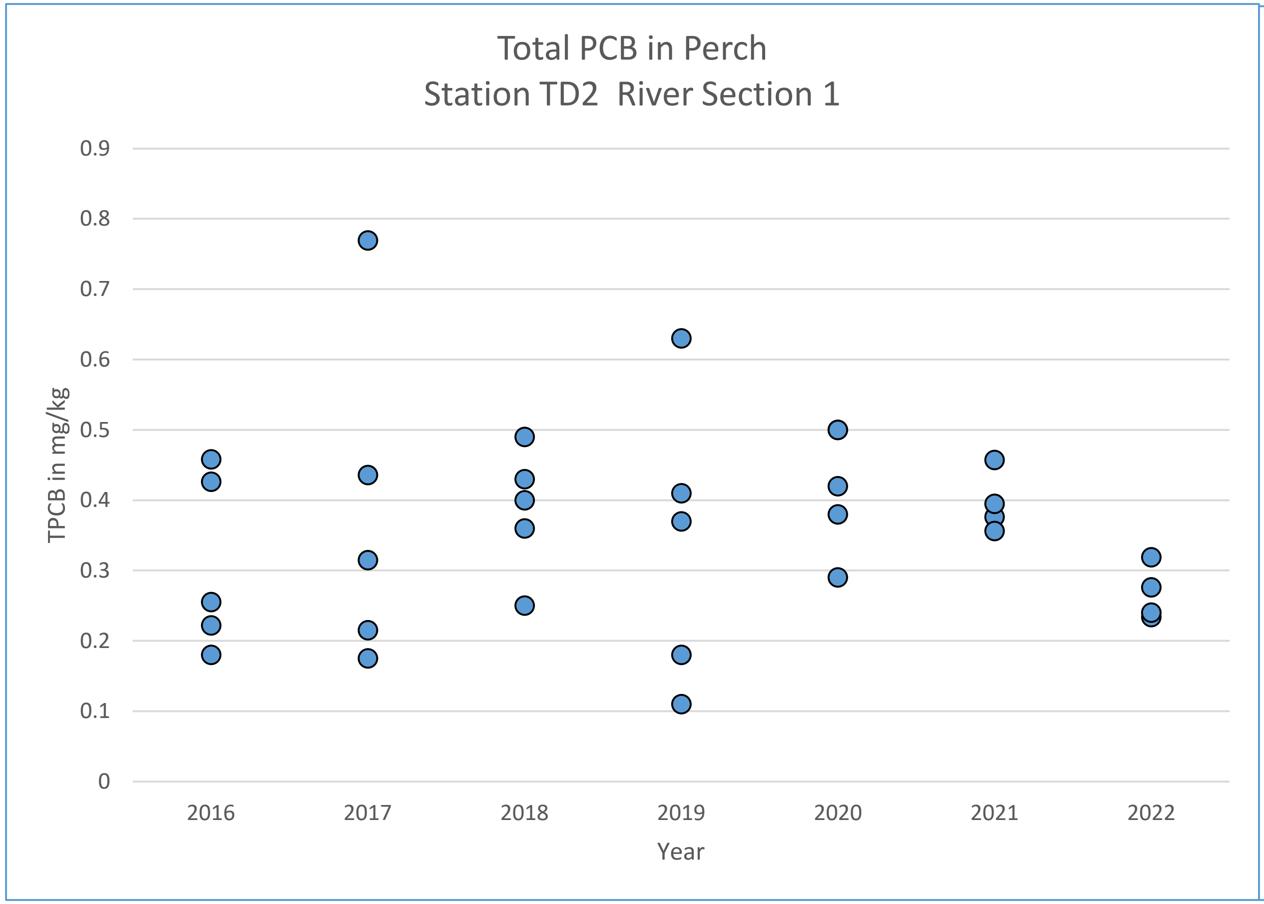


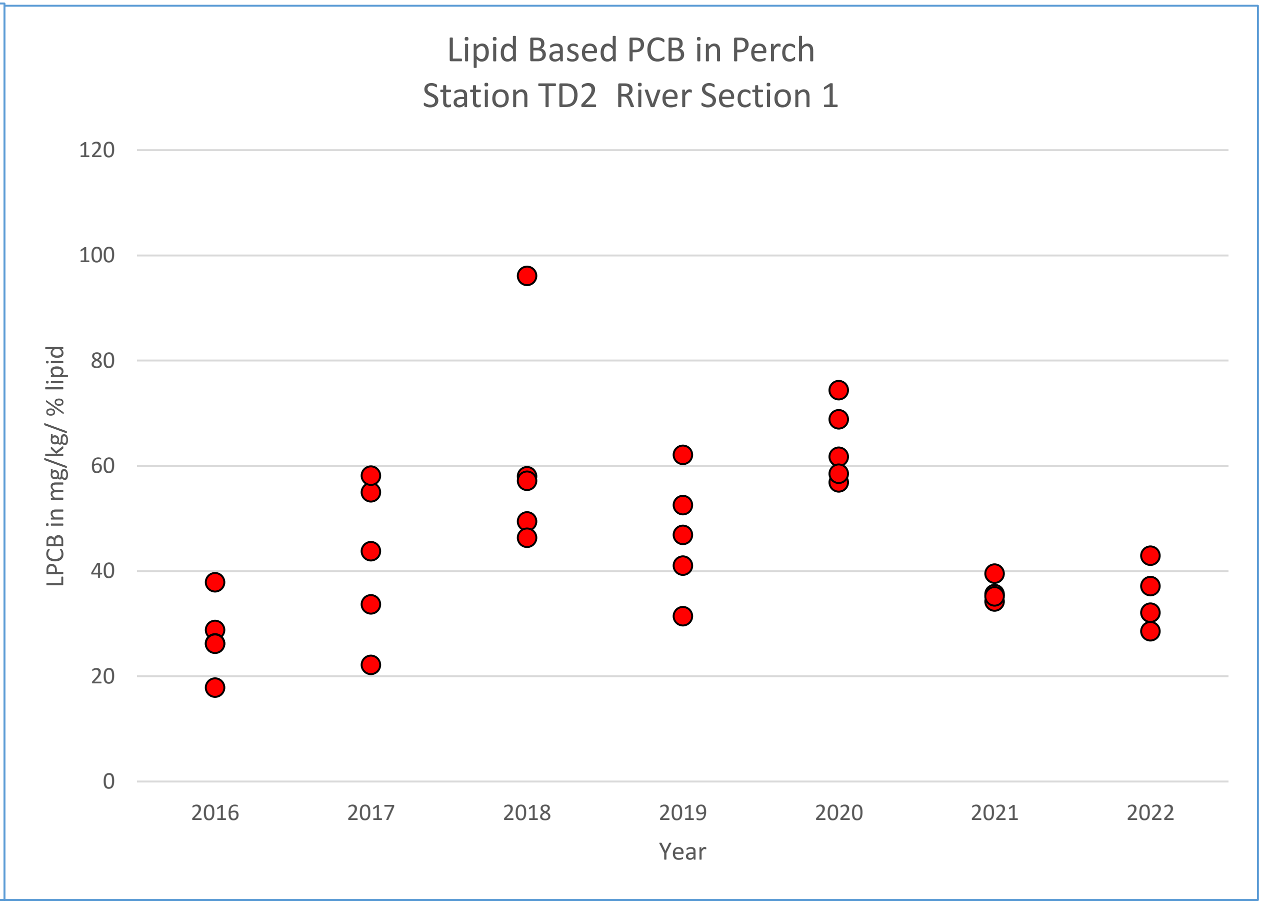
TD2 Perch Percent Lipid



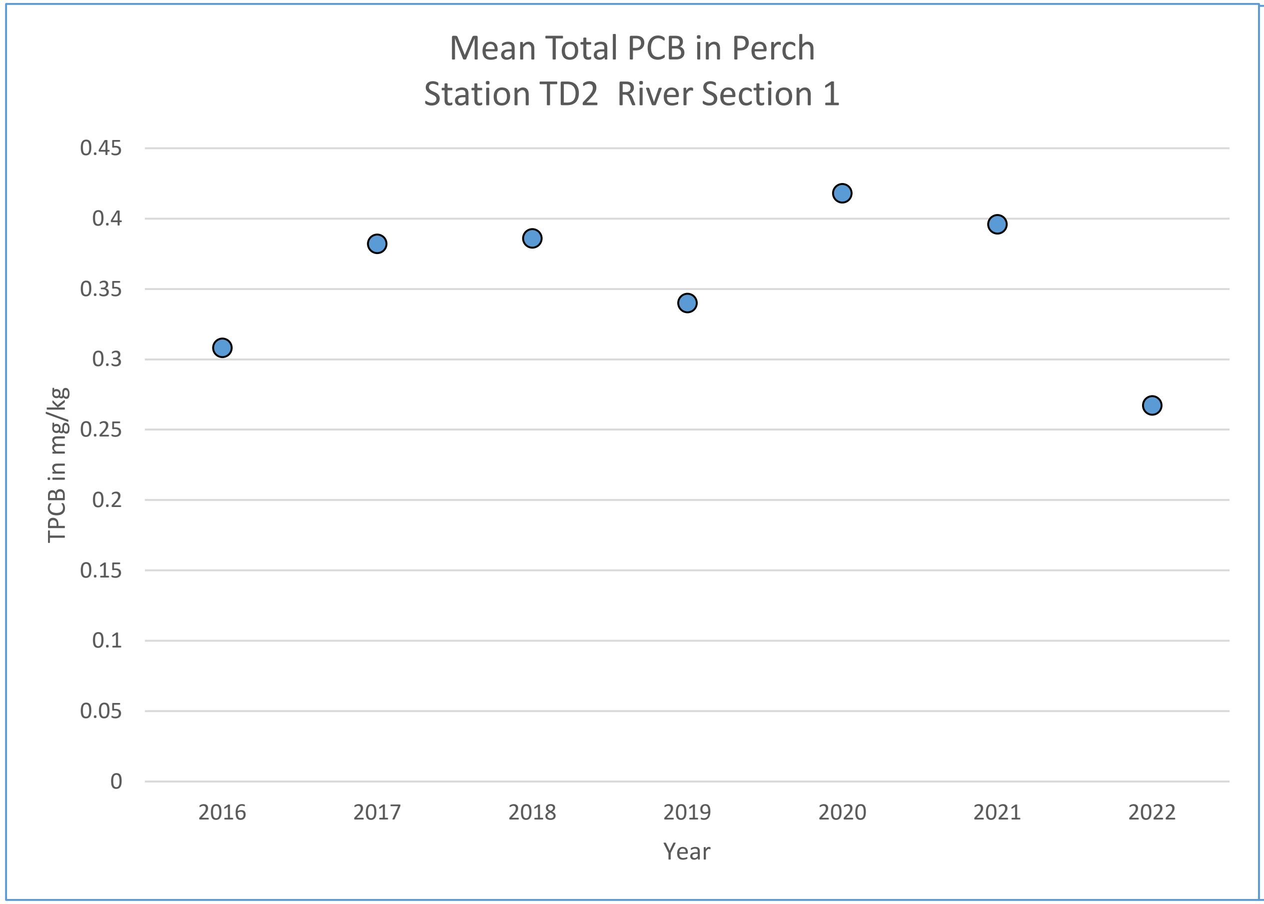


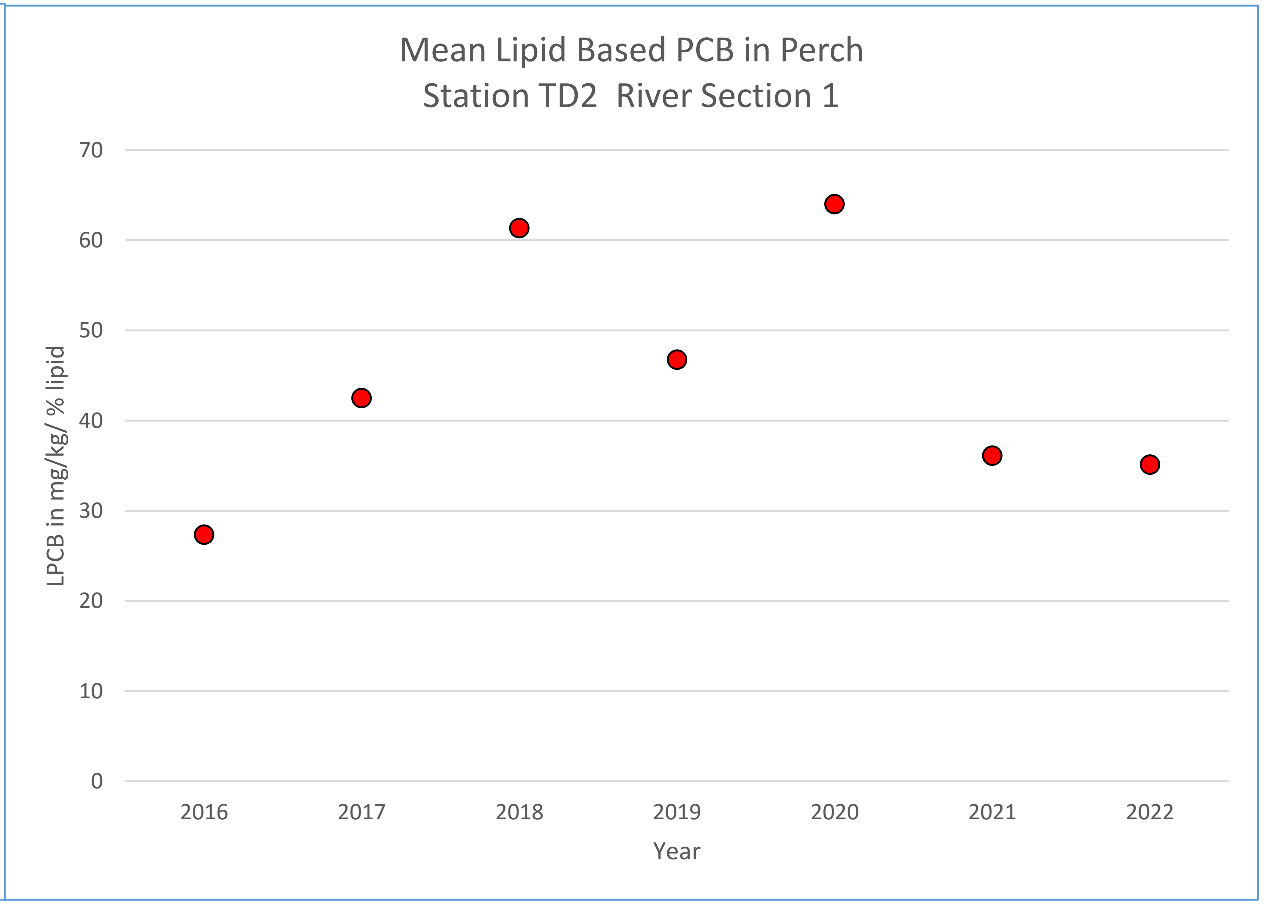
TD2 Perch Total PCB and Lipid Based PCB





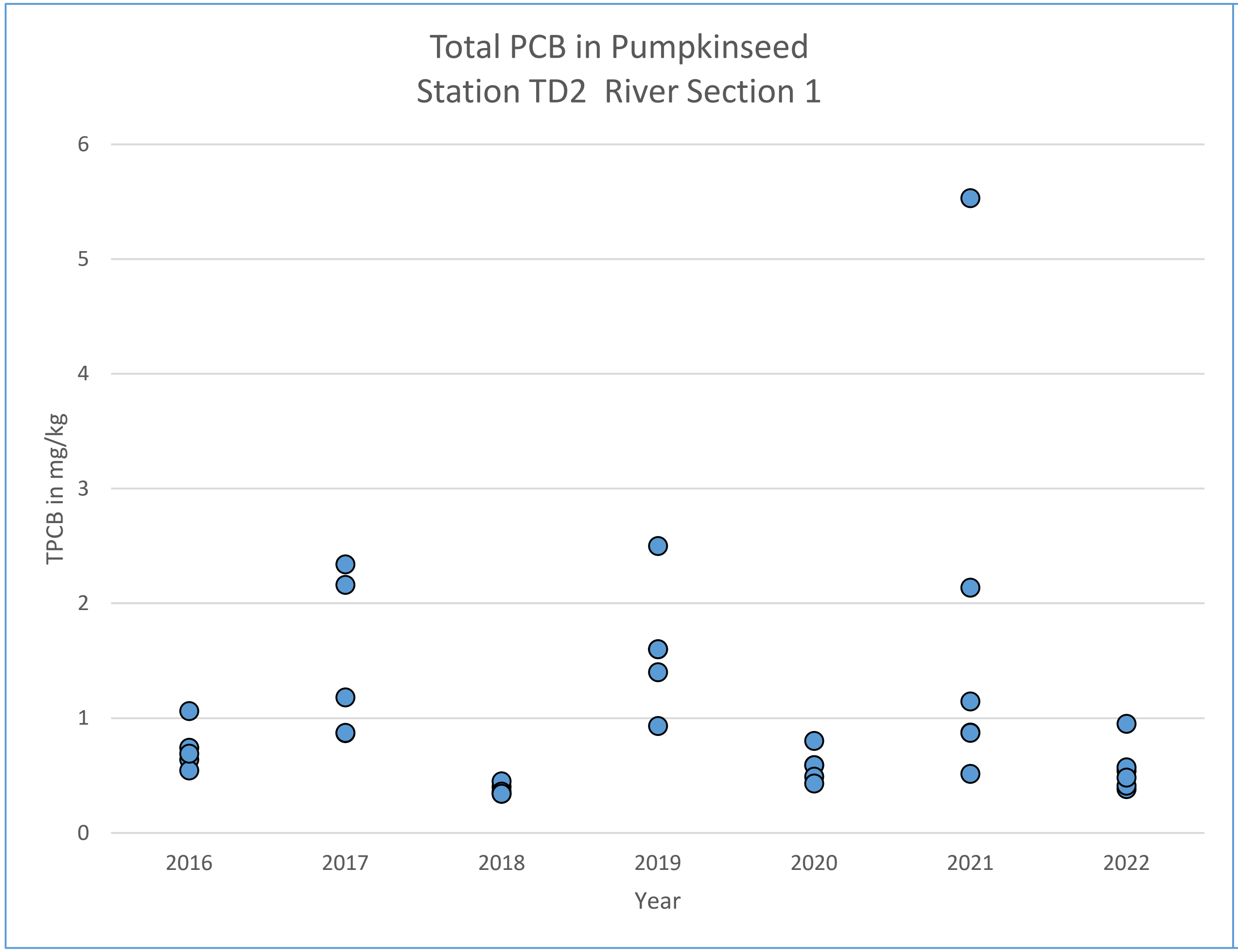
TD2 Perch Mean Total PCB and Mean Lipid Based PCB

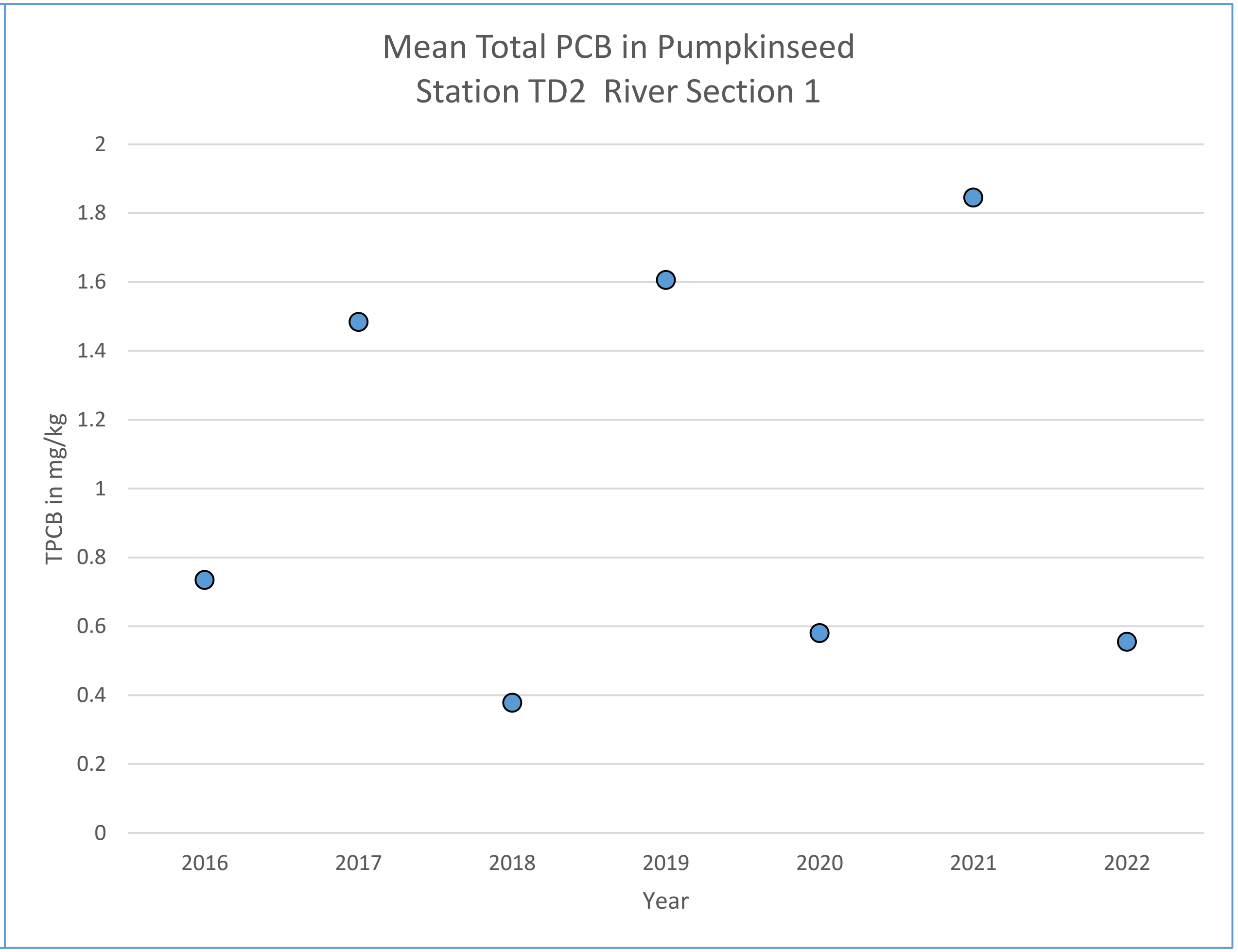




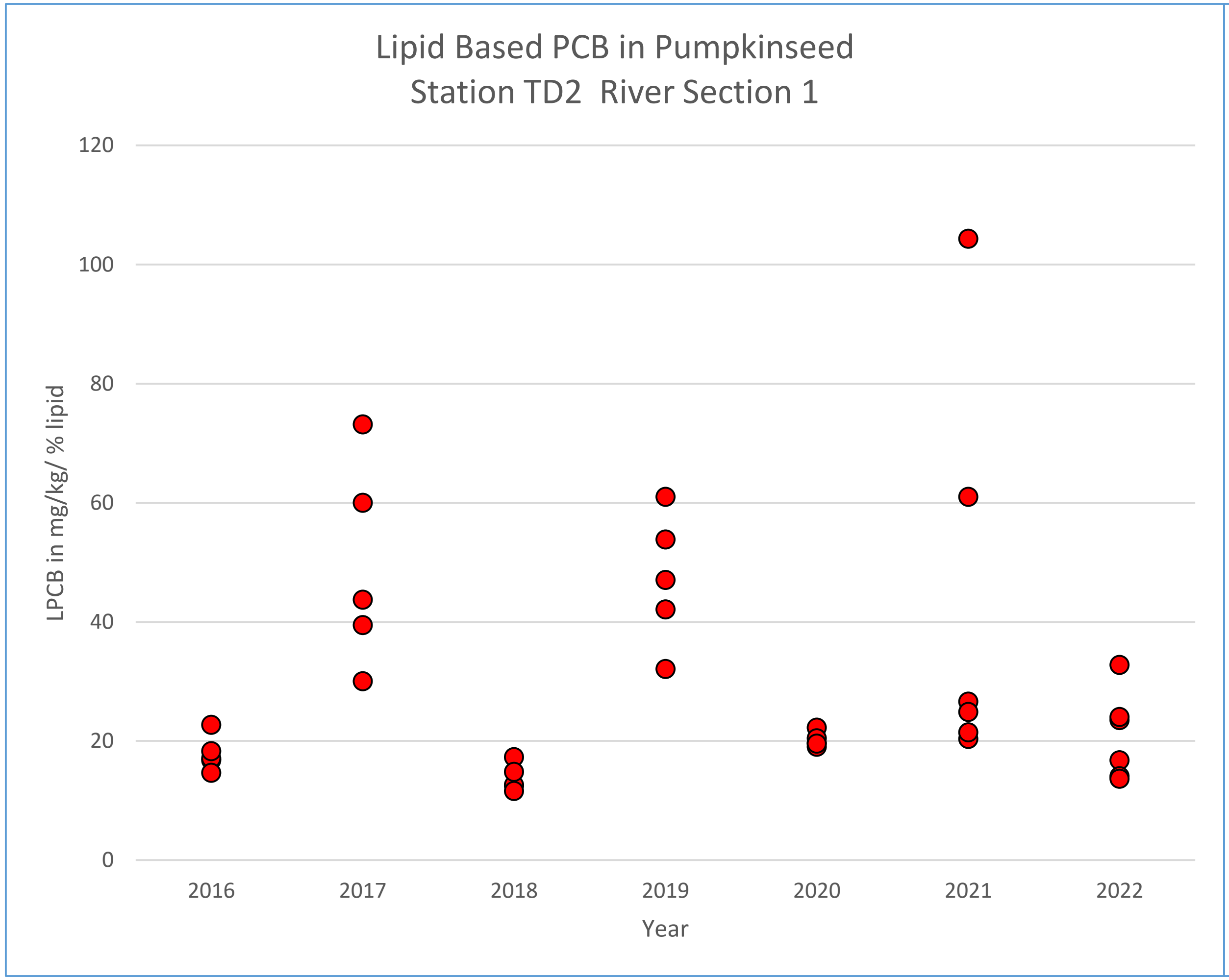
TD2 Pumpkinseed Data

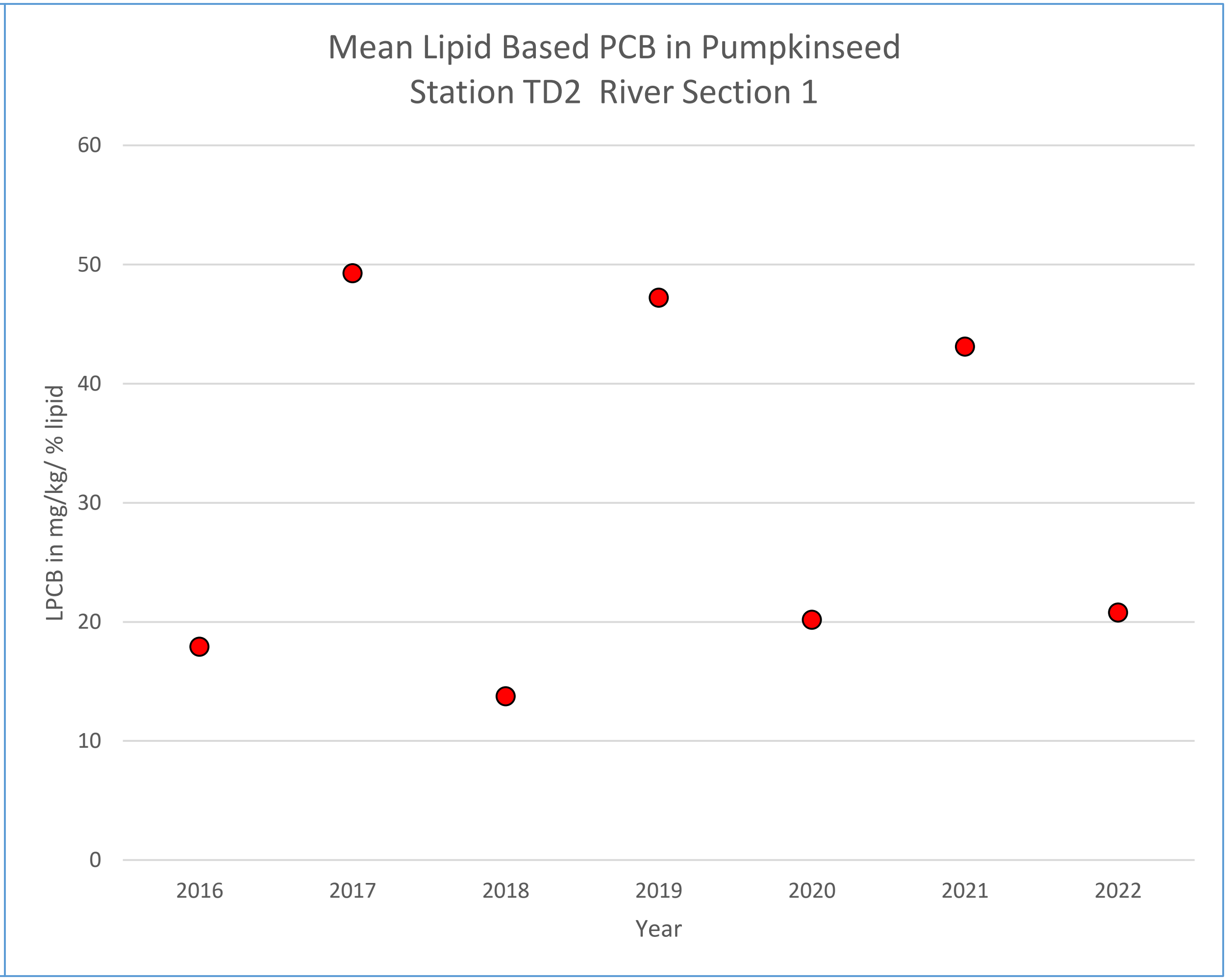
TD2 Pumpkinseed Total PCB



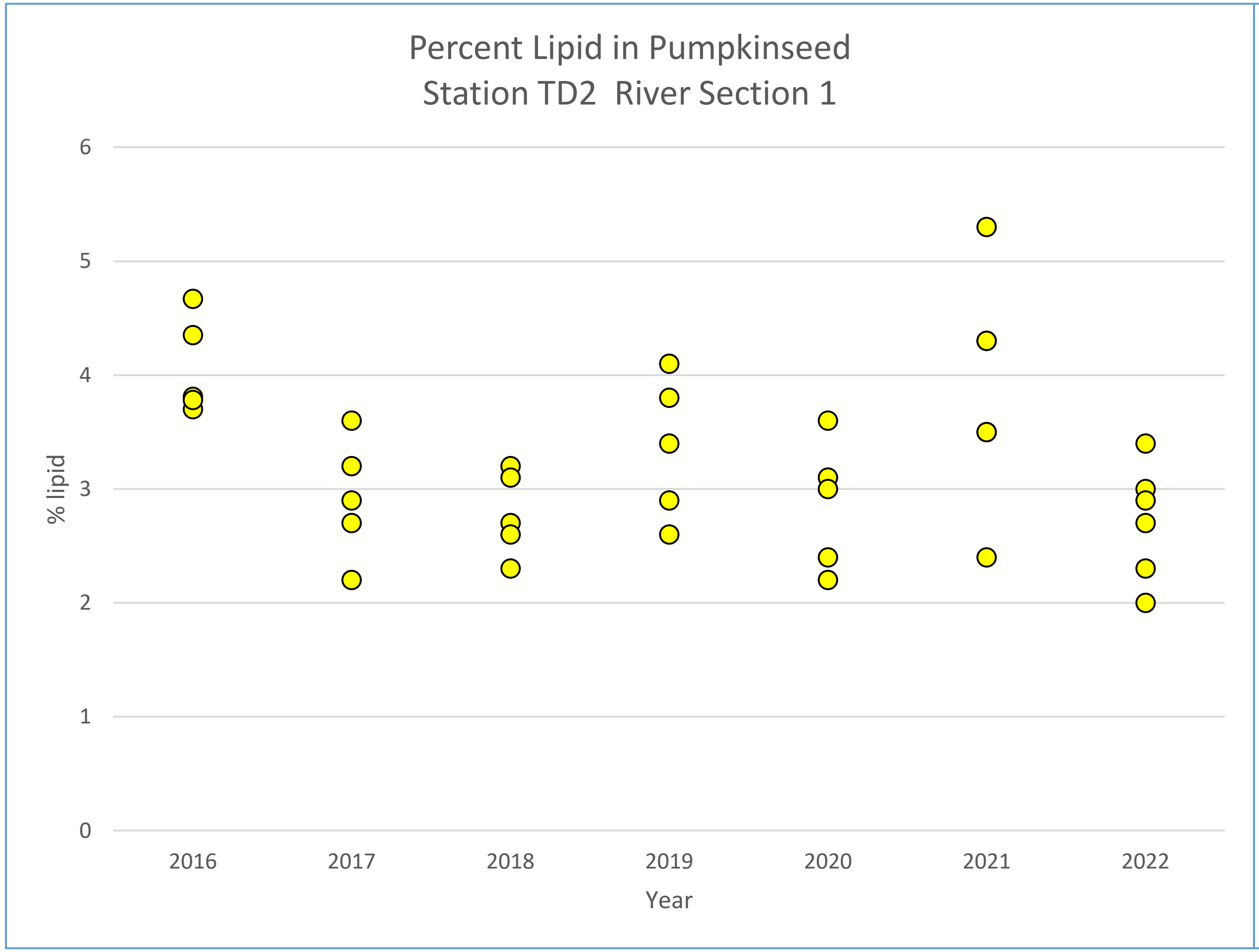


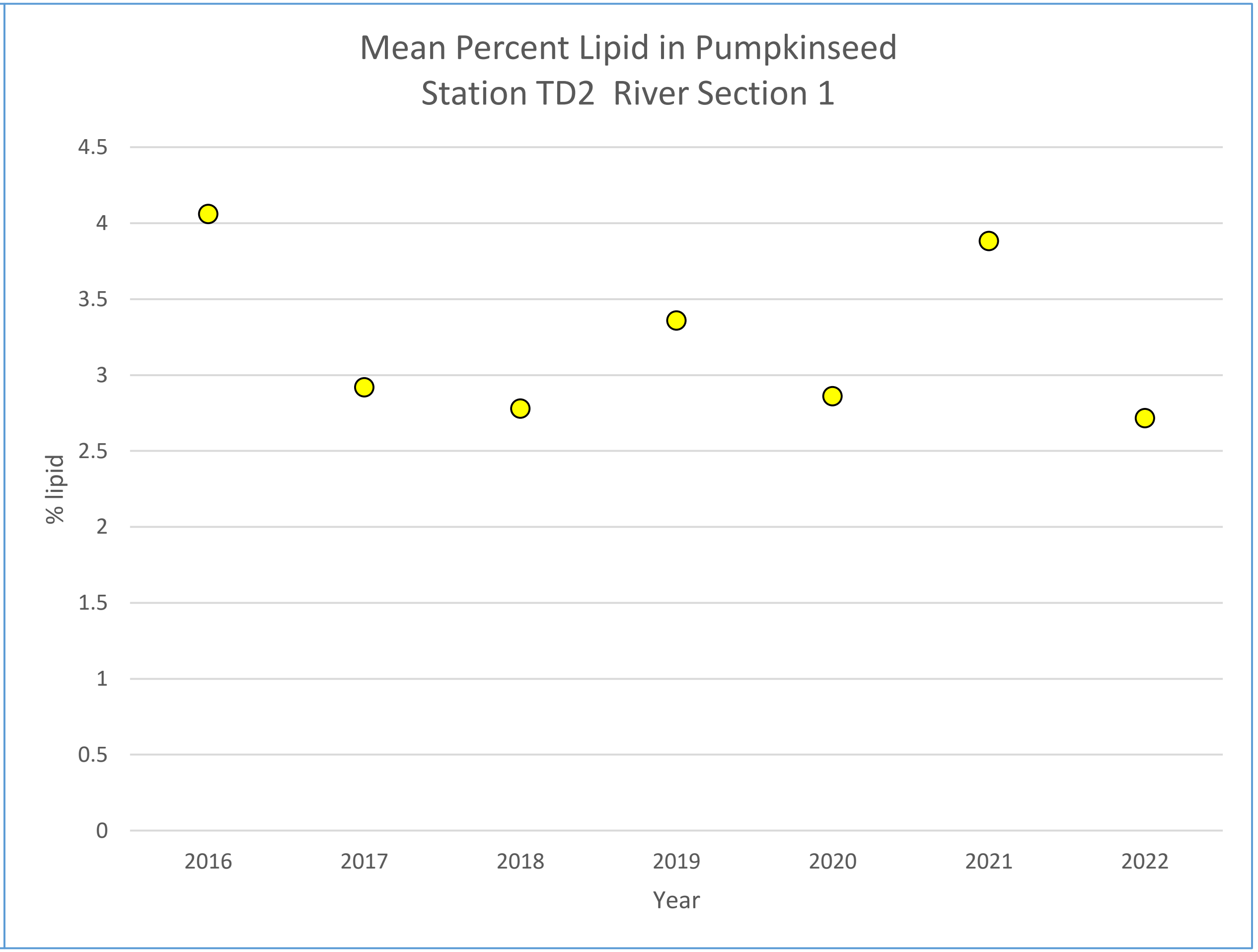
TD2 Pumpkinseed Lipid Based PCB



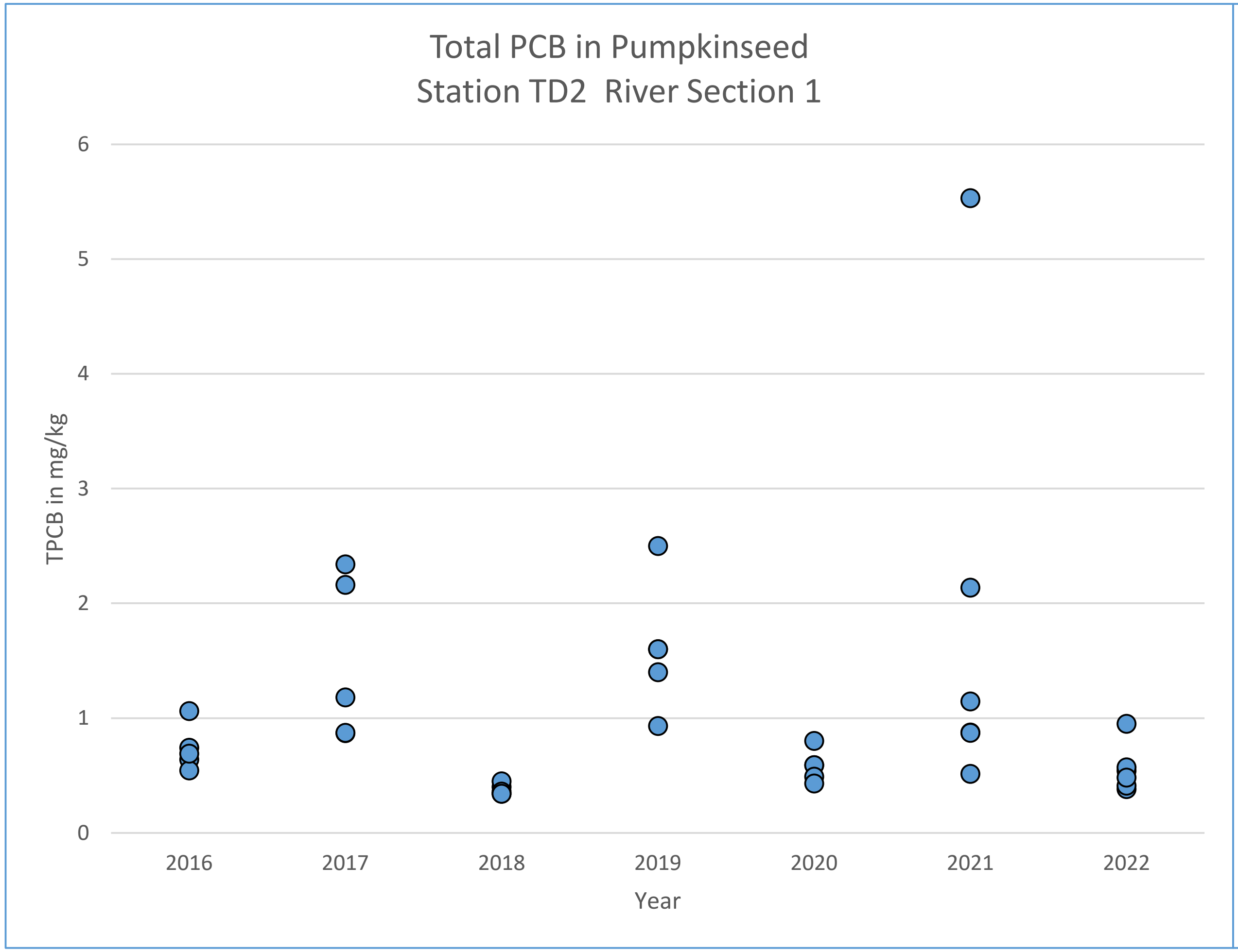


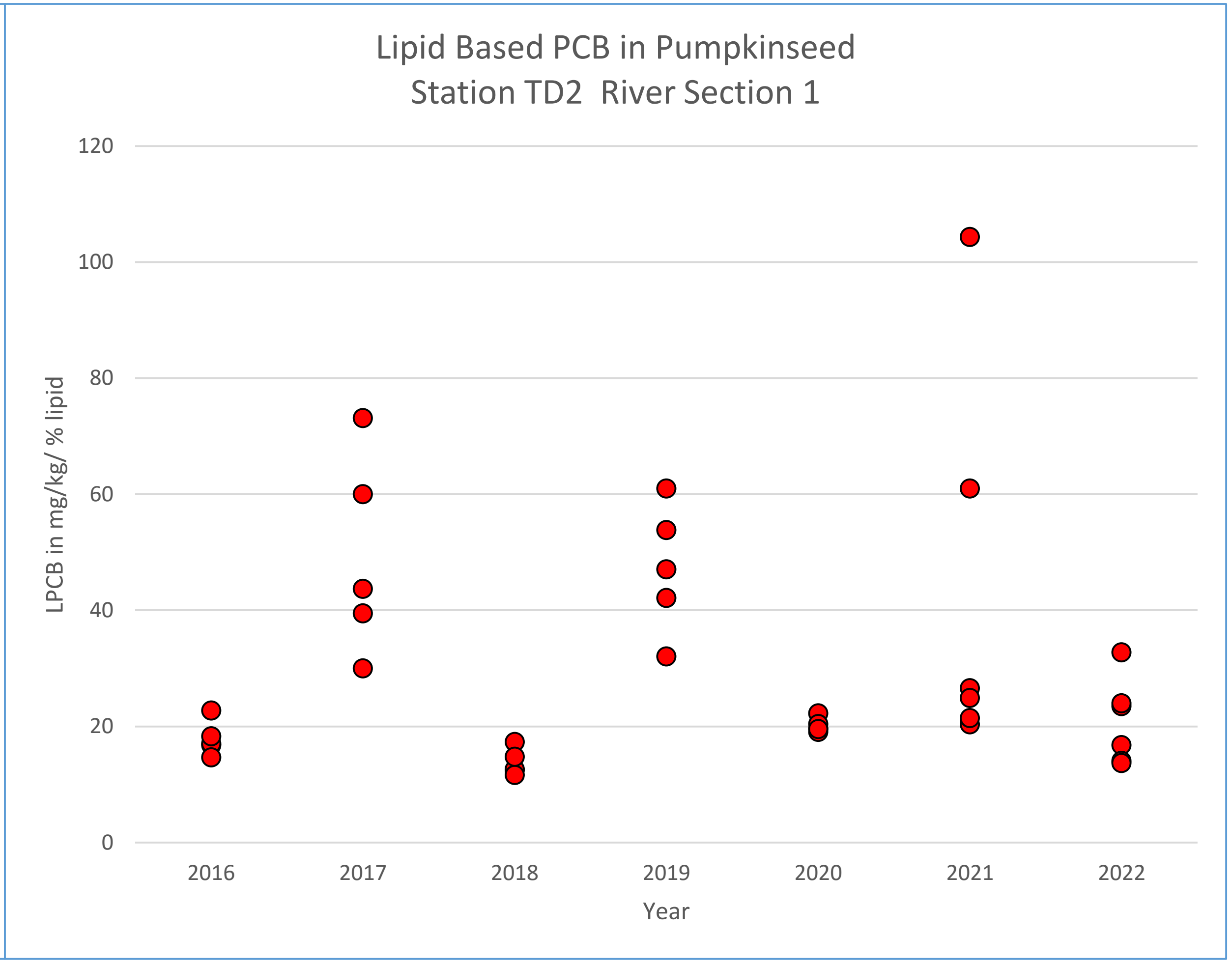
TD2 Pumpkinseed Percent Lipid



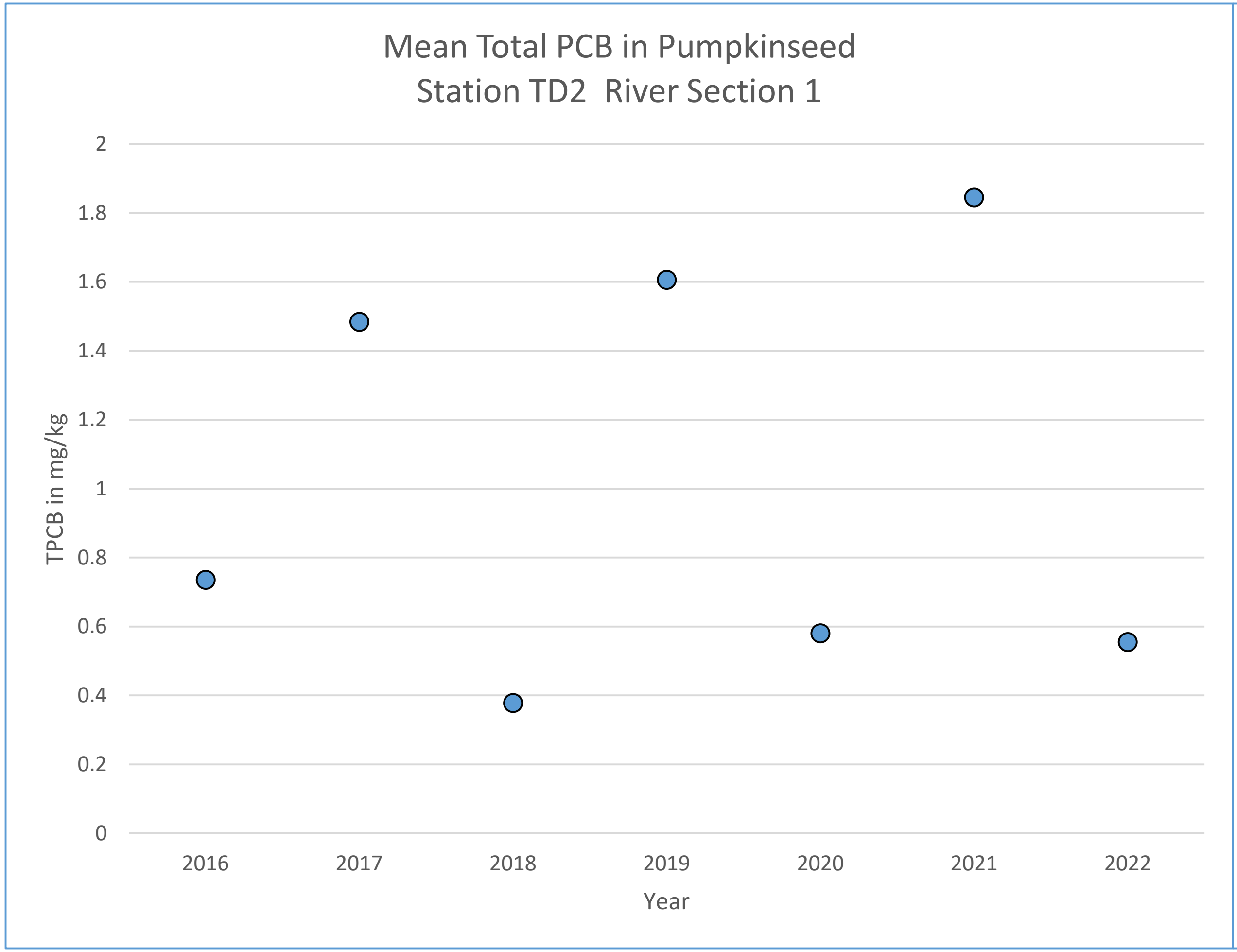


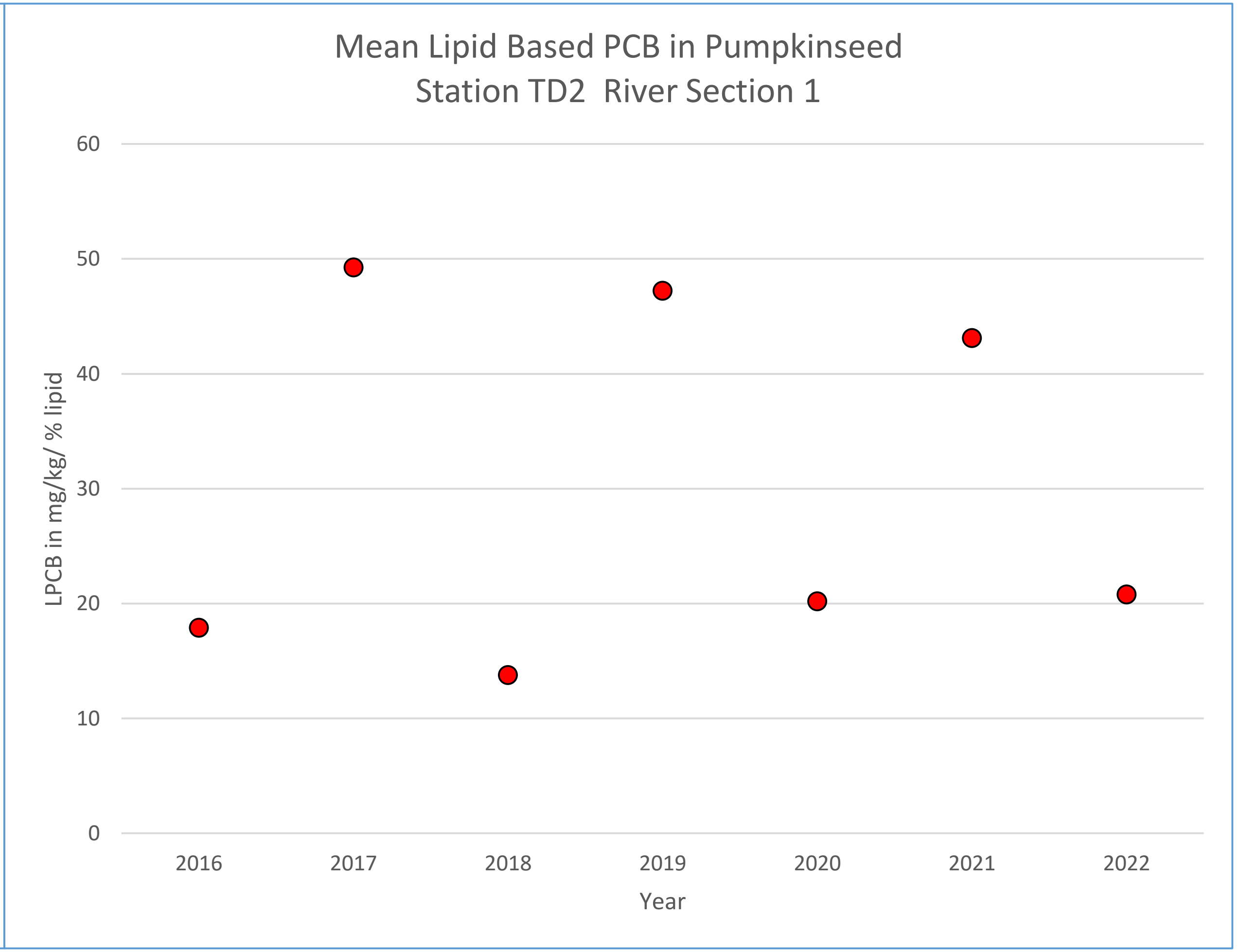
TD2 Pumpkinseed Total PCB and Lipid Based PCB





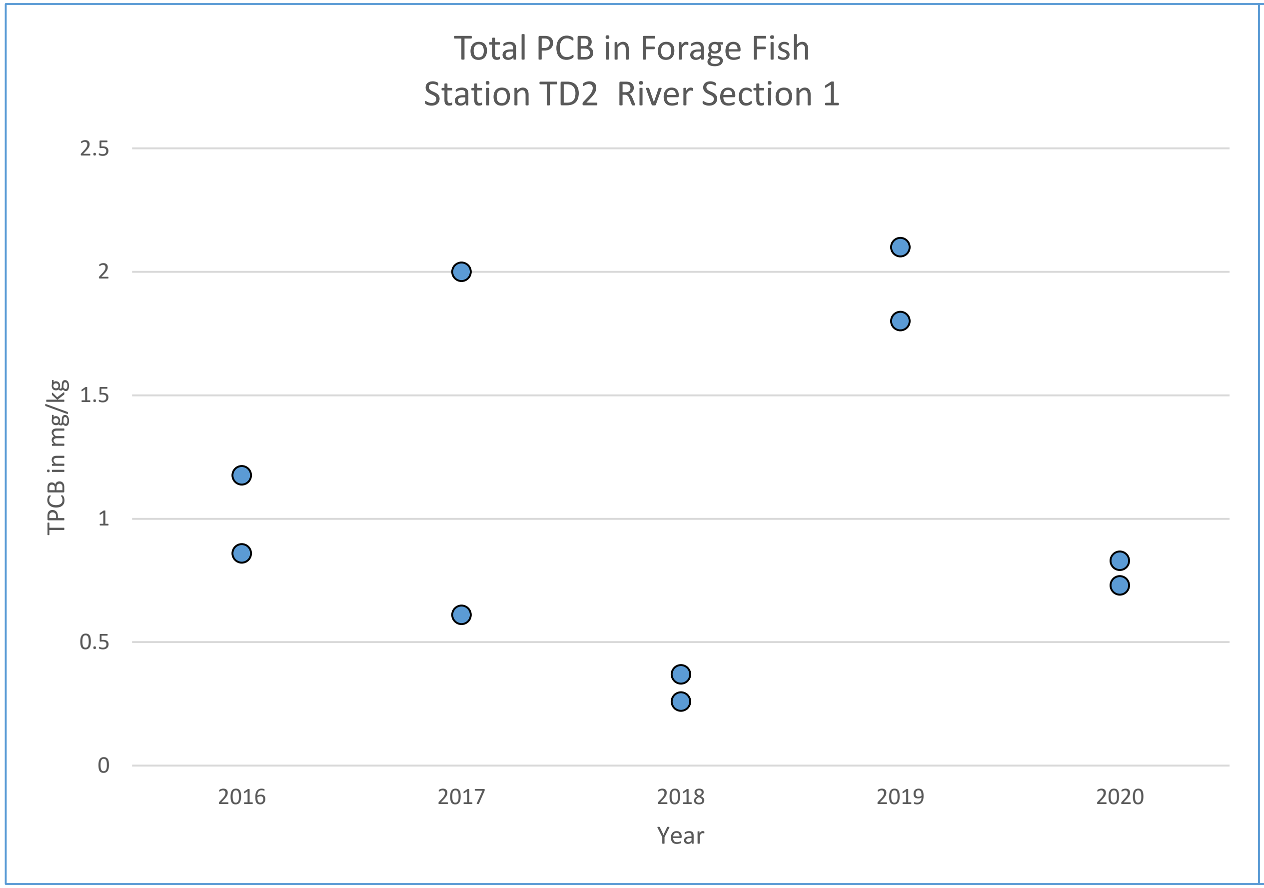
TD2 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

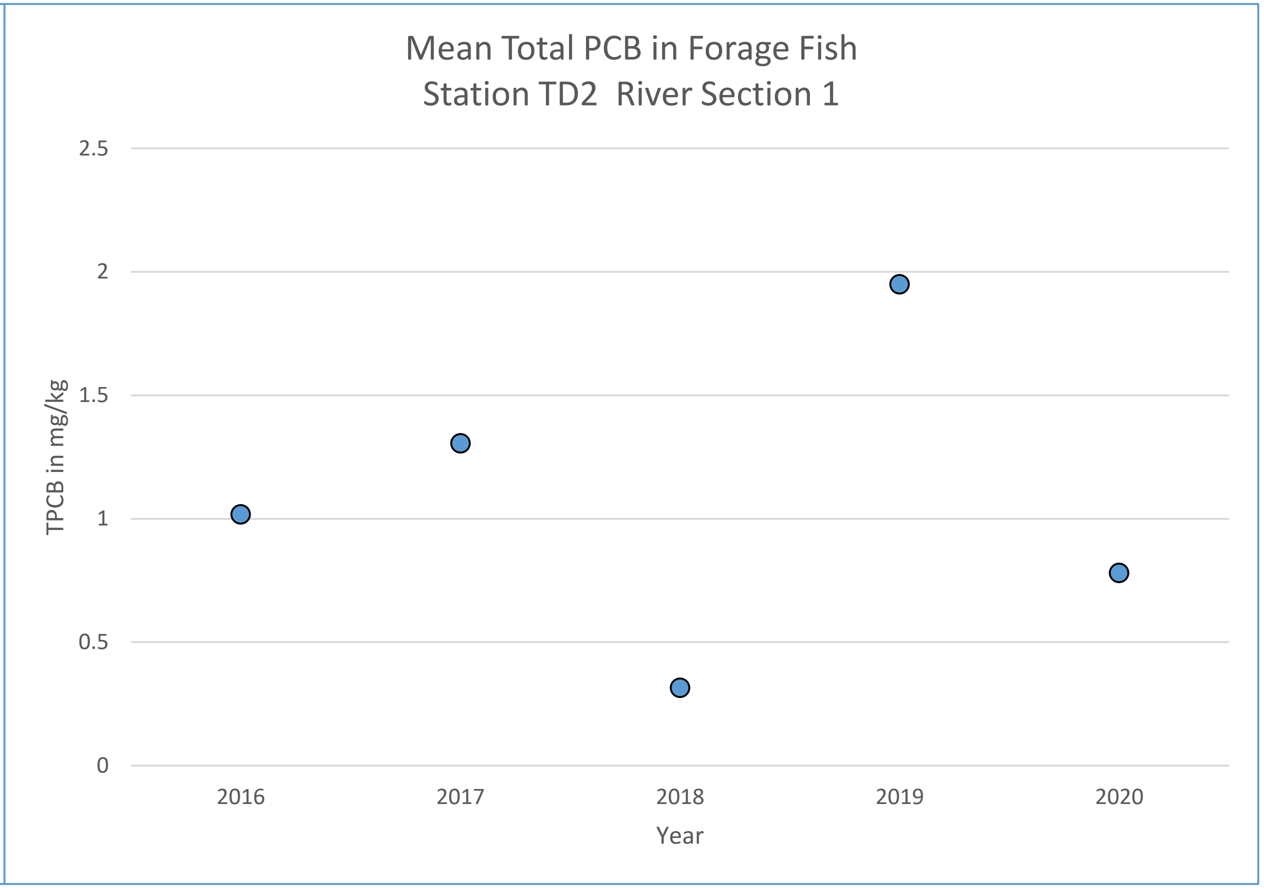




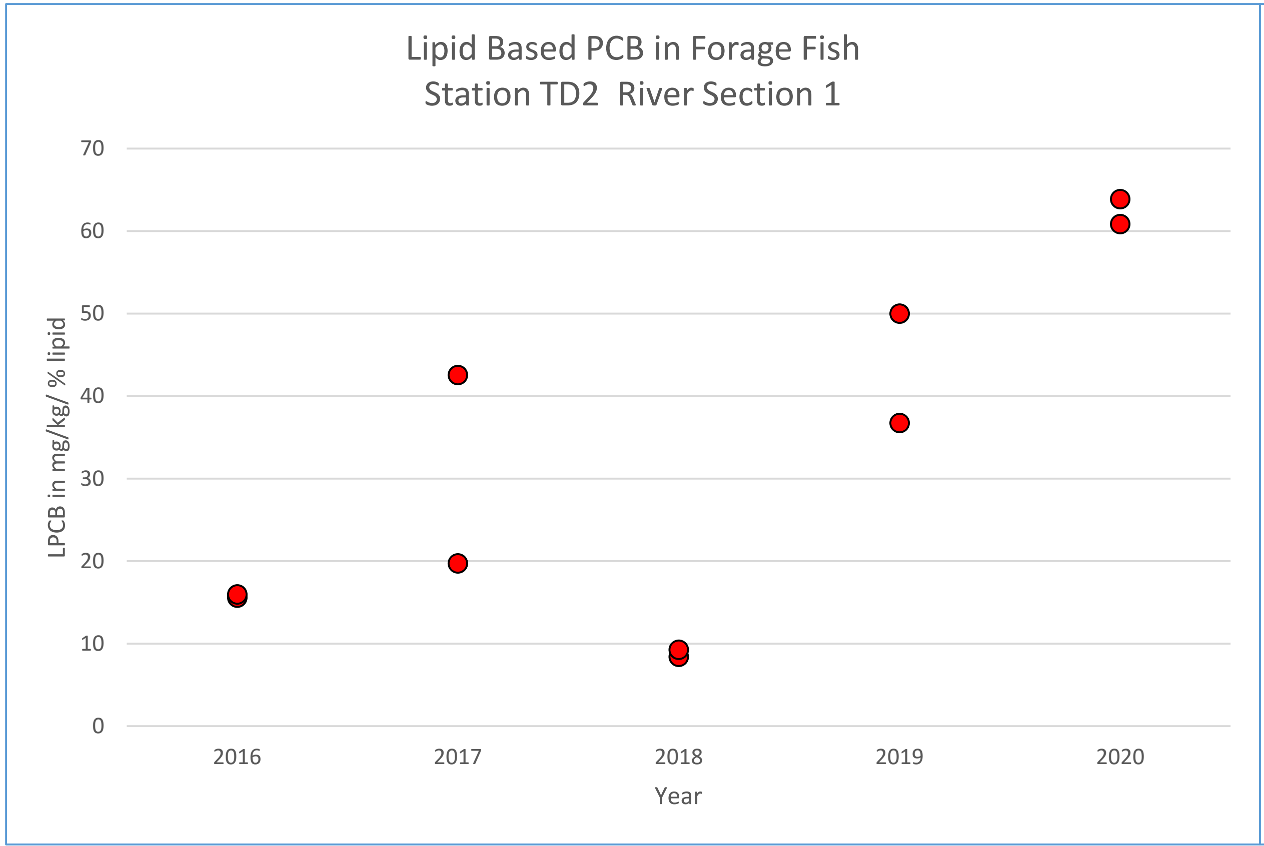
TD2 Forage Fish Data

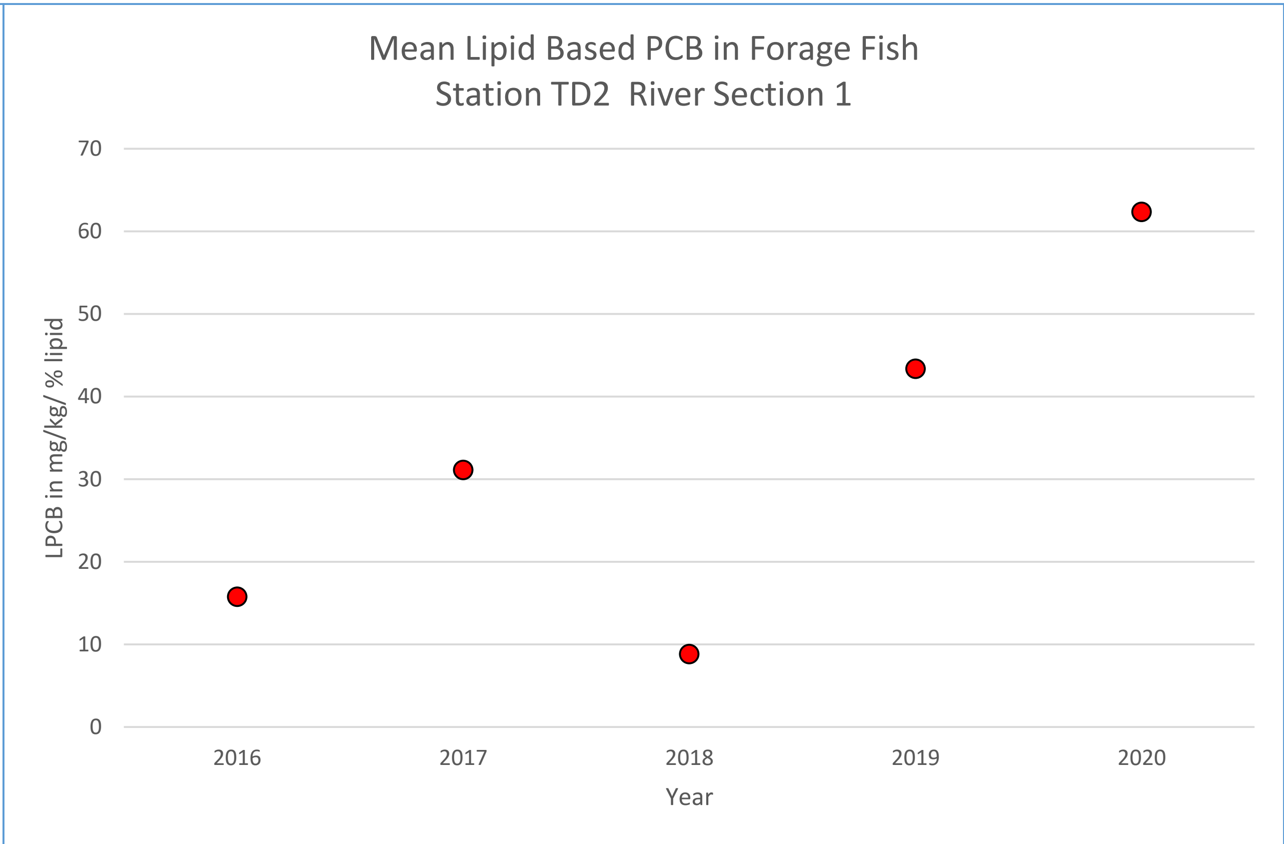
TD2 Forage Fish Total PCB



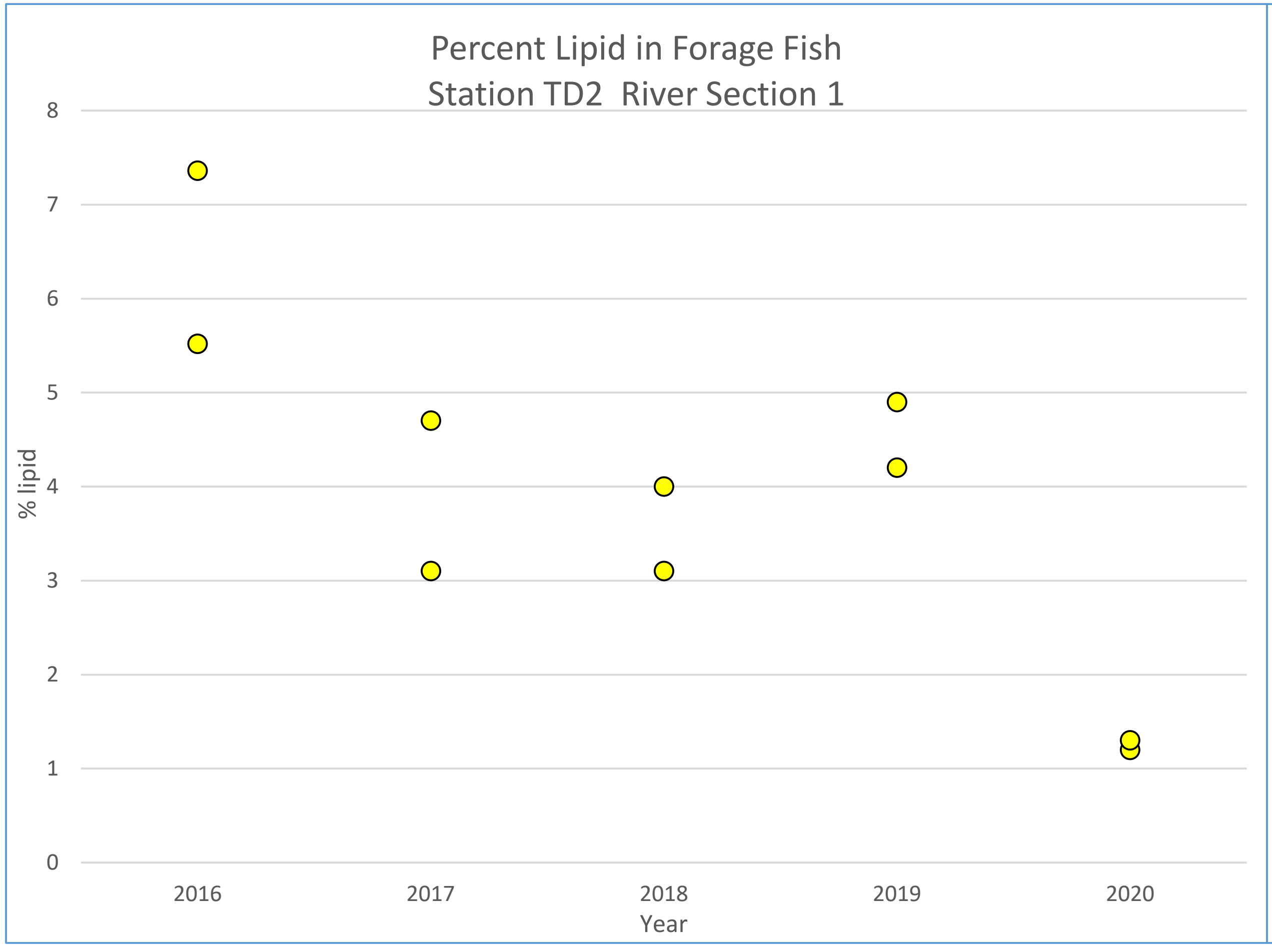


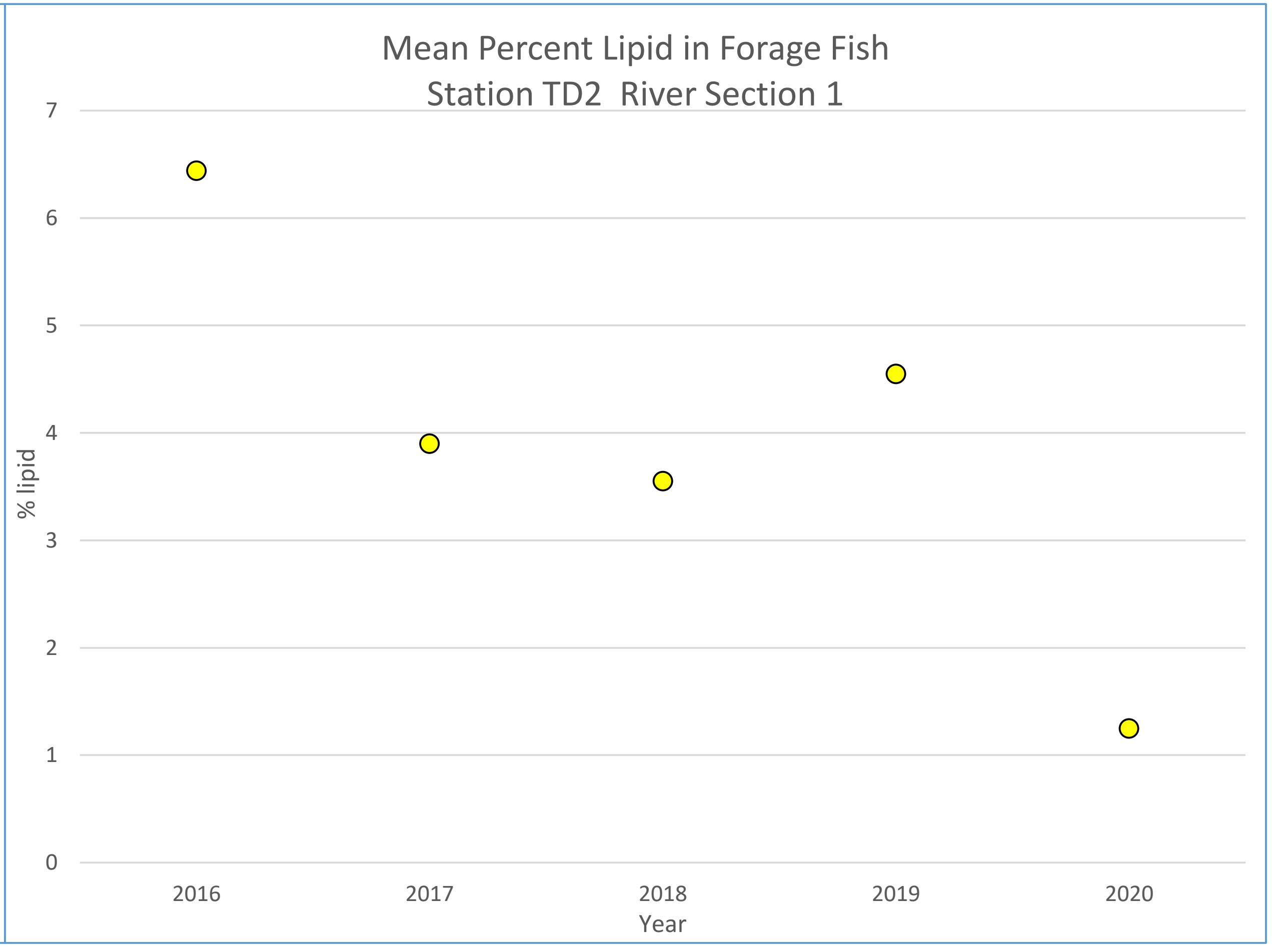
TD2 Forage Fish Lipid Based PCB



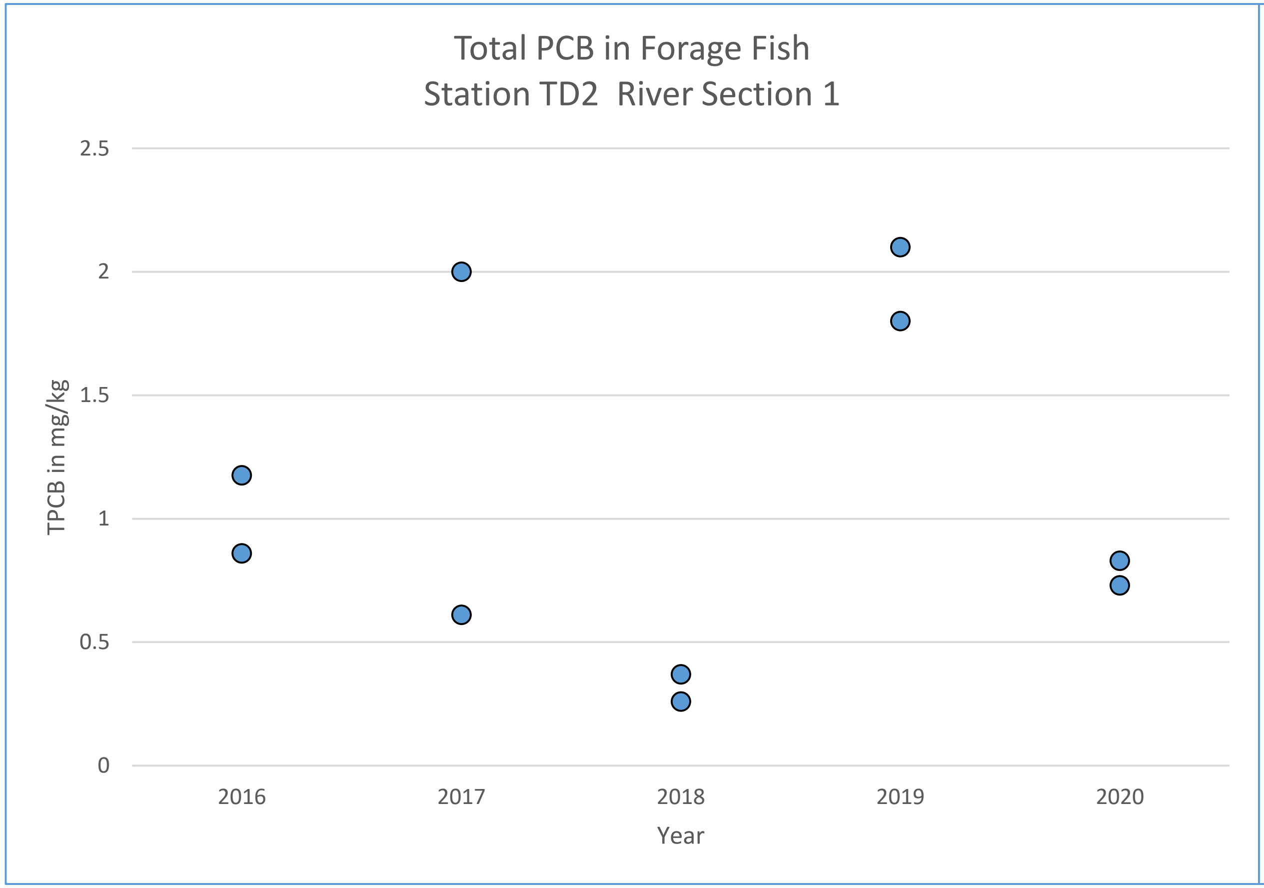


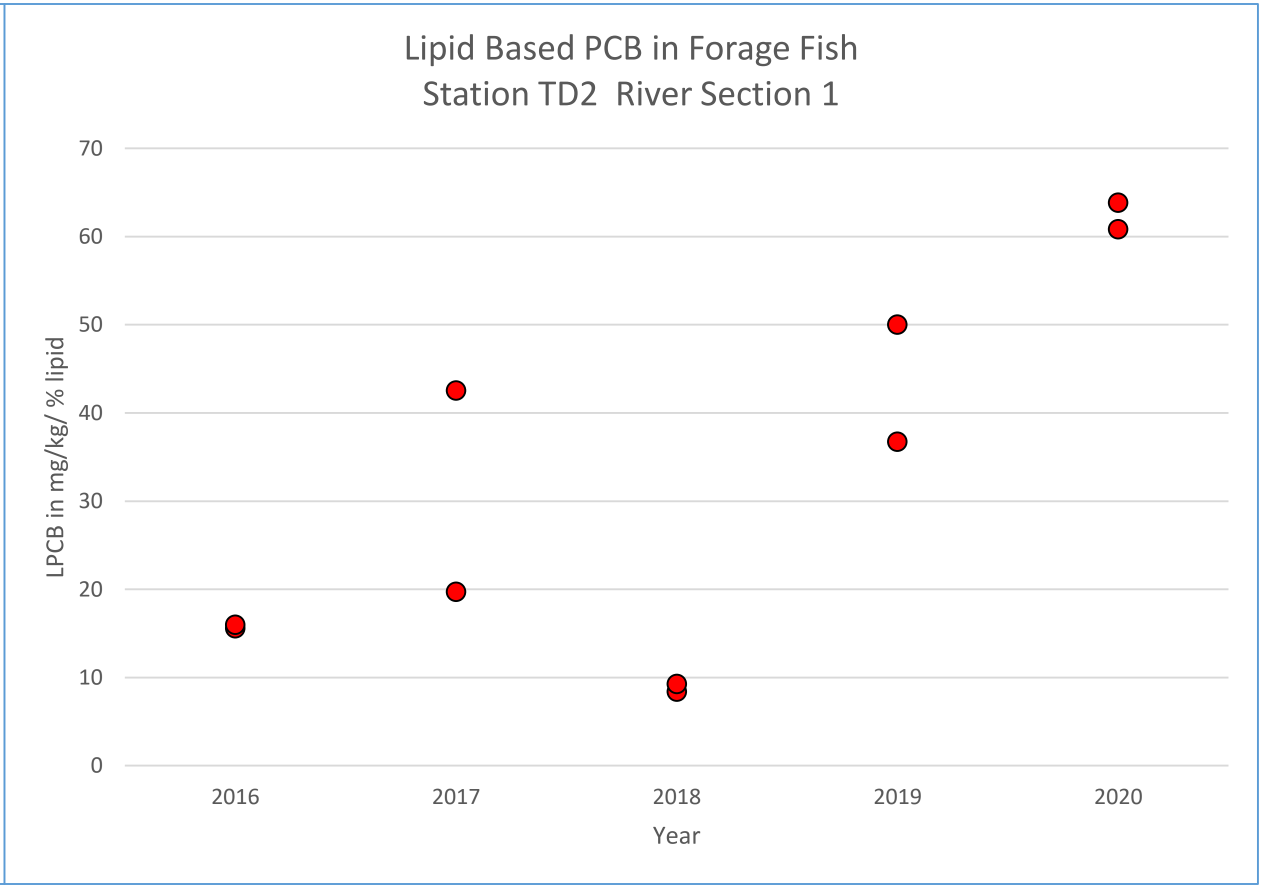
TD2 Forage Fish Percent Lipid



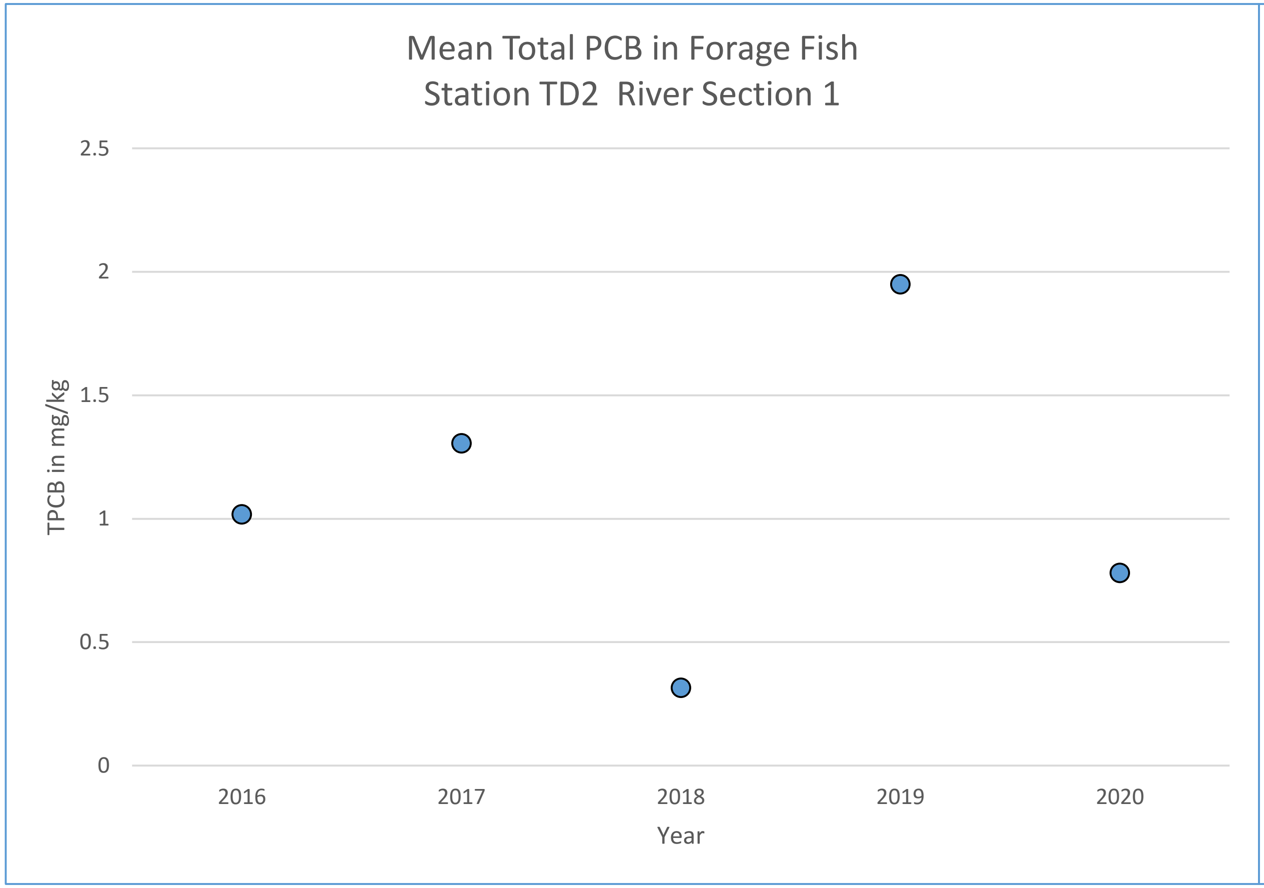


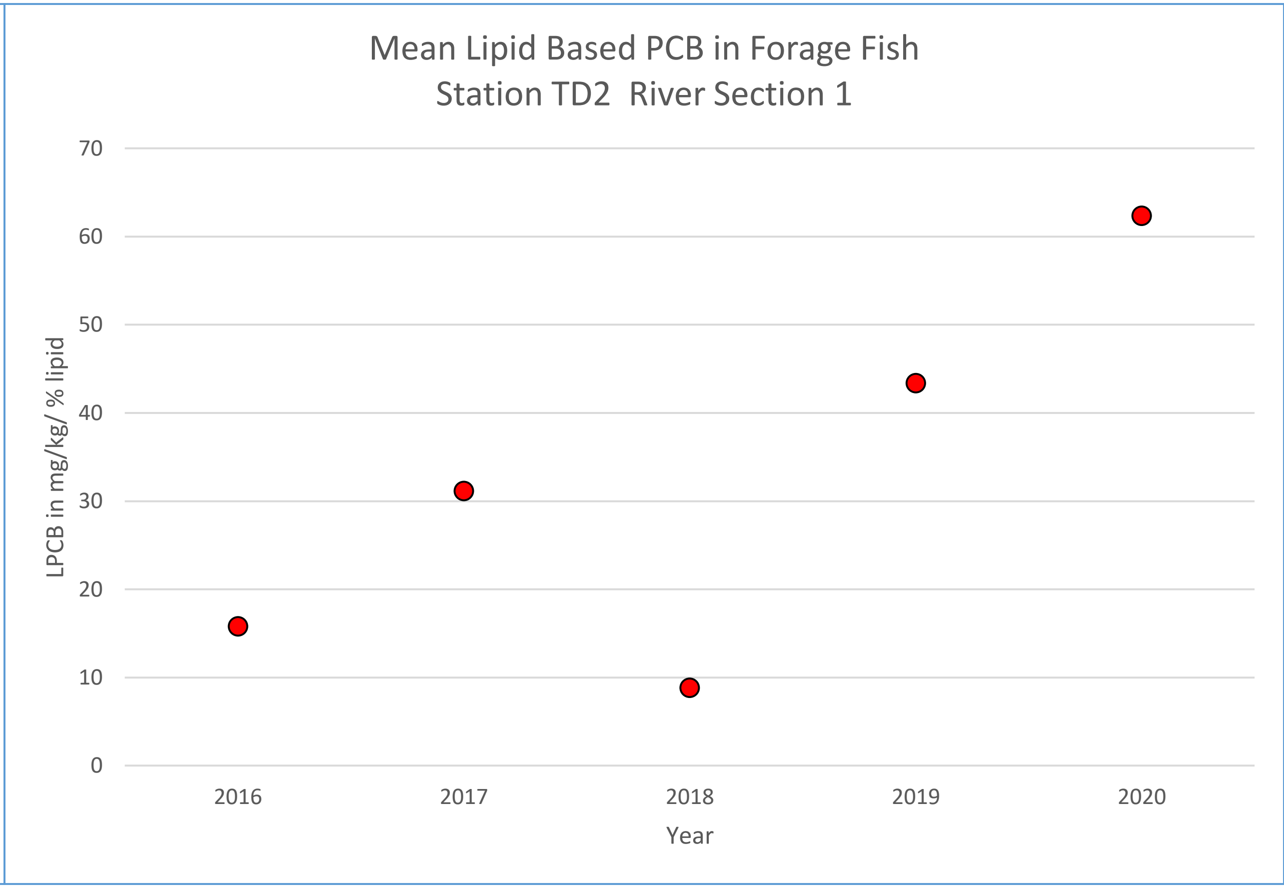
TD2 Forage Fish Total PCB and Lipid Based PCB





TD2 Forage Fish Mean Total PCB and Mean Lipid Based PCB





Station TD3

Stations TD3, TD4 and TD5

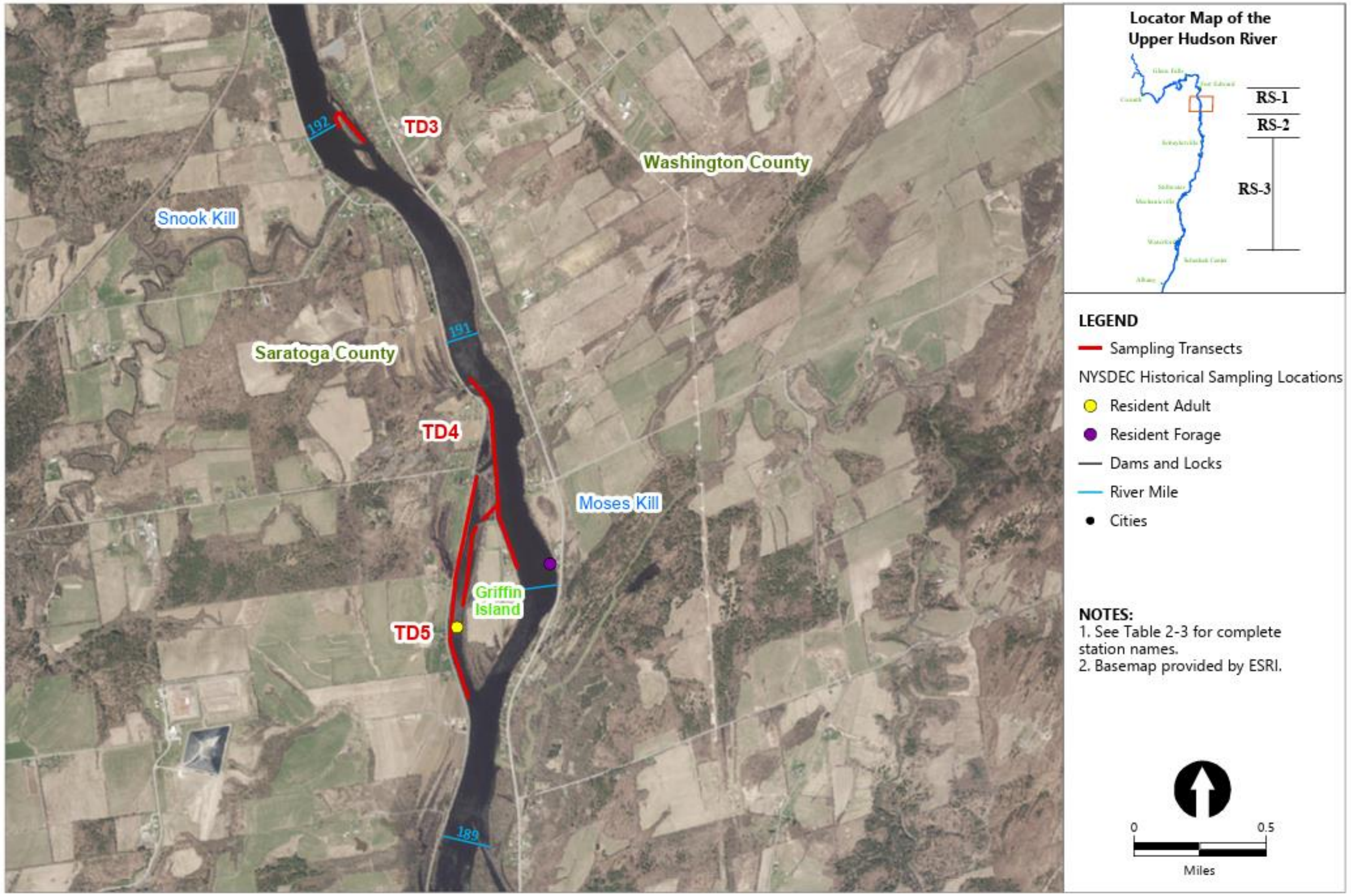


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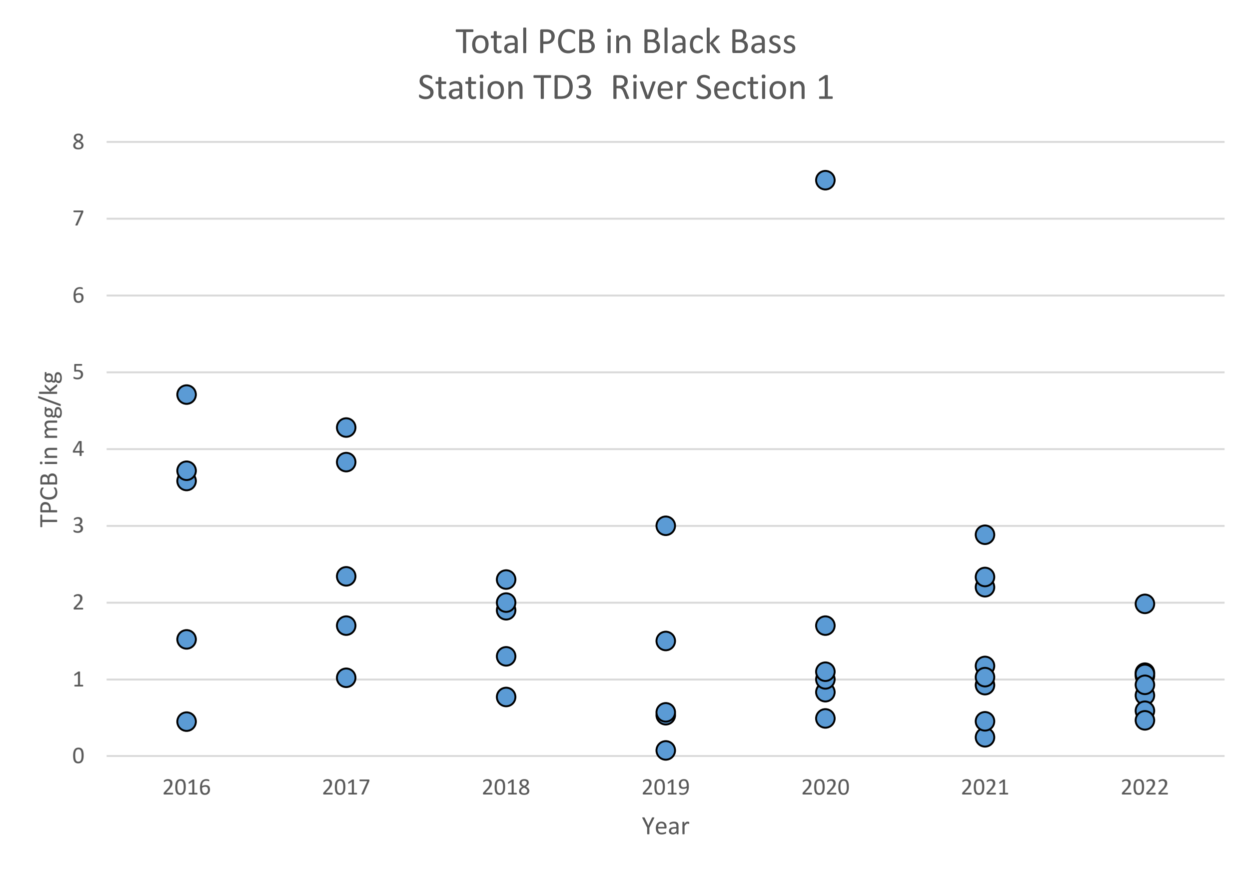
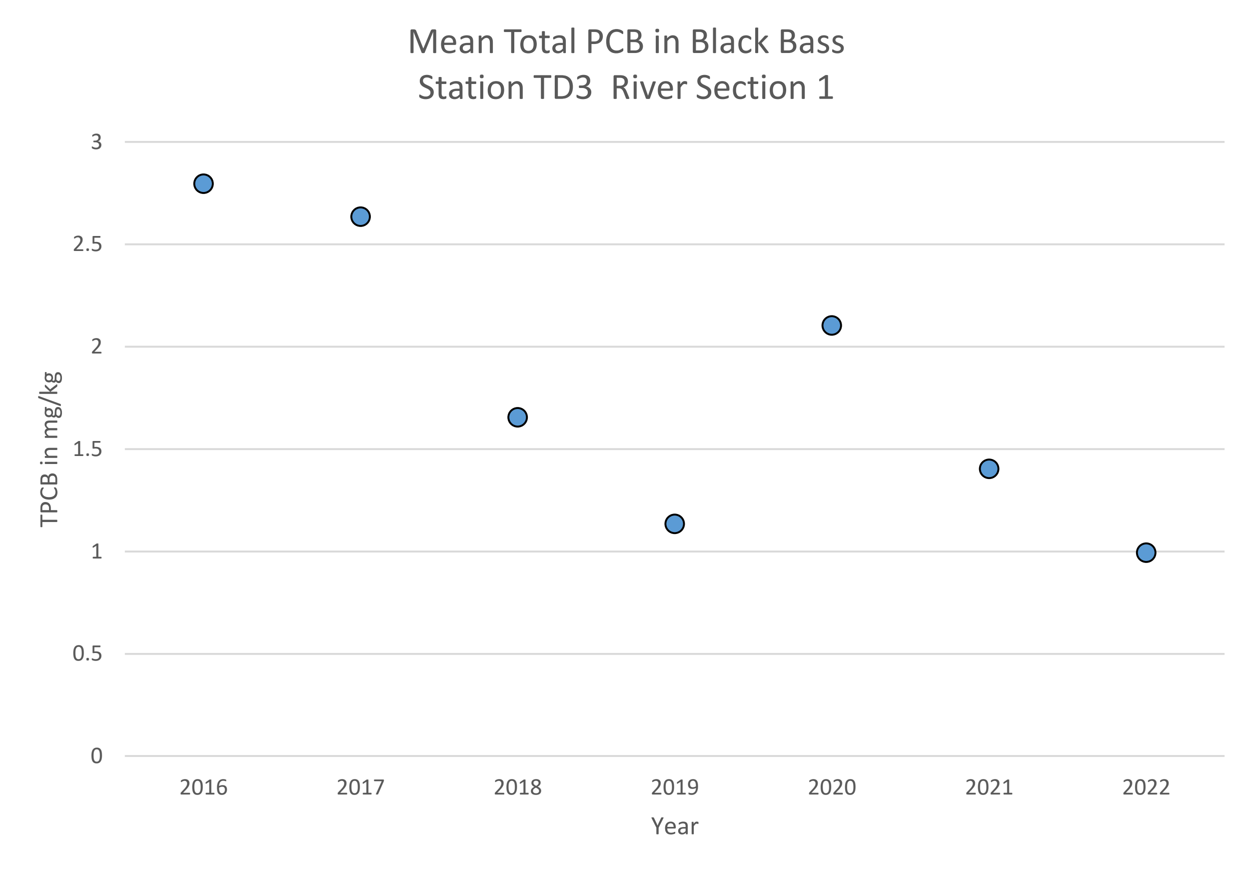
Figure 2-2c
Spring 2018 Fish Sampling Locations
2018 Water and Fish Data Summary Report
Prepared for the General Electric Company

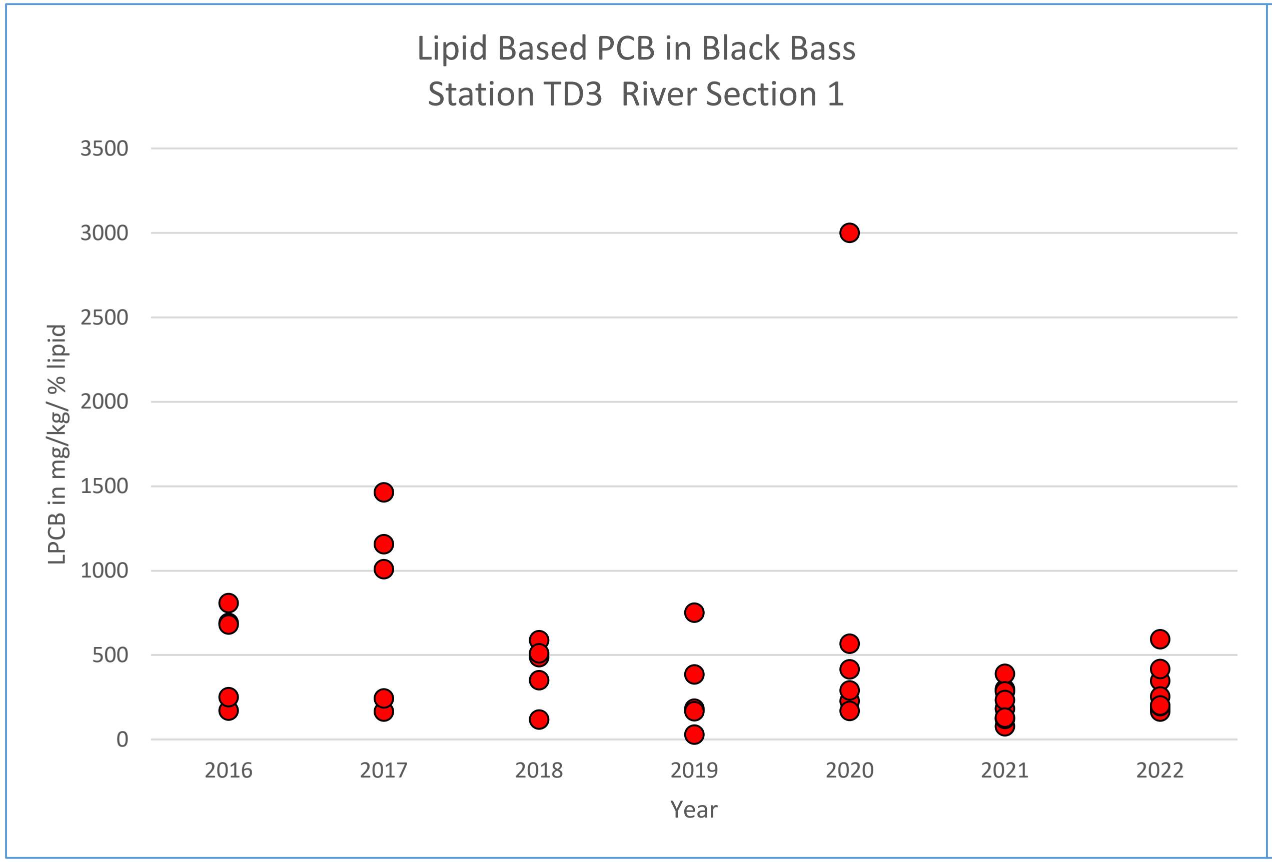
TD3 Black Bass Data

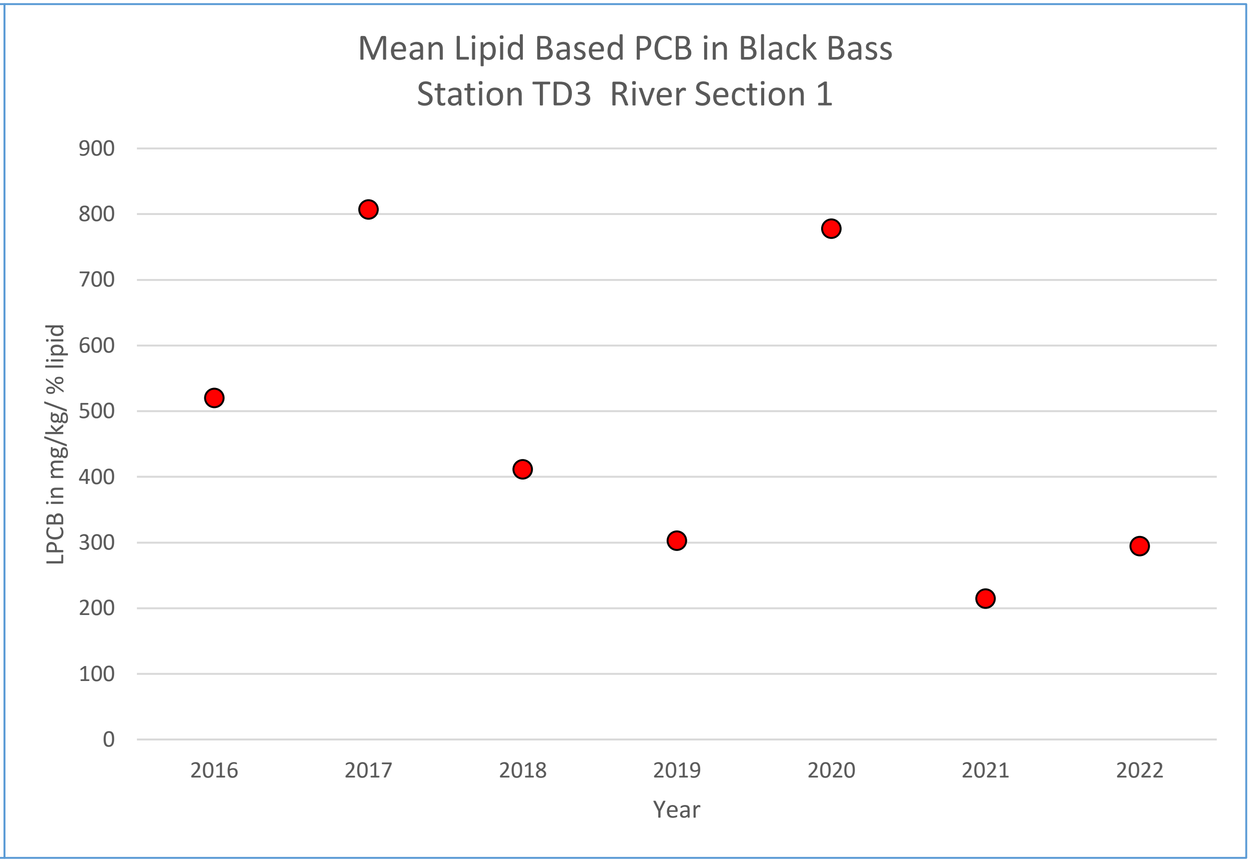
TD3 Black Bass Total PCB



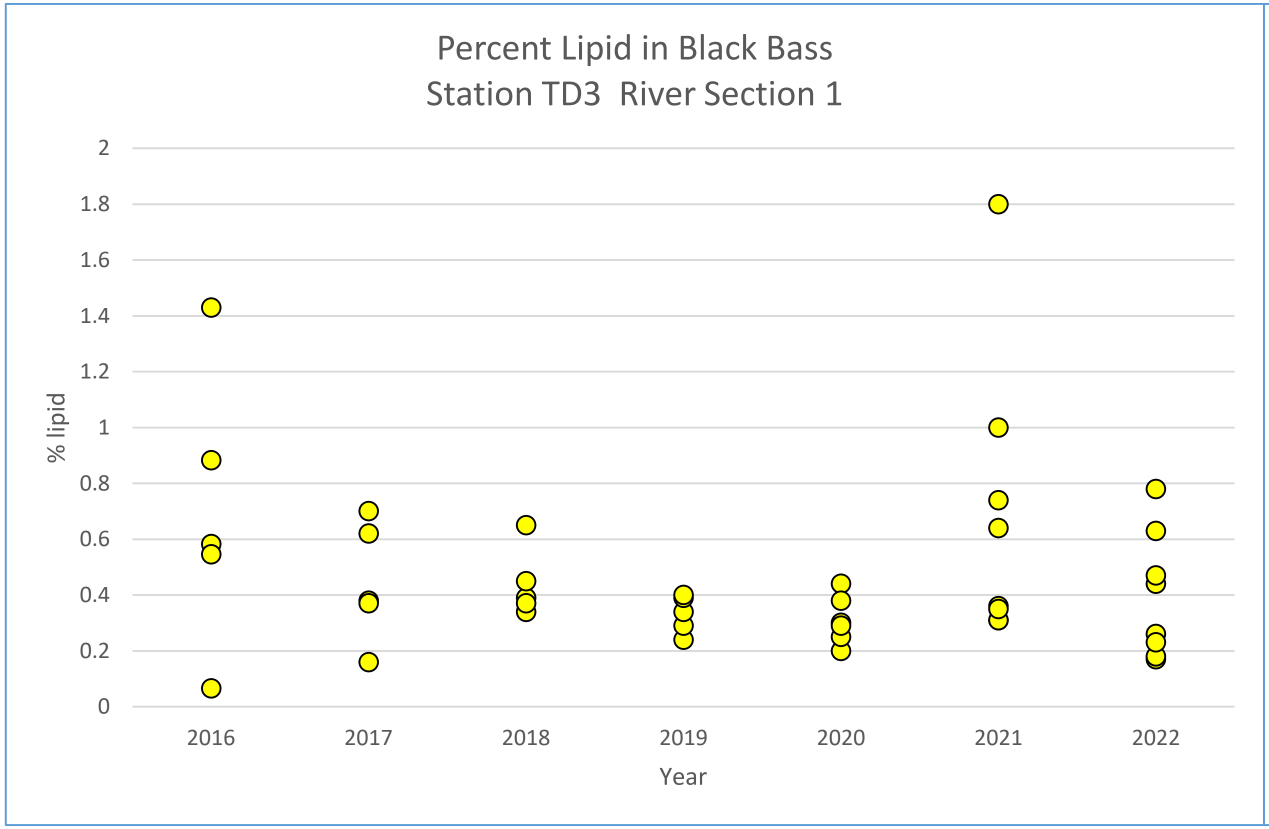


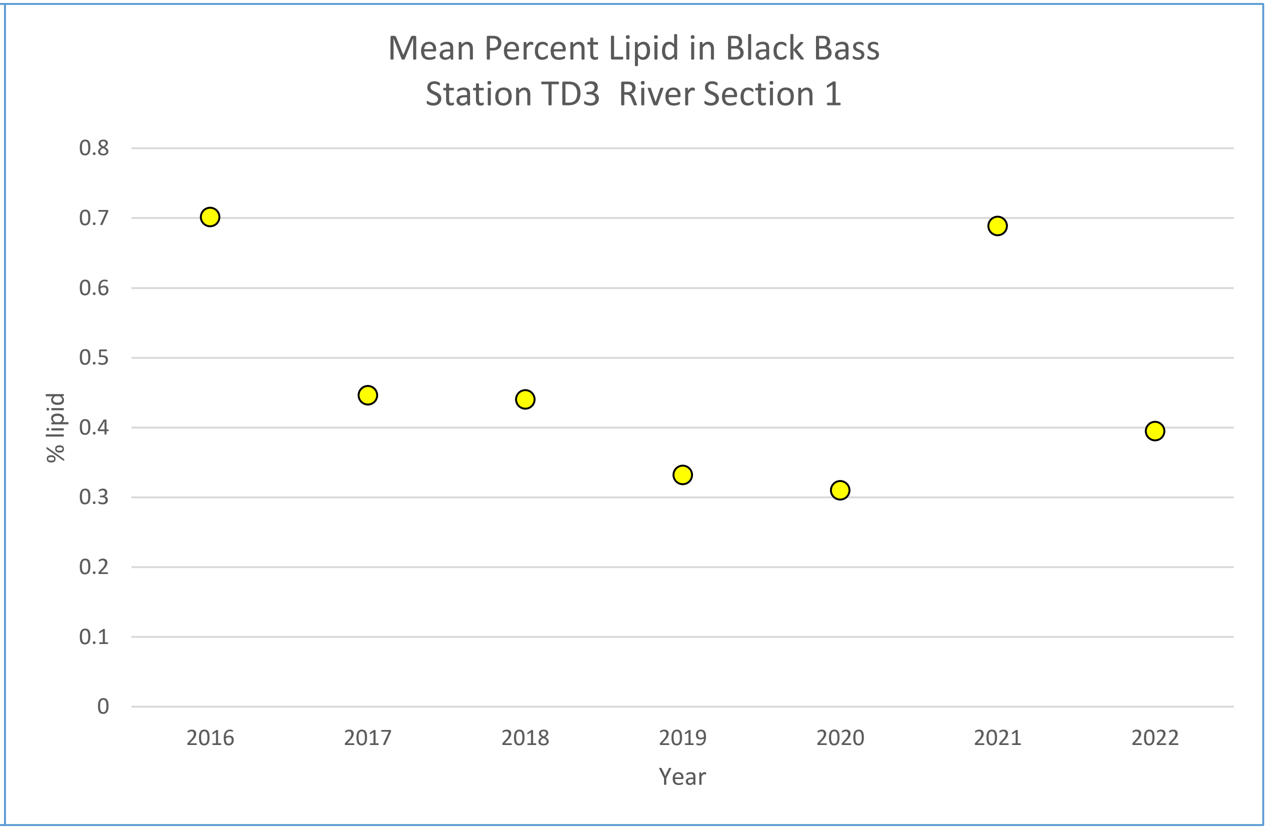
TD3 Black Bass Lipid Based PCB



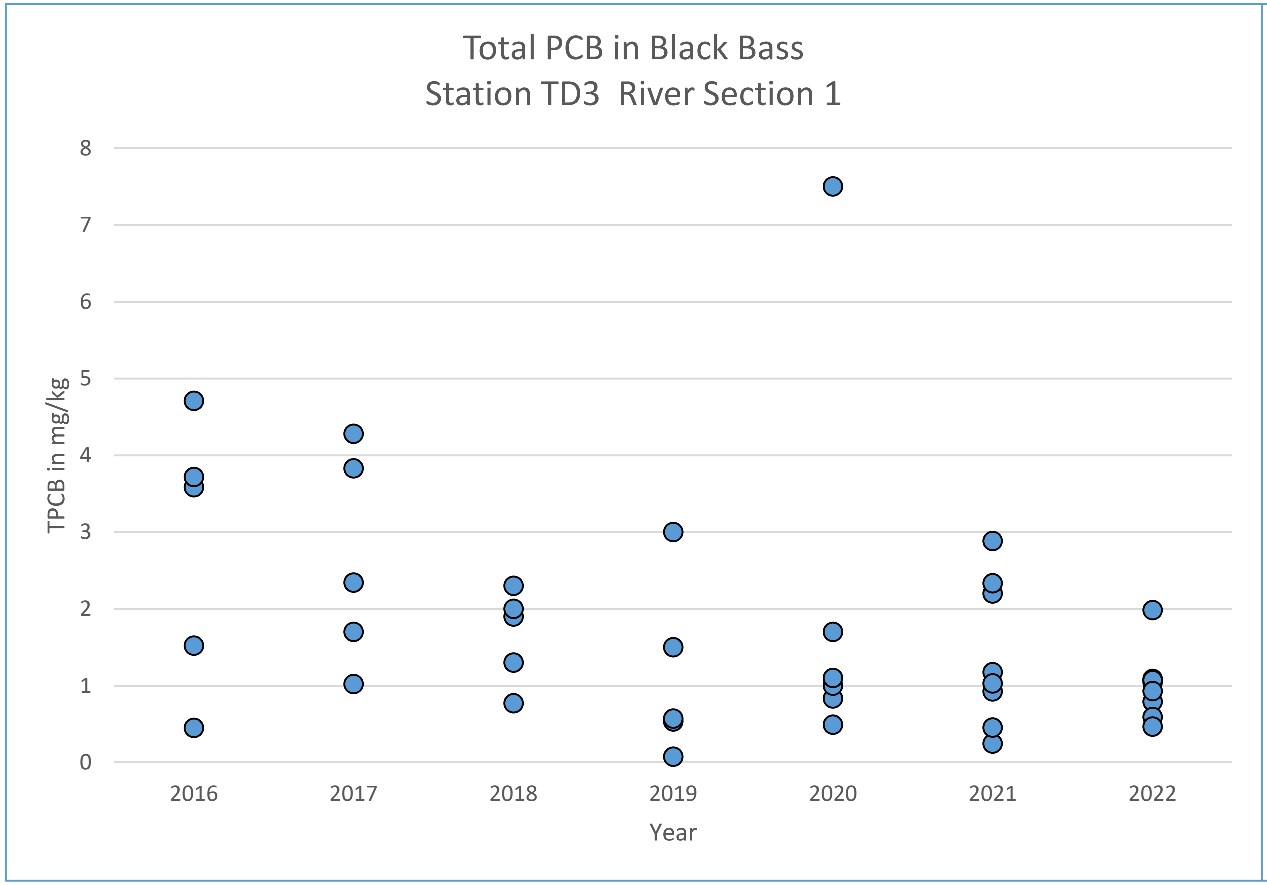


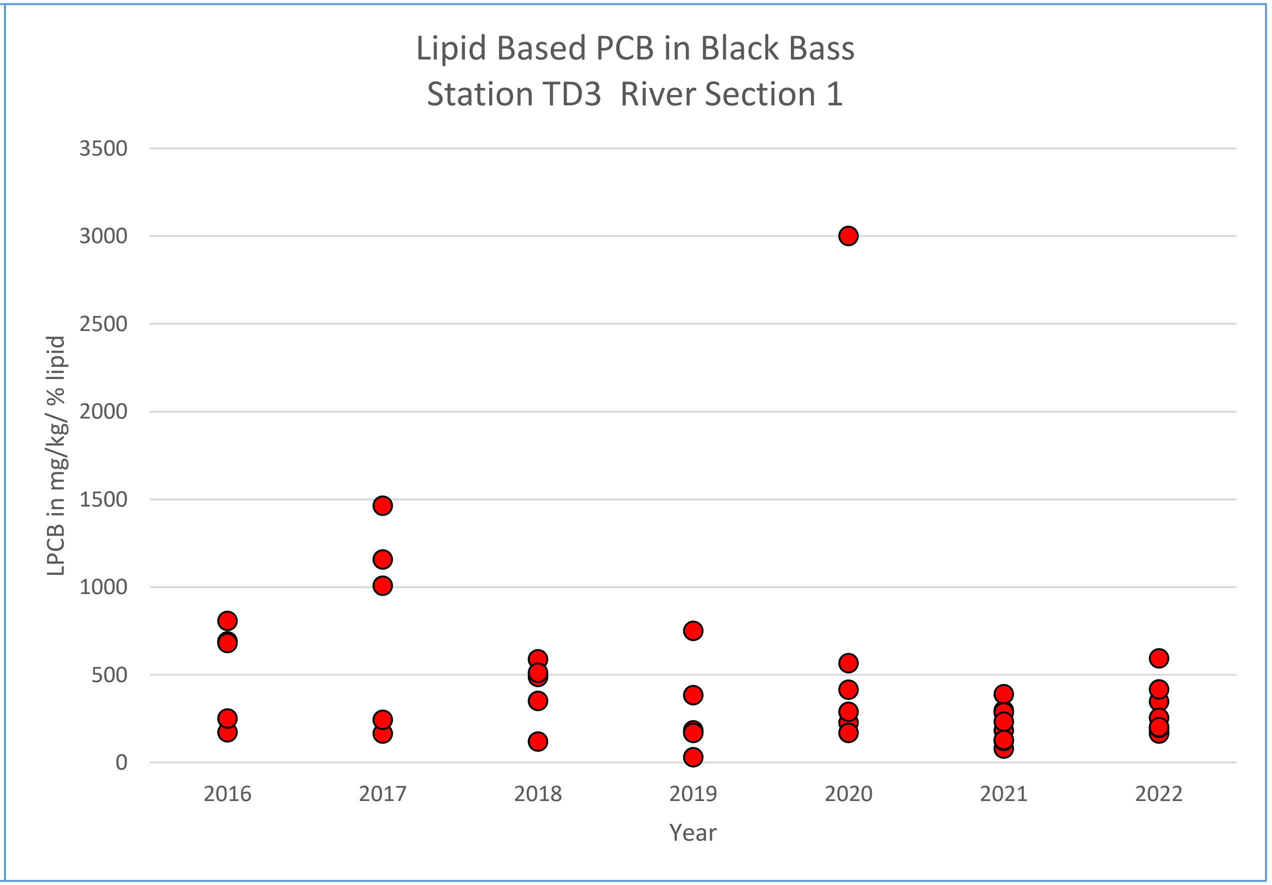
TD3 Black Bass Percent Lipid



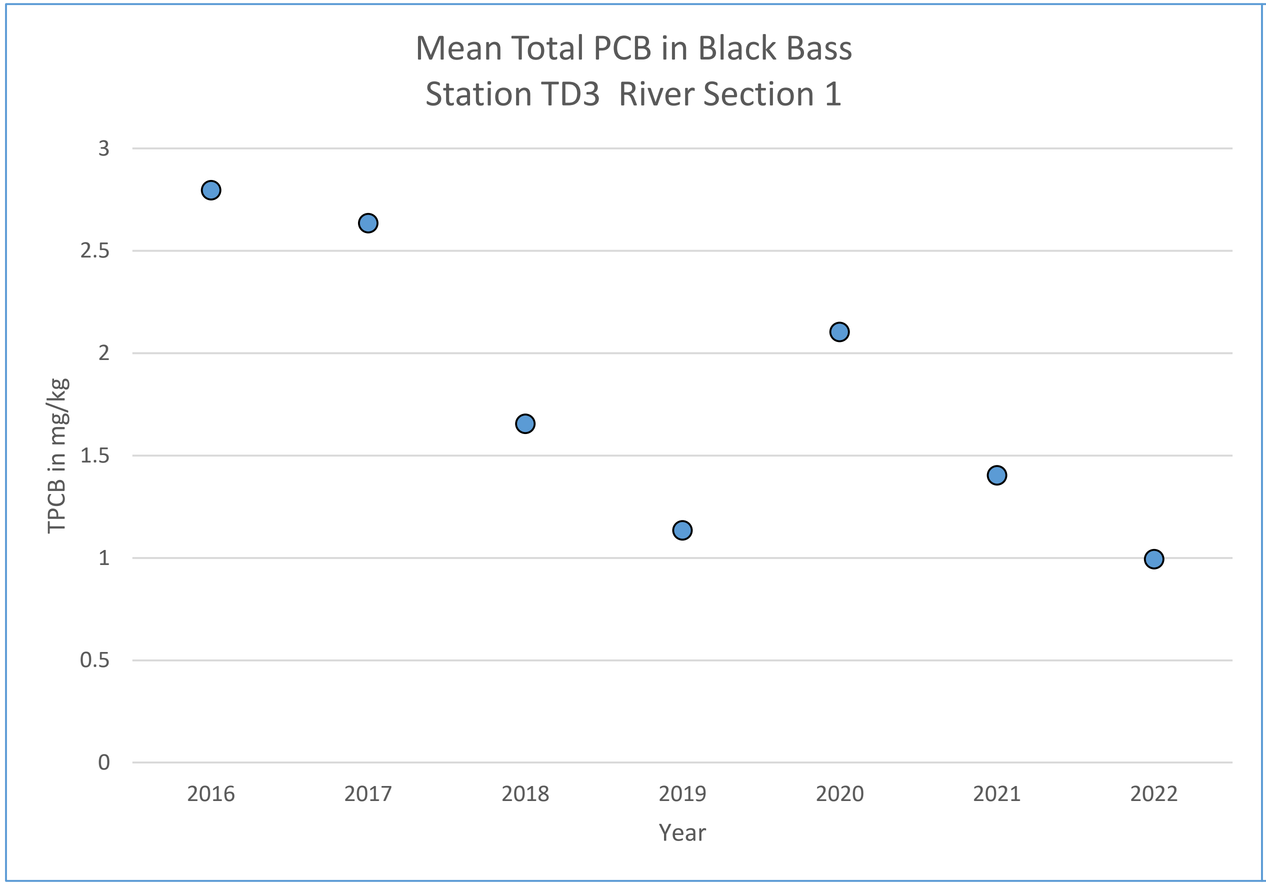


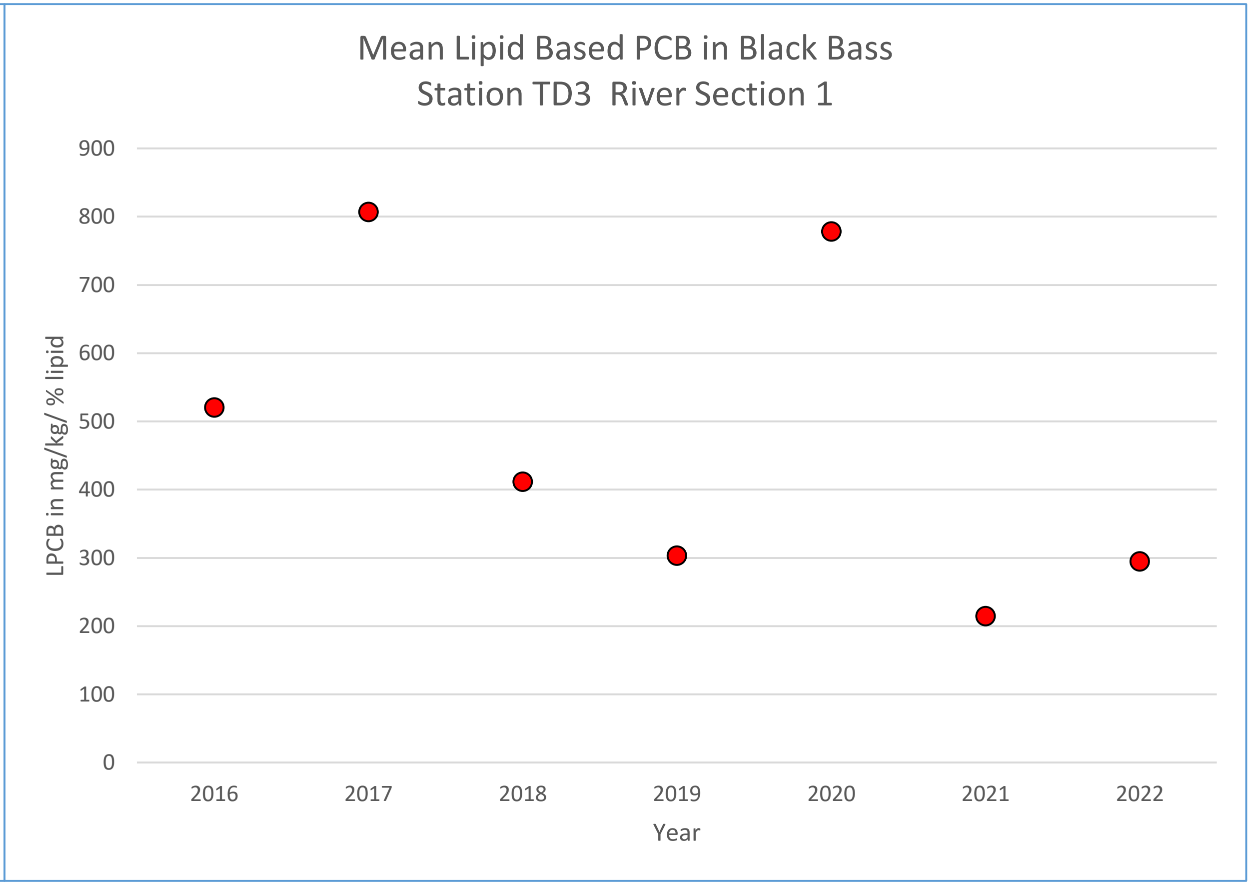
TD3 Black Bass Total PCB and Lipid Based PCB





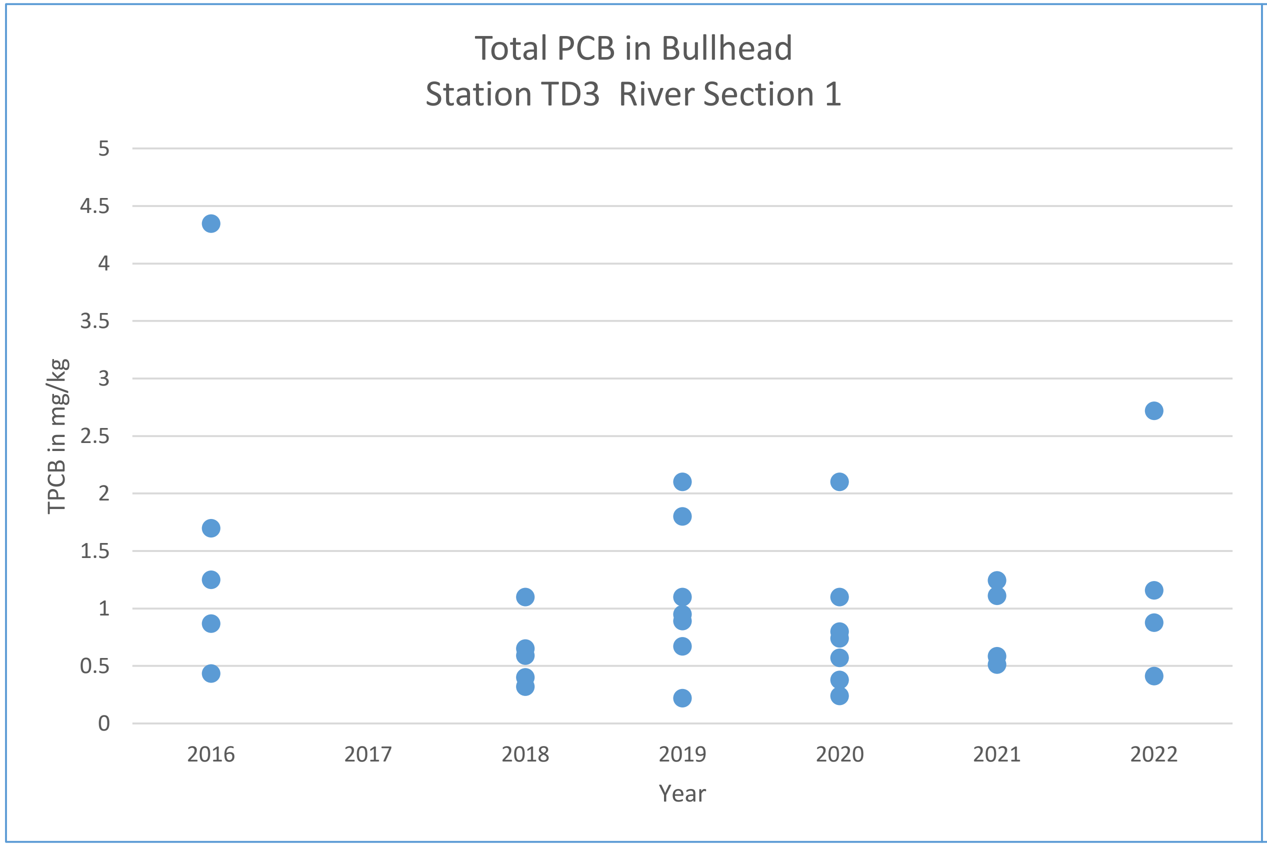
TD3 Black Bass Mean Total PCB and Mean Lipid Based PCB

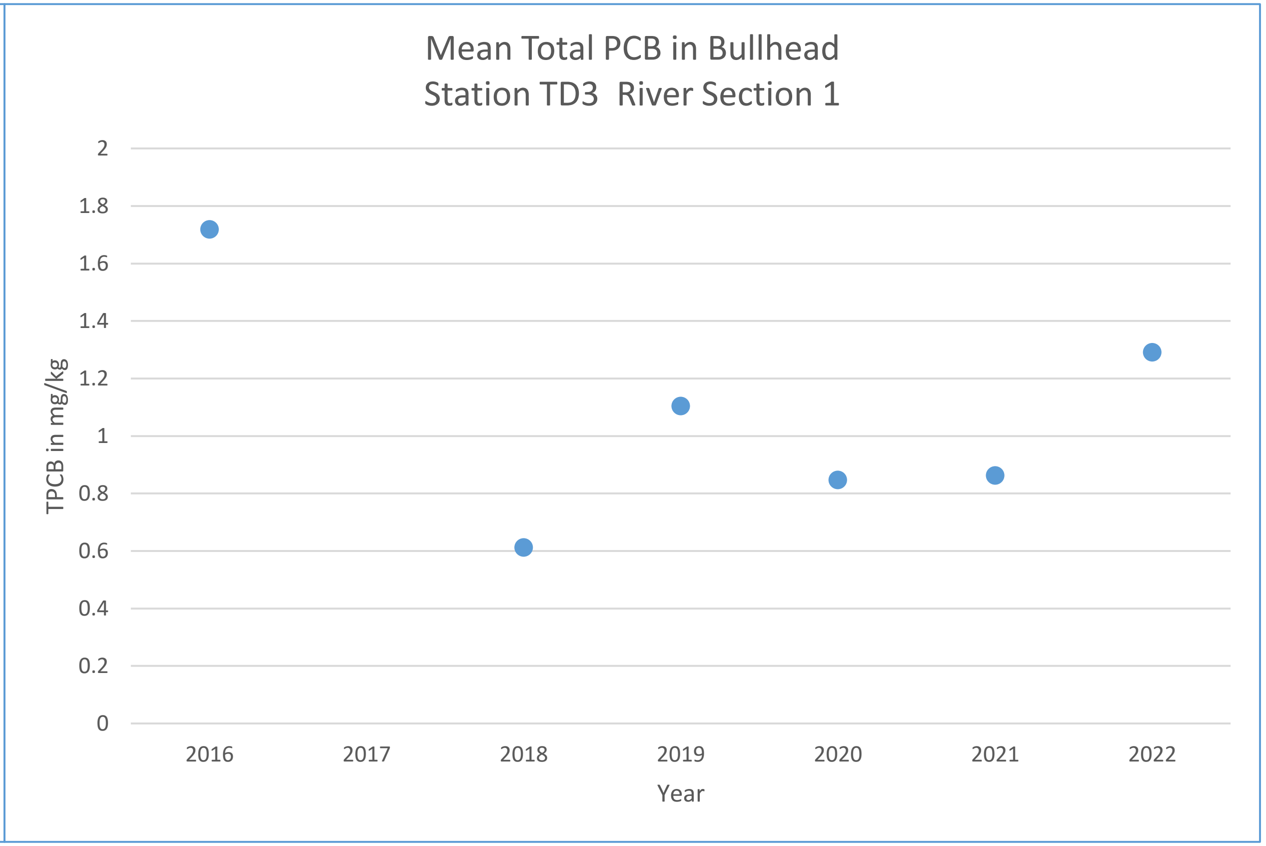




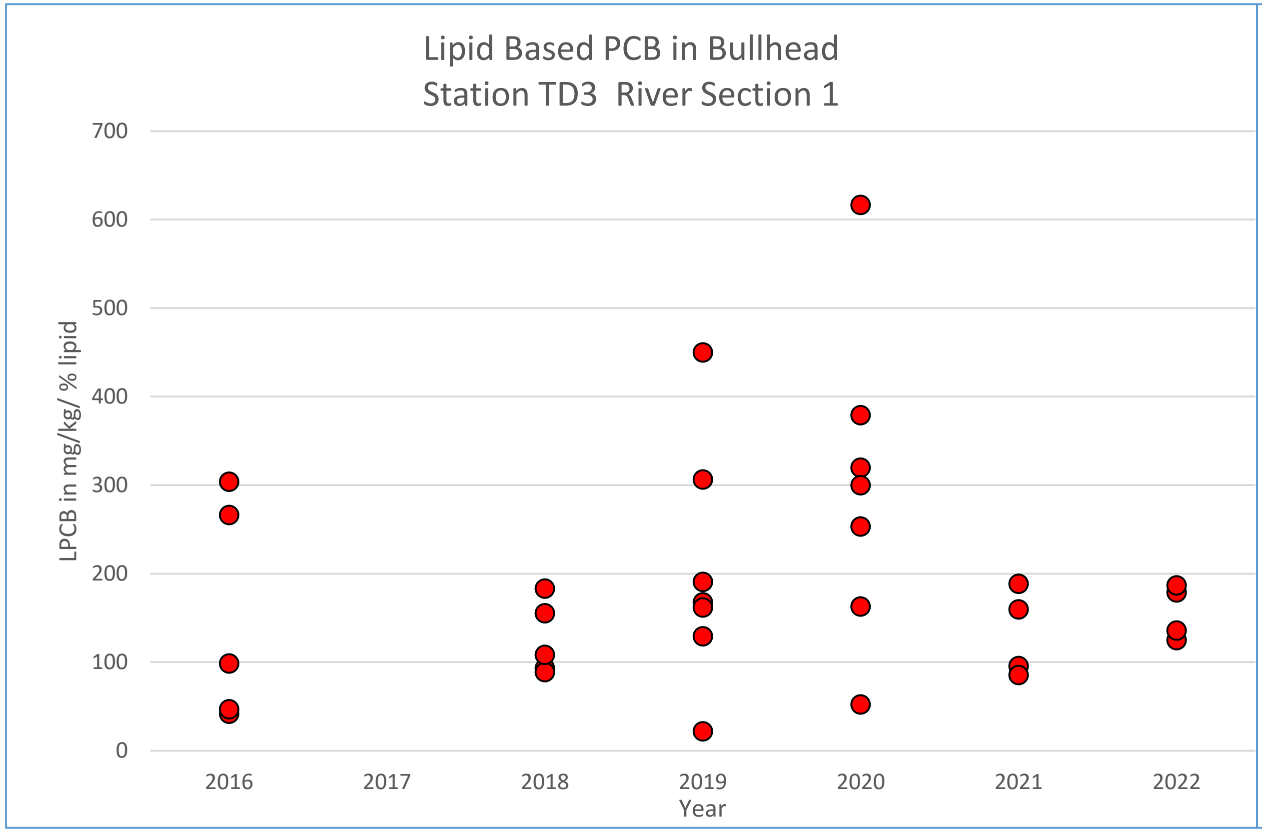
TD3 Bullhead Data

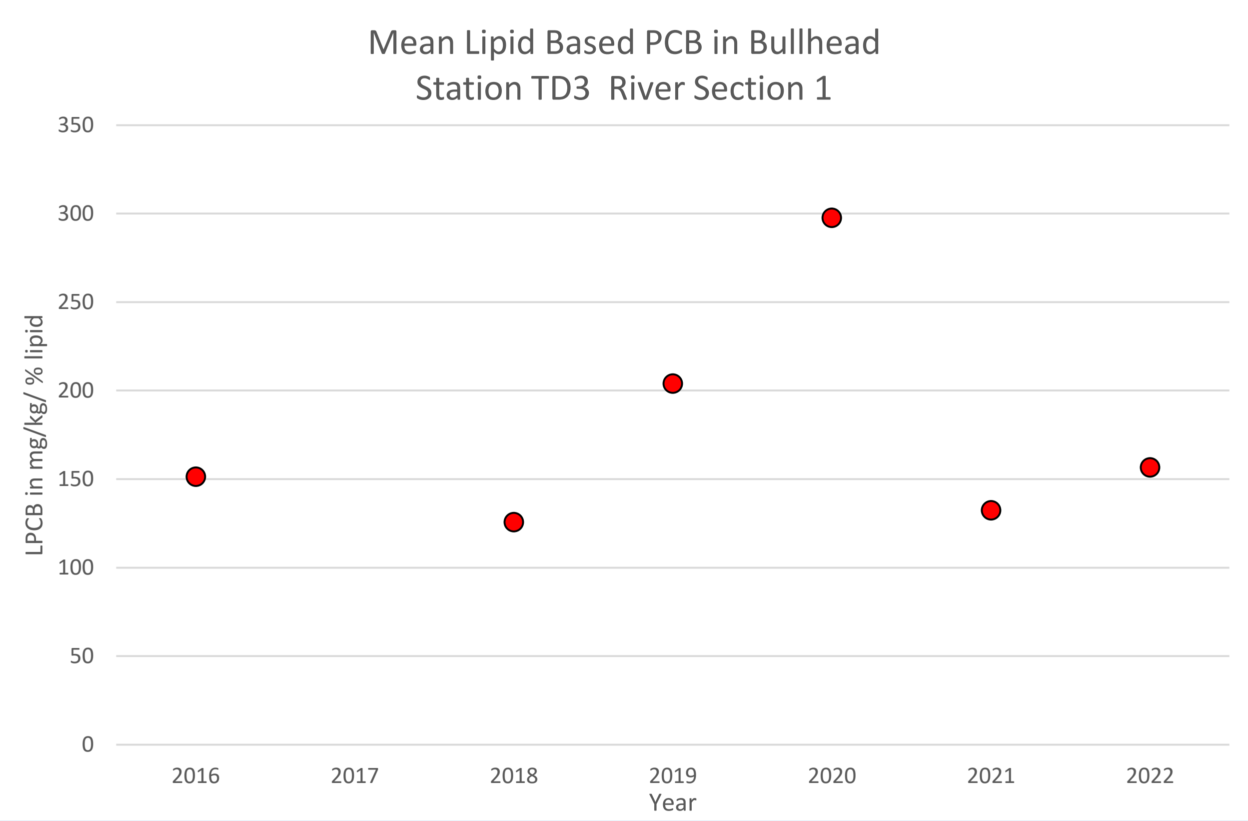
TD3 Bullhead Total PCB



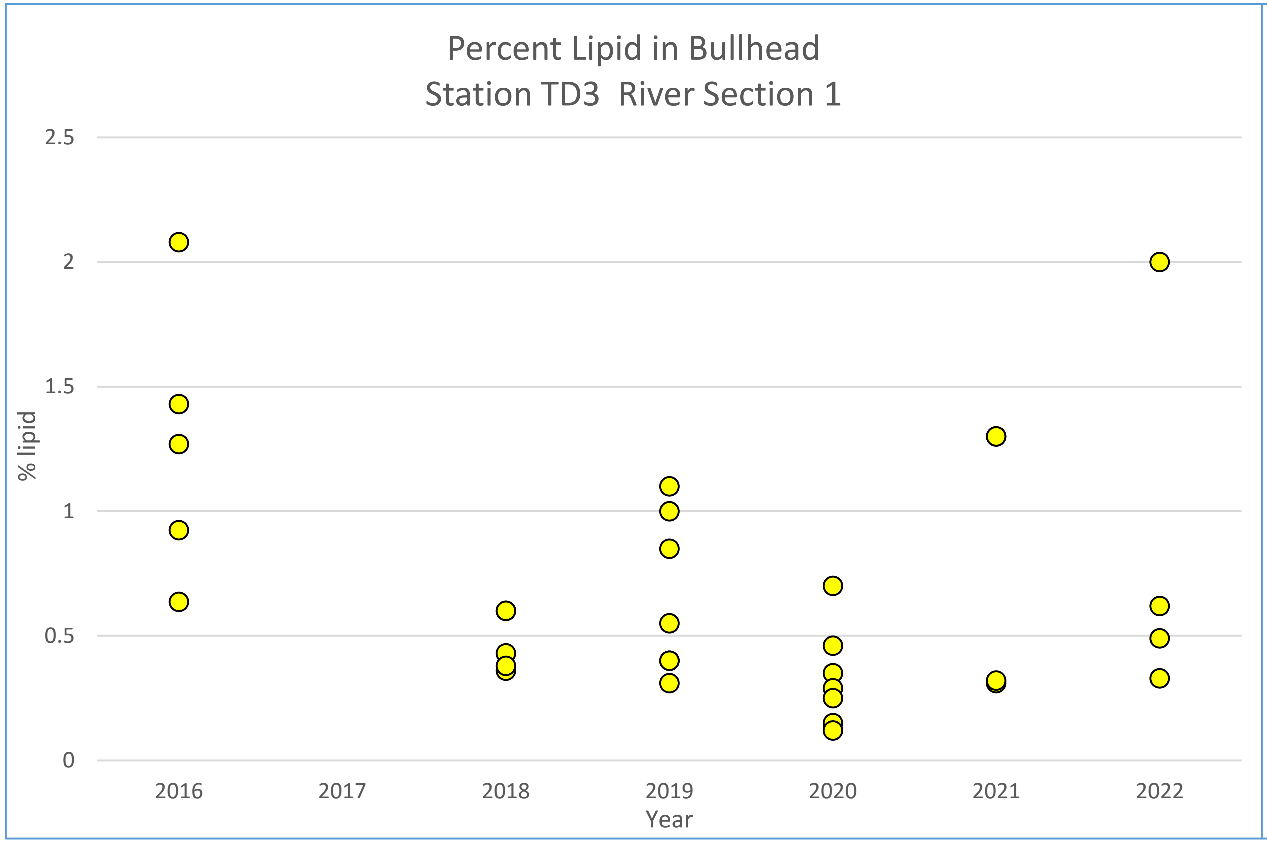


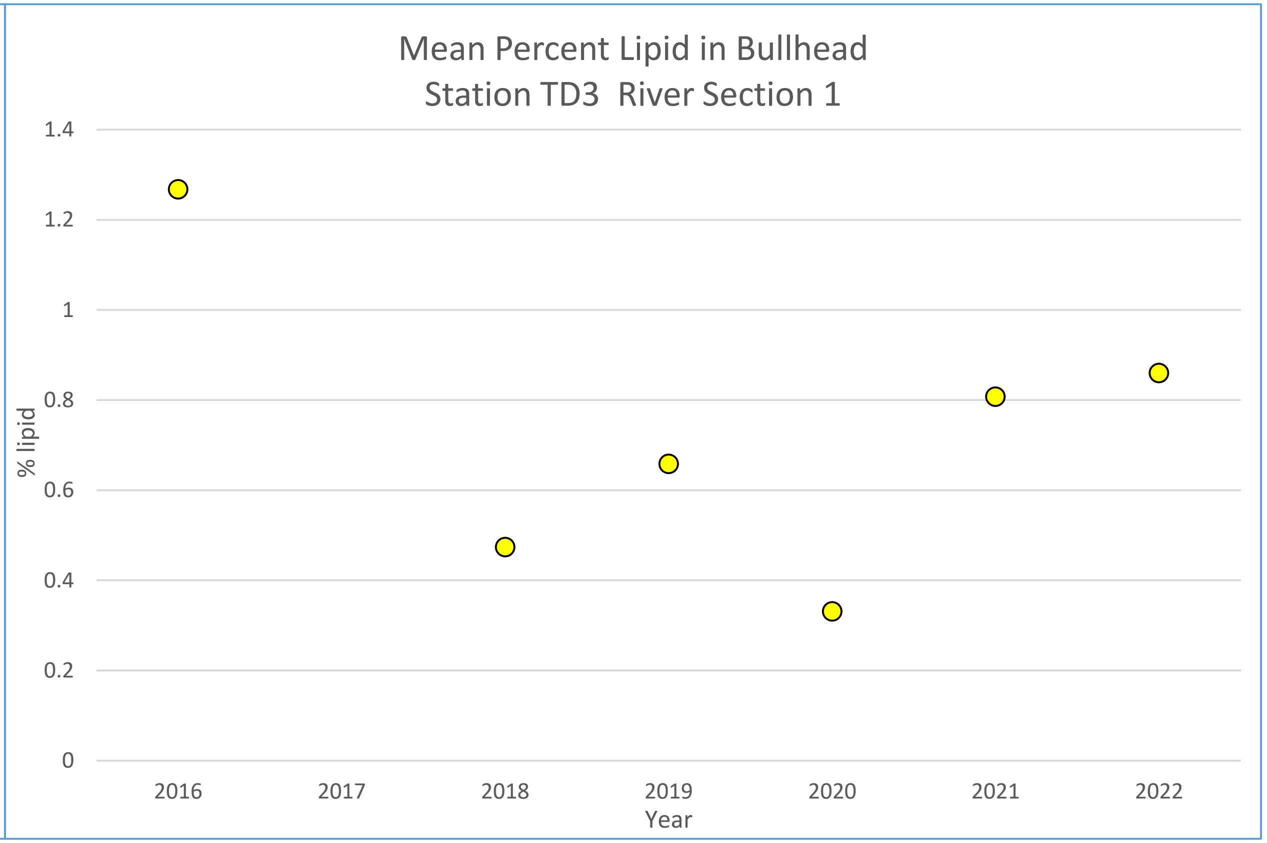
TD3 Bullhead Lipid Based PCB



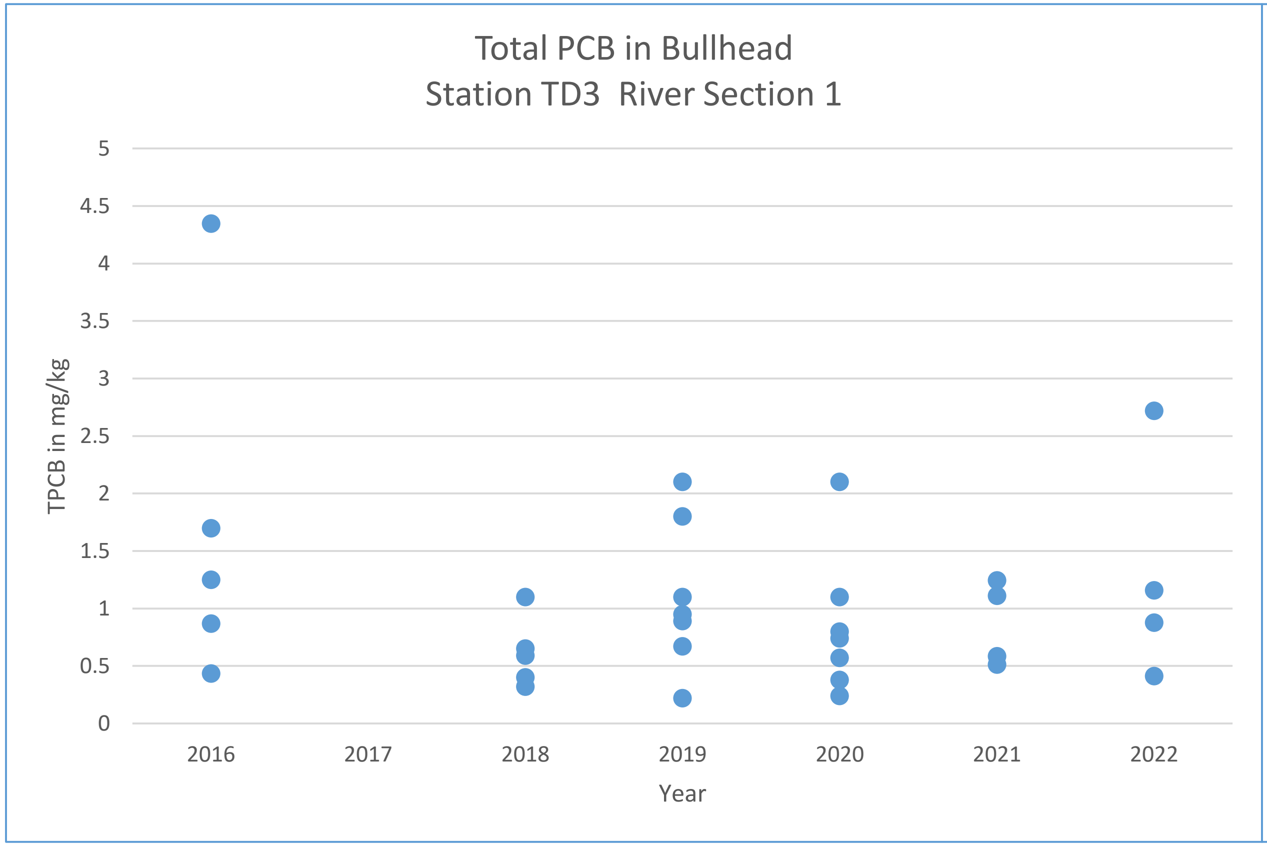


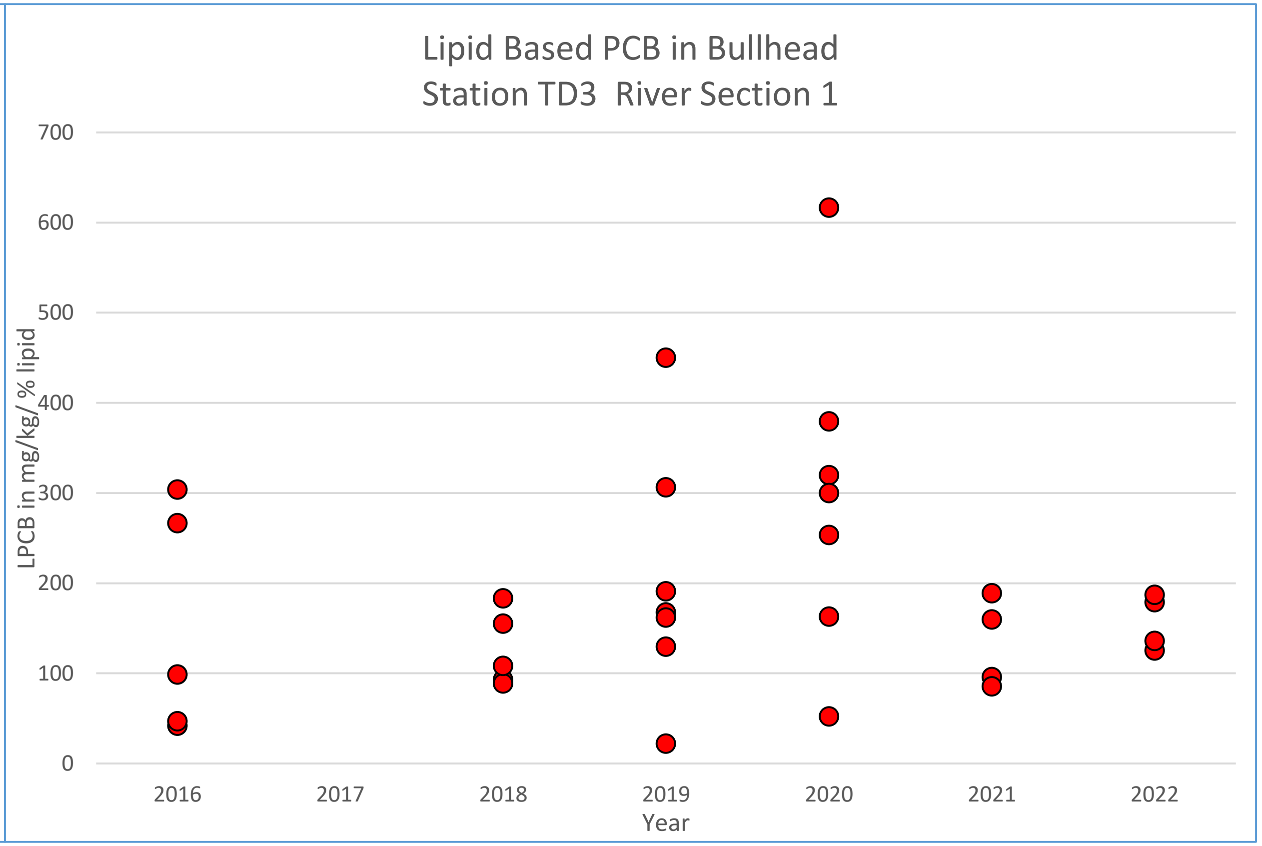
TD3 Bullhead Percent Lipid



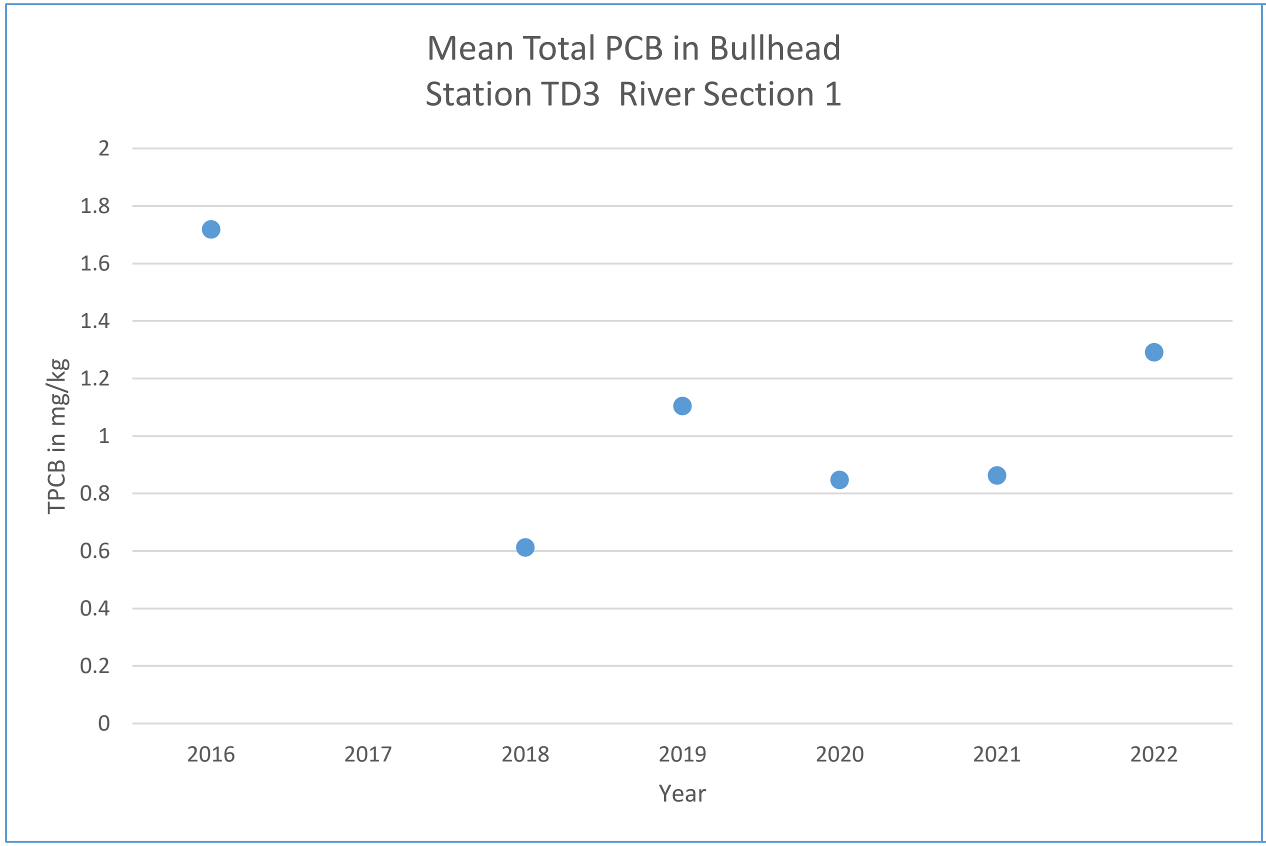


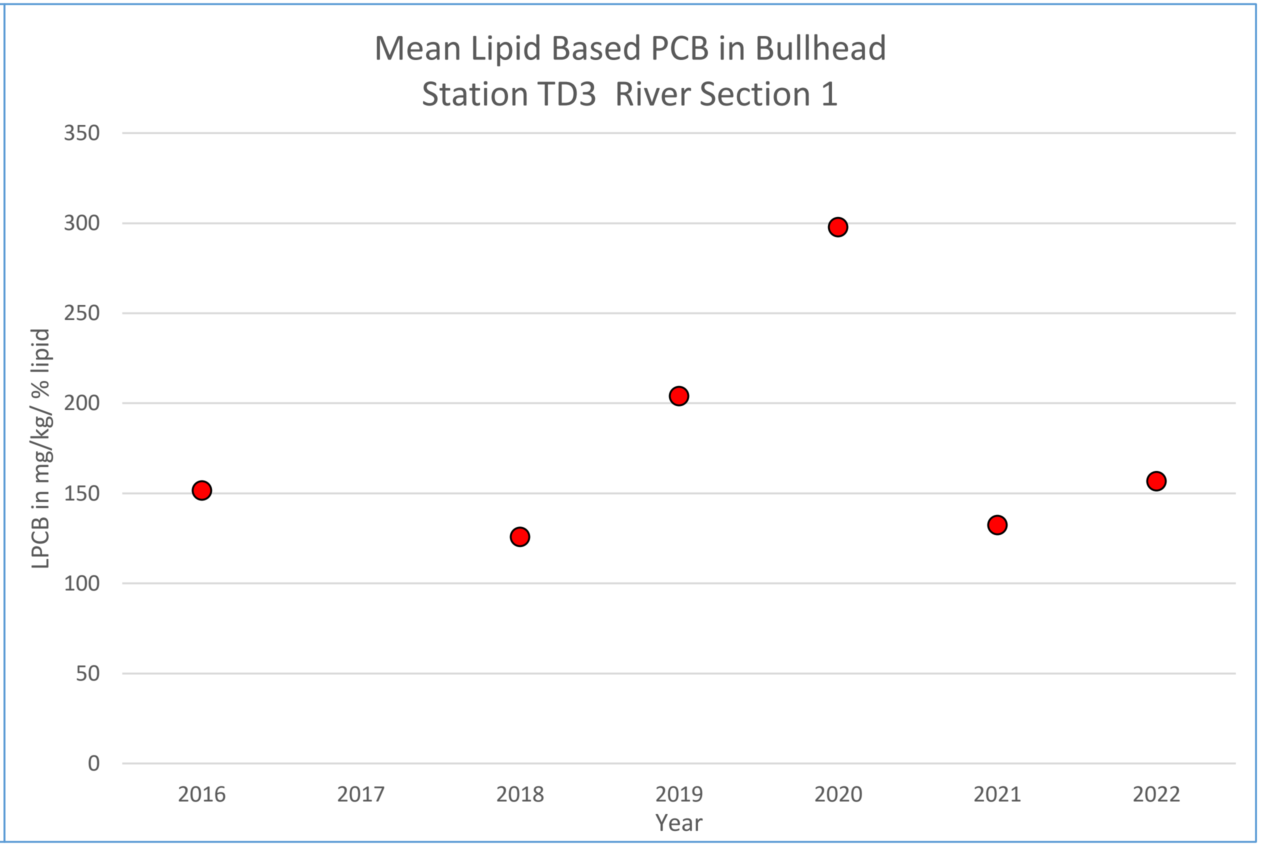
TD3 Bullhead Total PCB and Lipid Based PCB





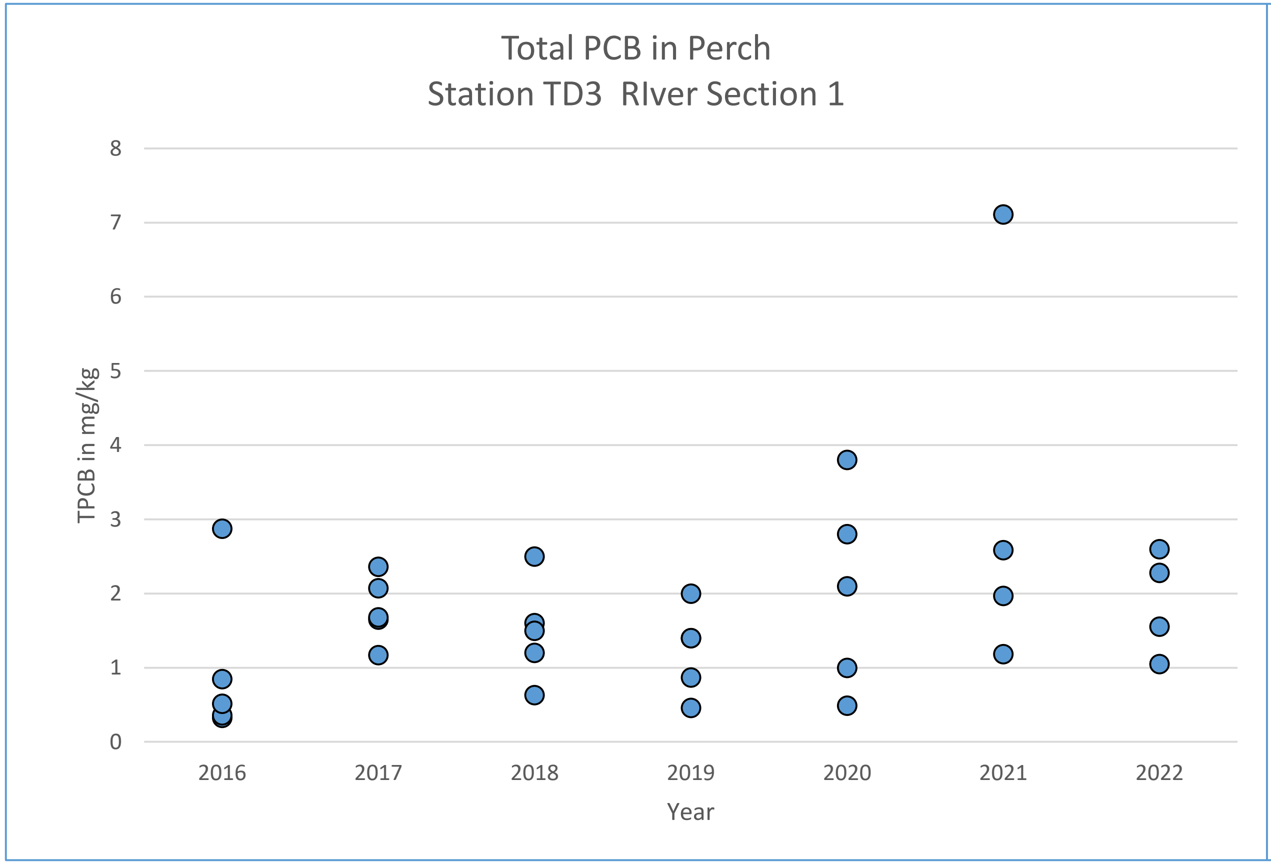
TD3 Bullhead Mean Total PCB and Mean Lipid Based PCB

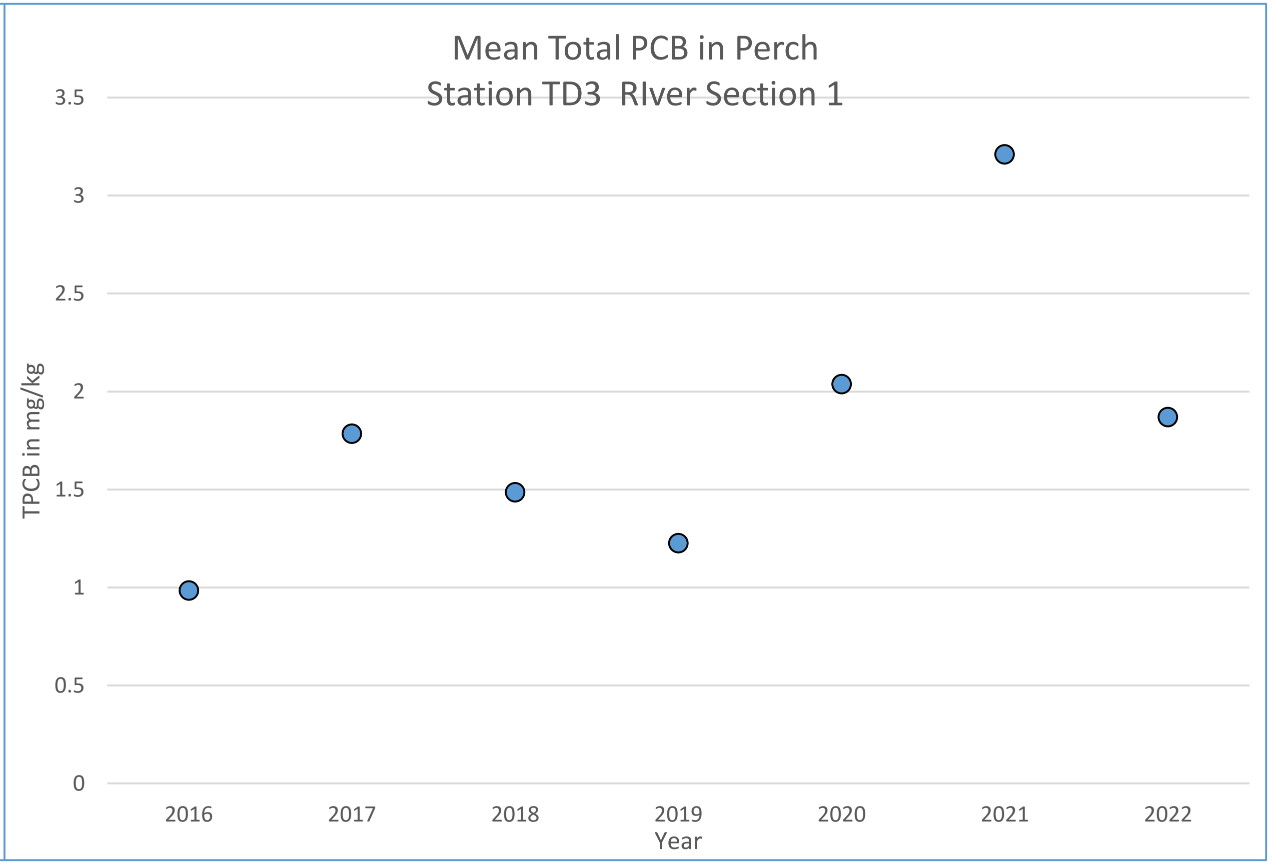




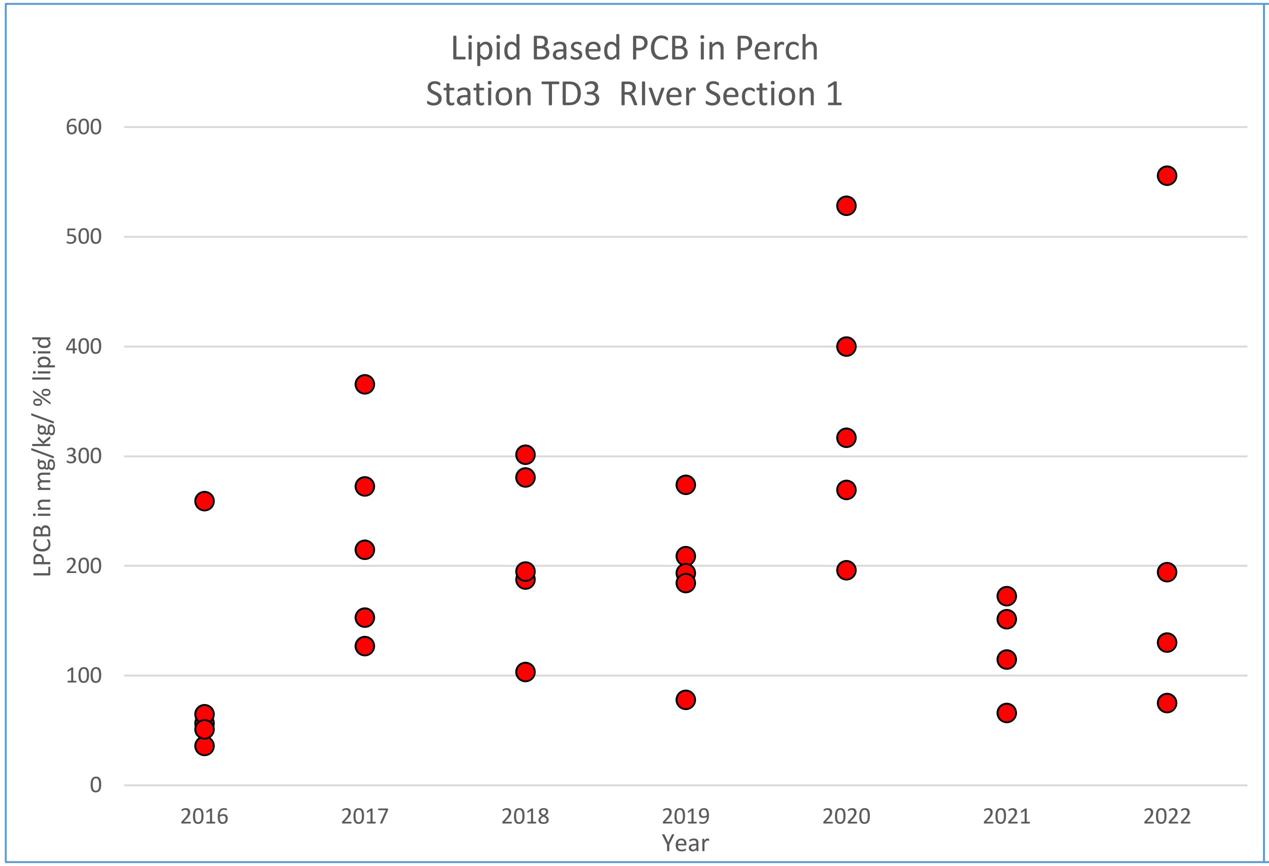
TD3 Perch Data

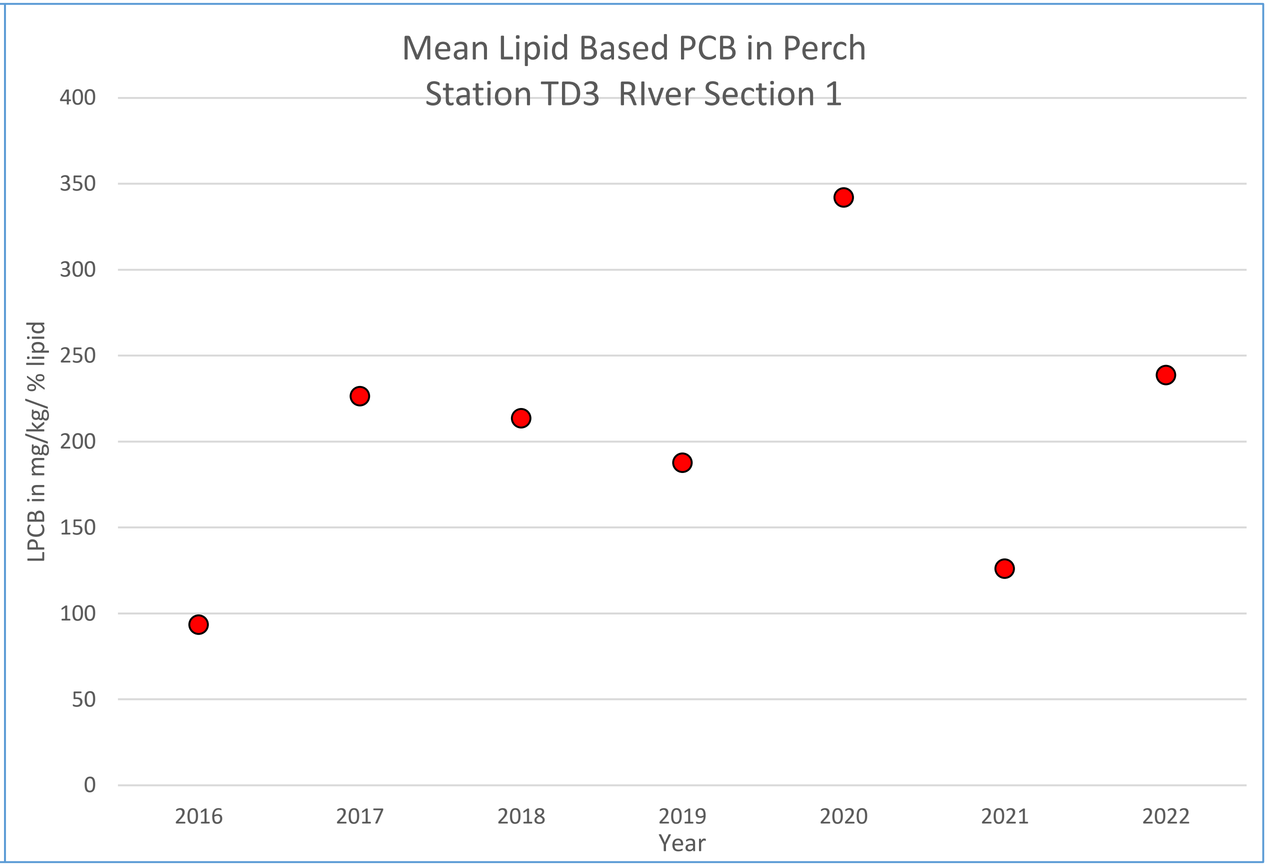
TD3 Perch Total PCB



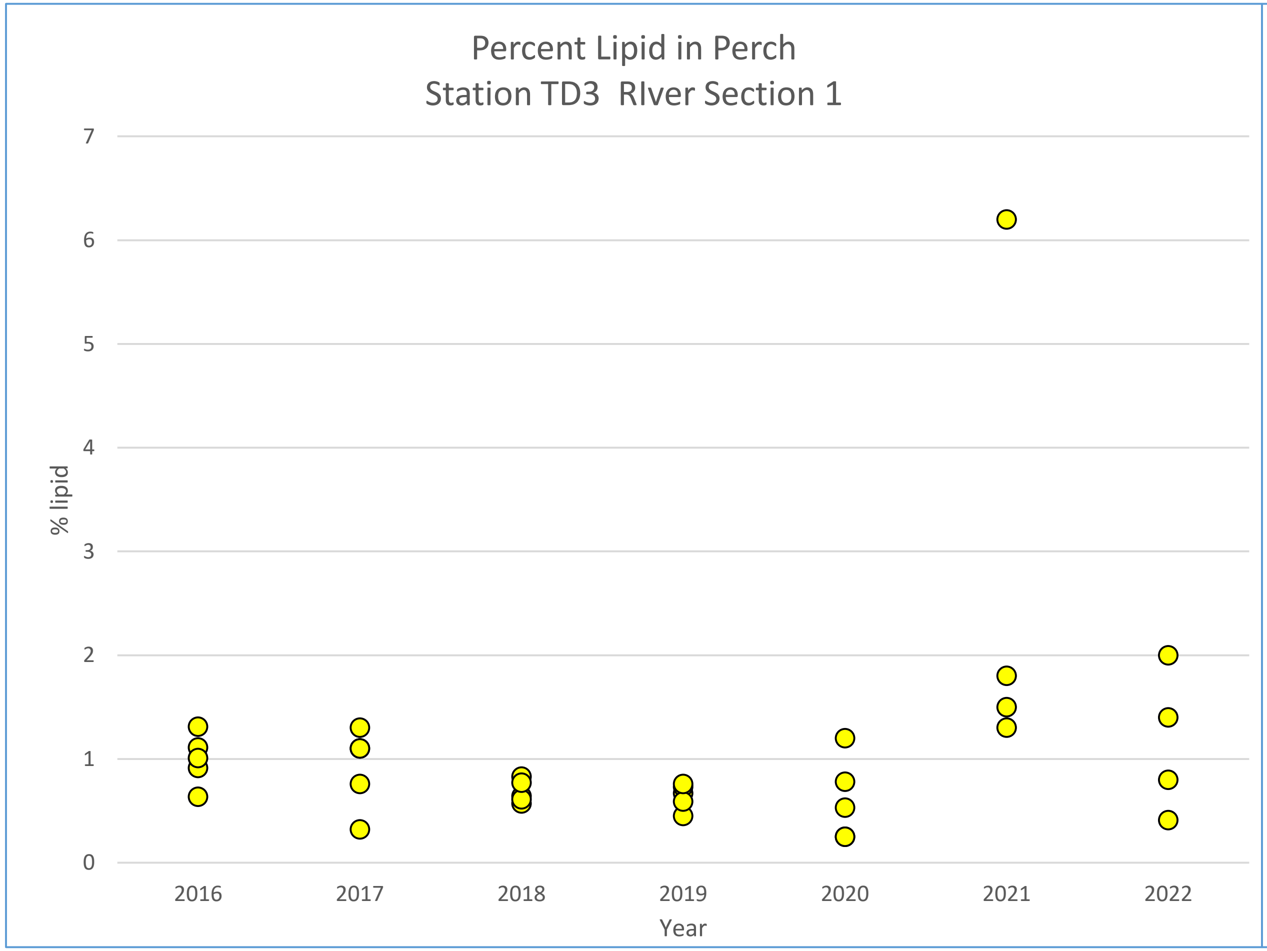


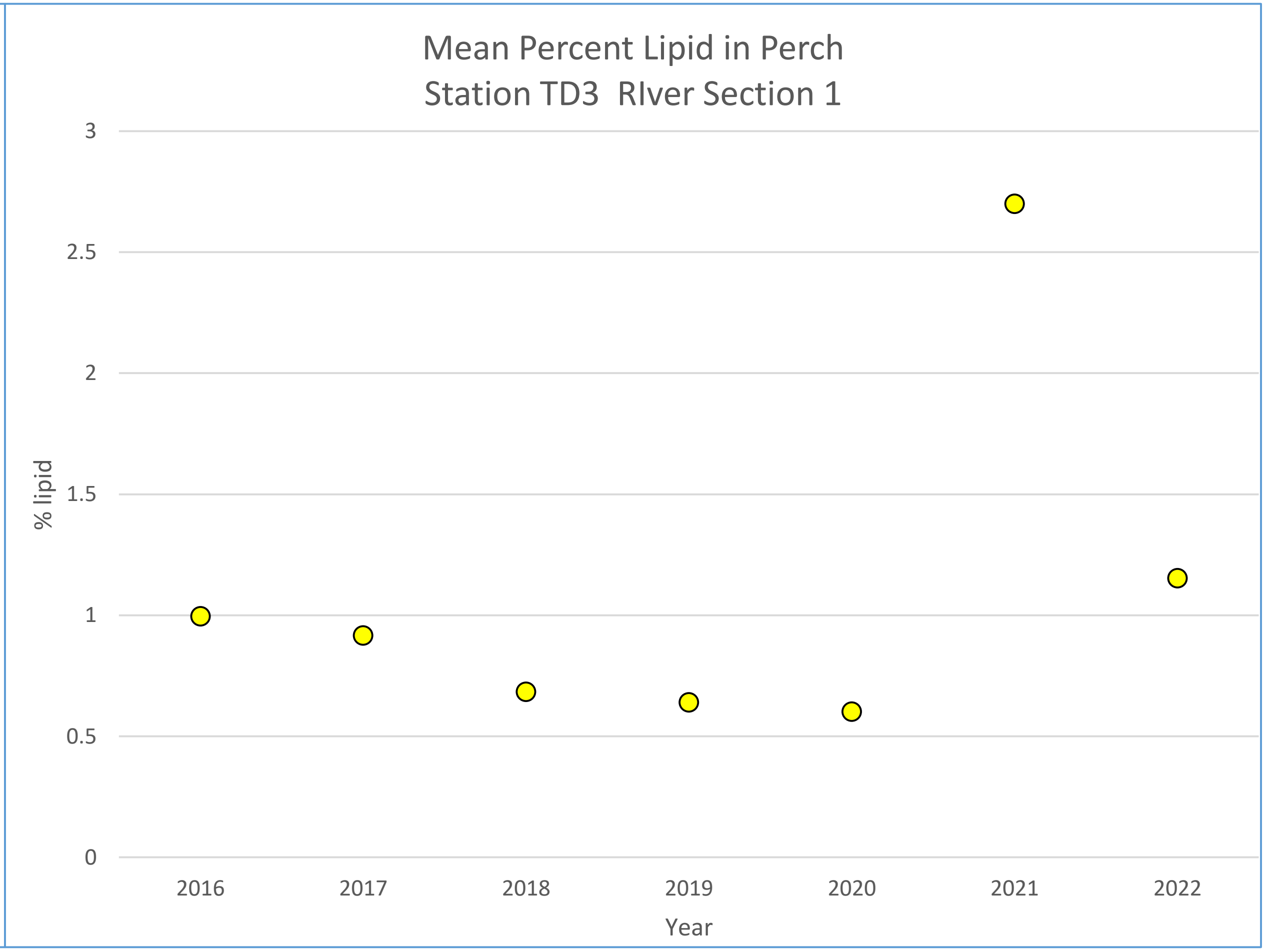
TD3 Perch Lipid Based PCB



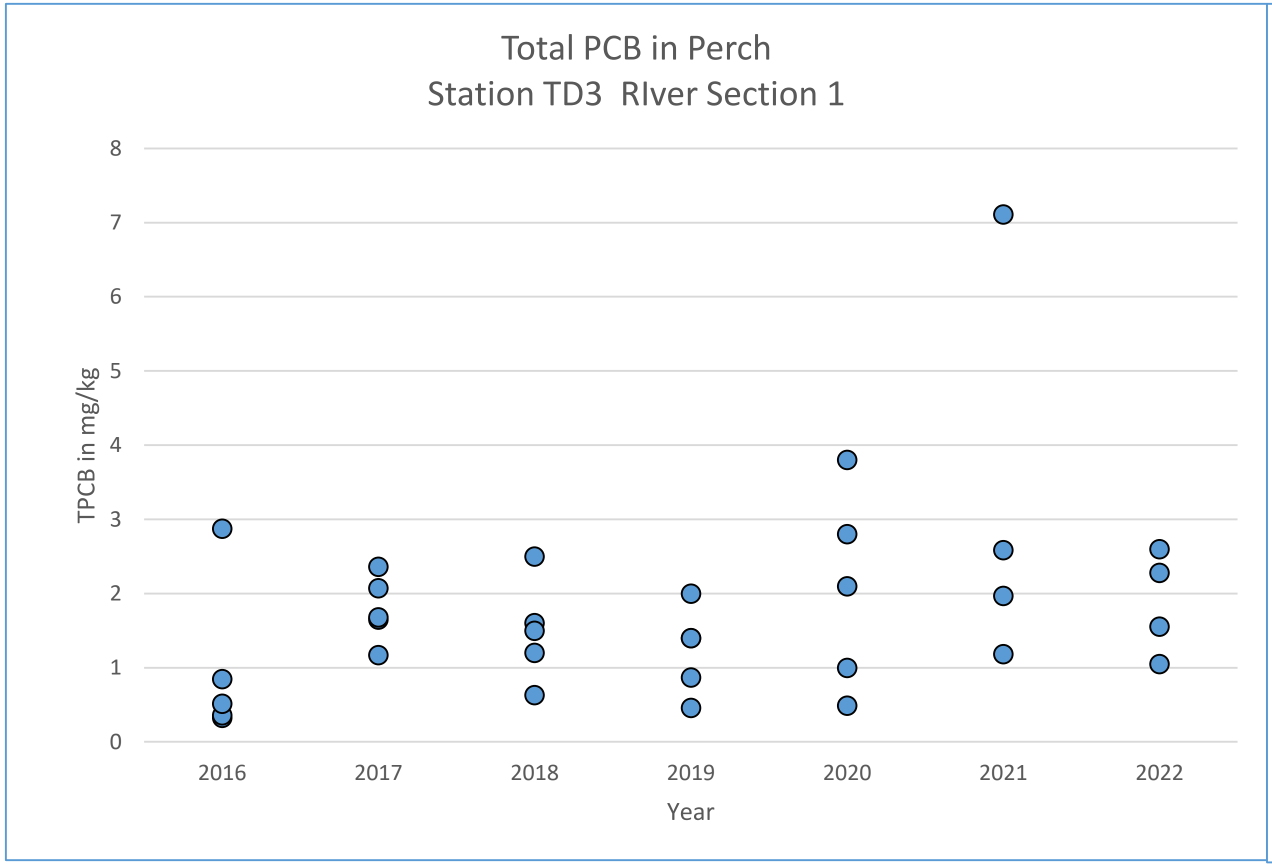


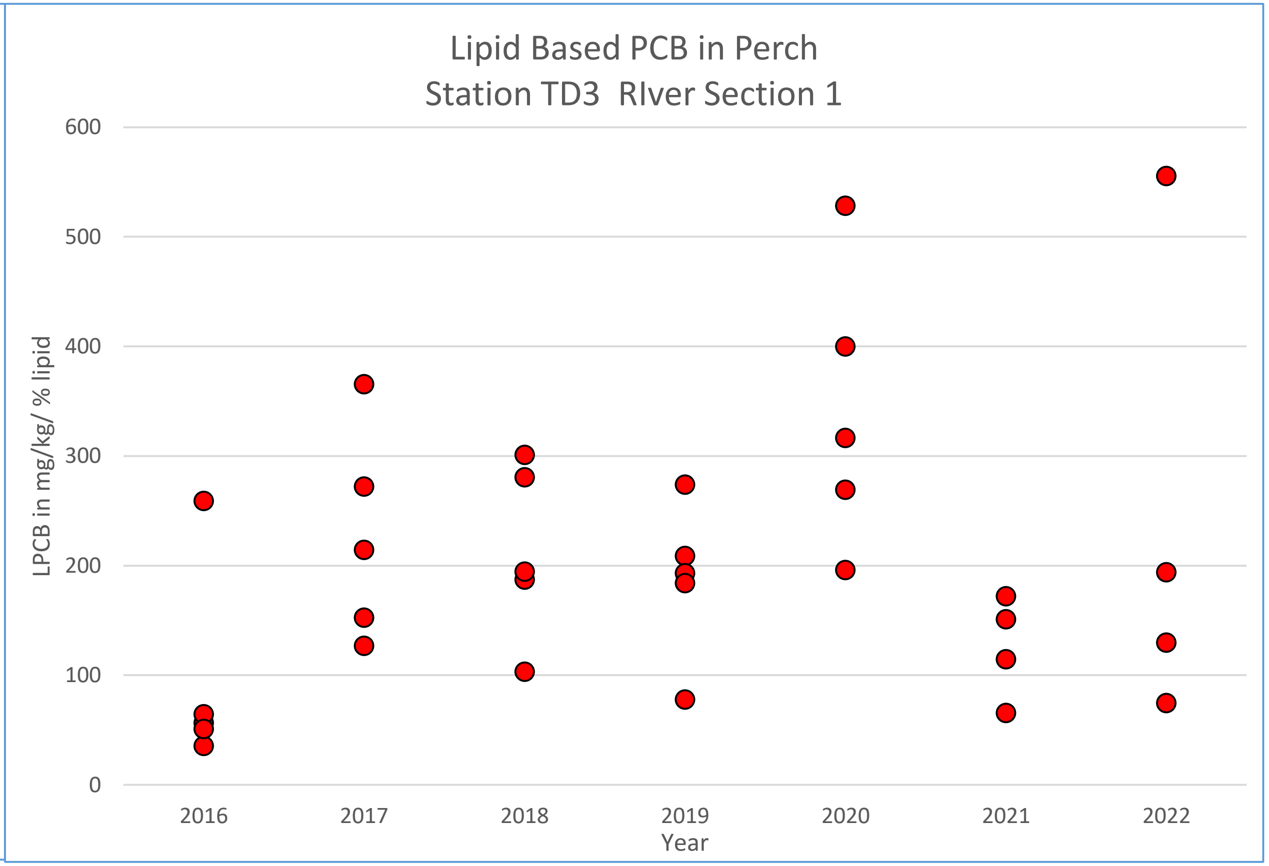
TD3 Perch Percent Lipid



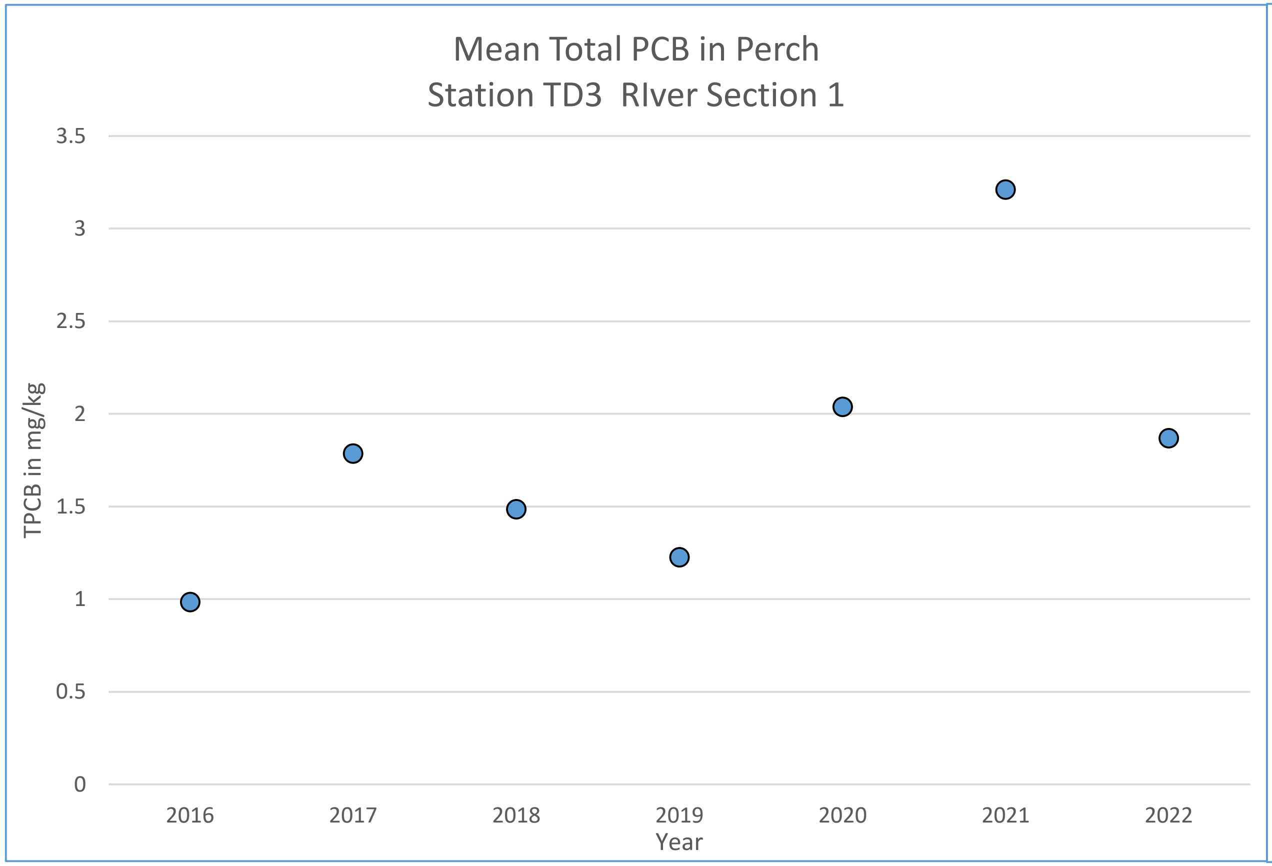


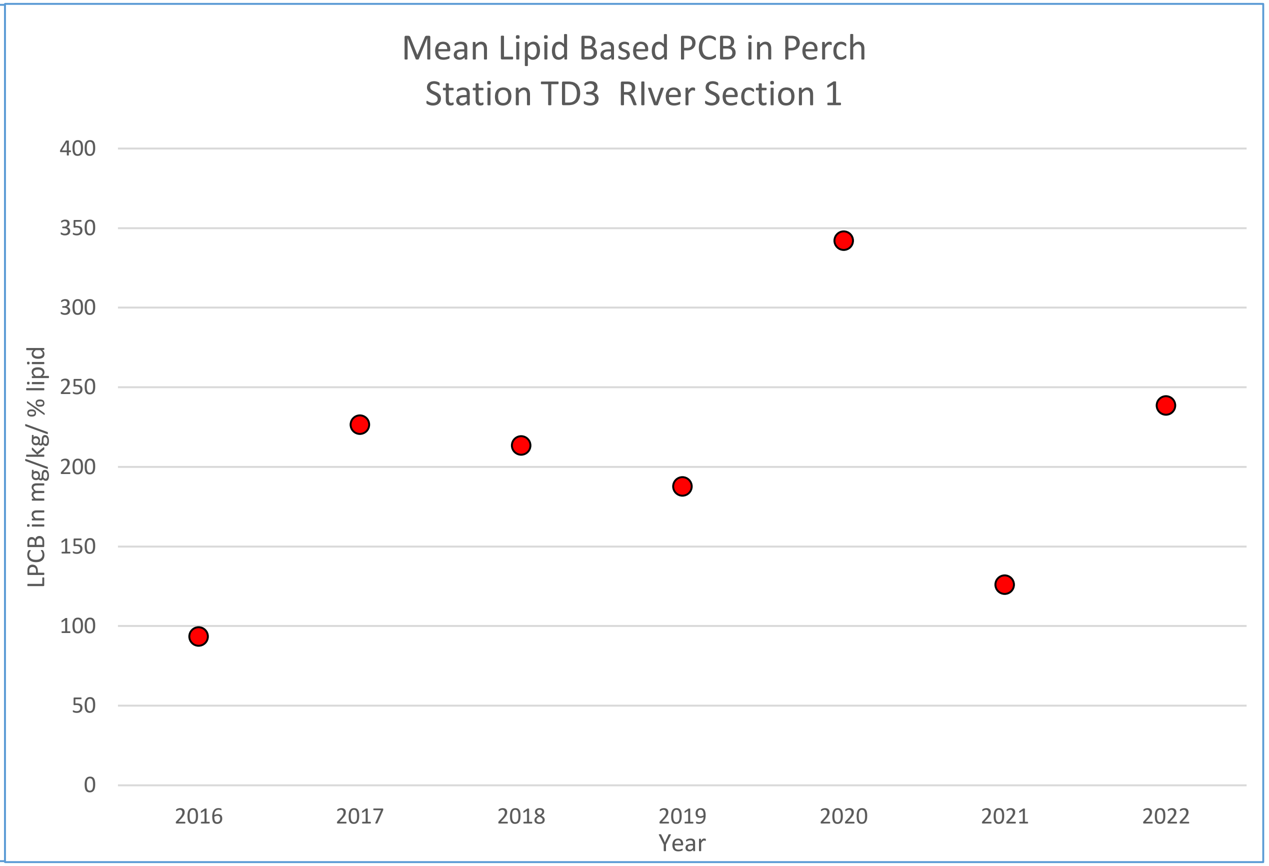
TD3 Perch Total PCB and Lipid Based PCB





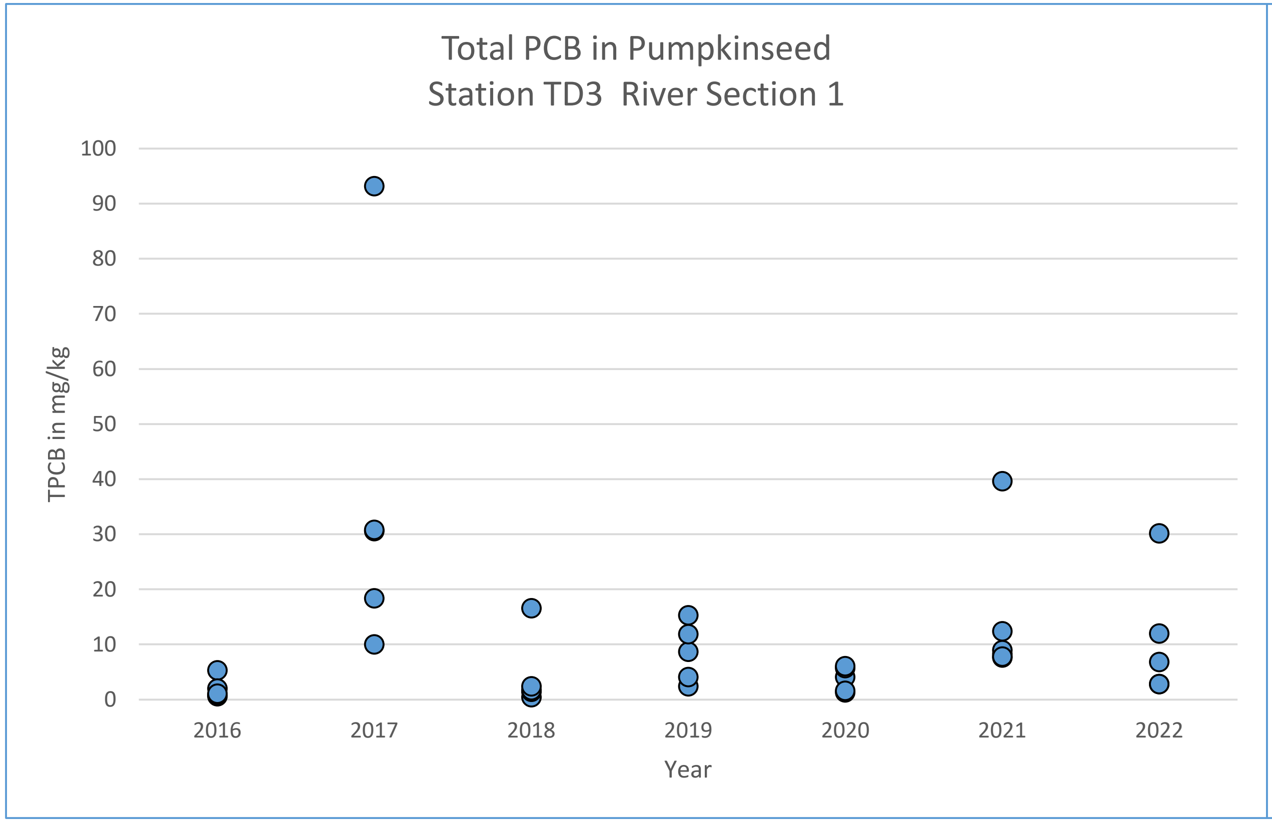
TD3 Perch Mean Total PCB and Mean Lipid Based PCB

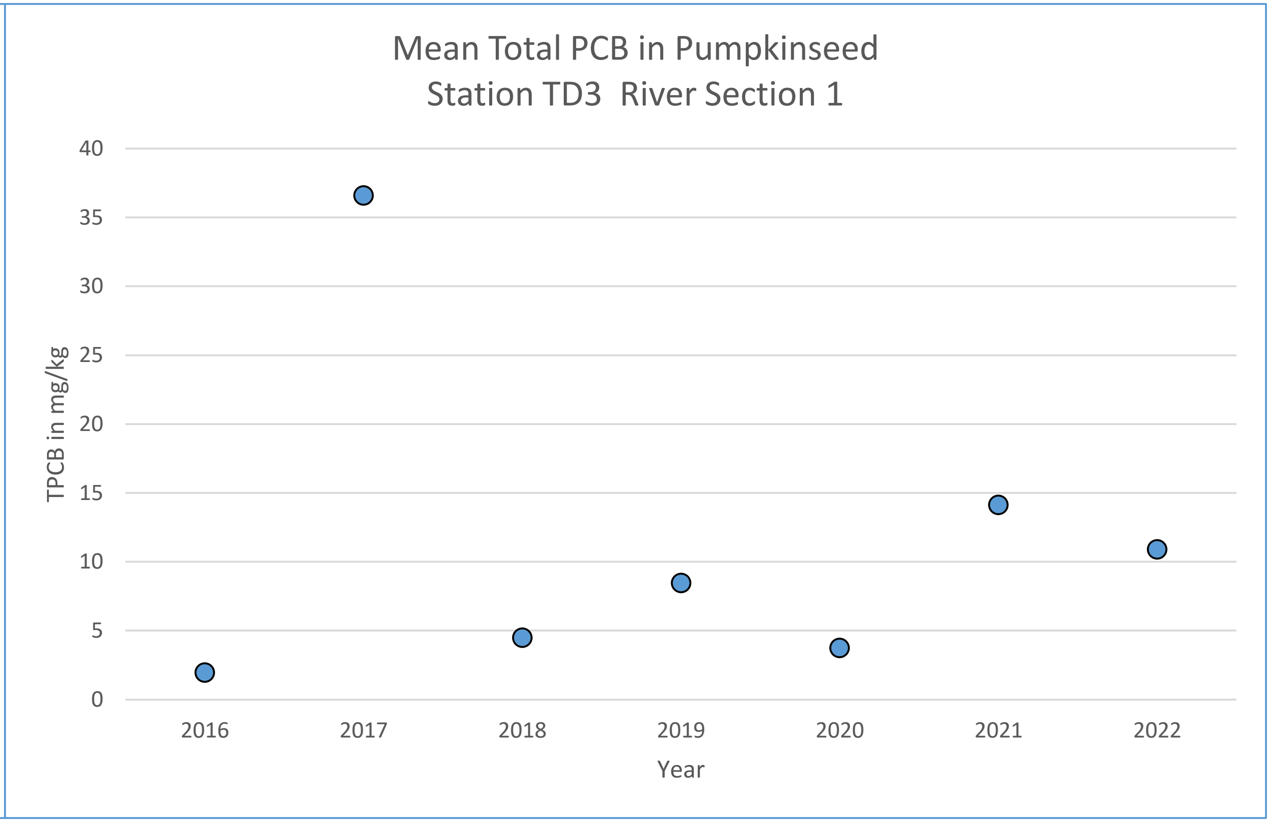




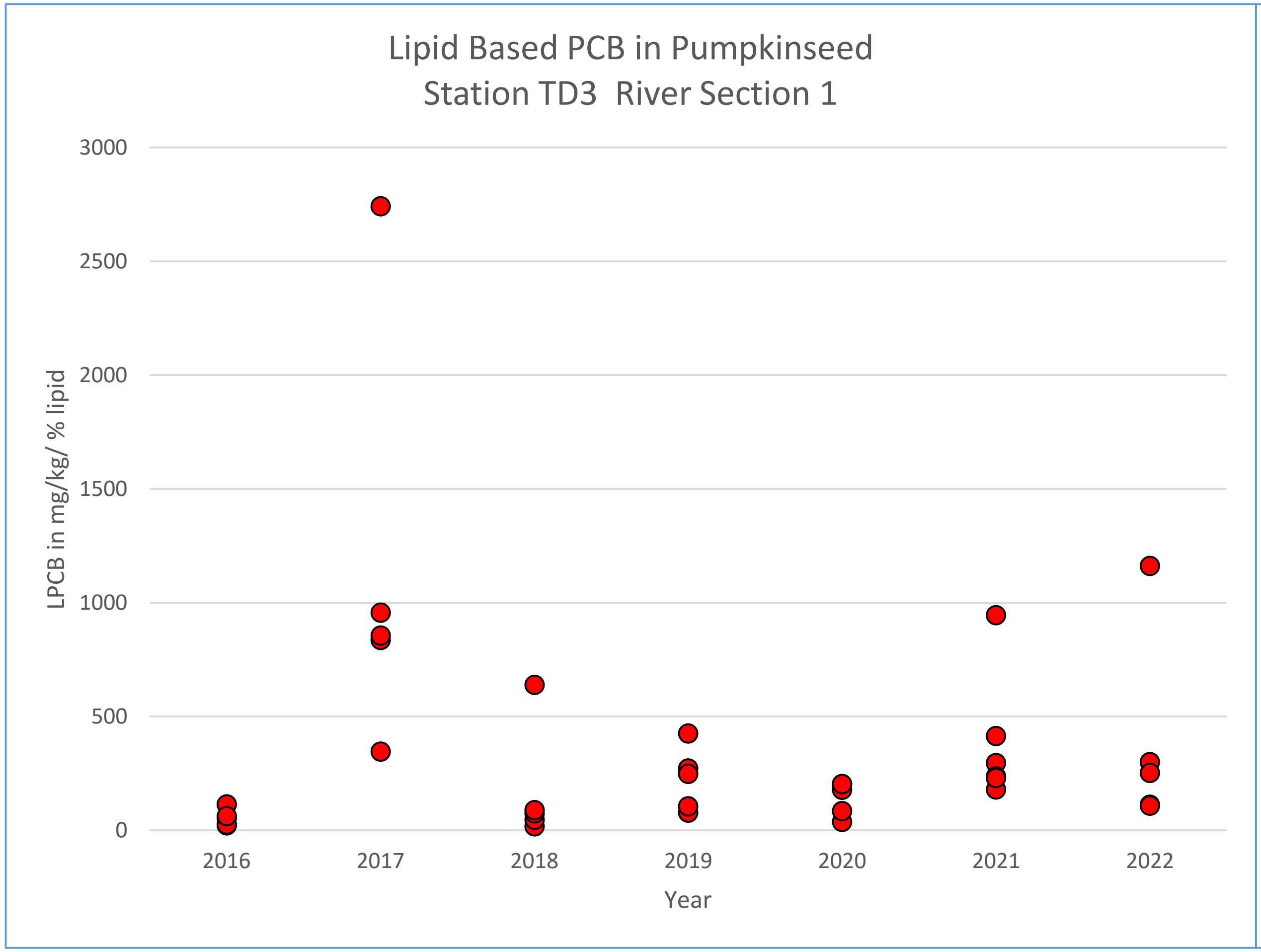
TD3 Pumpkinseed Data

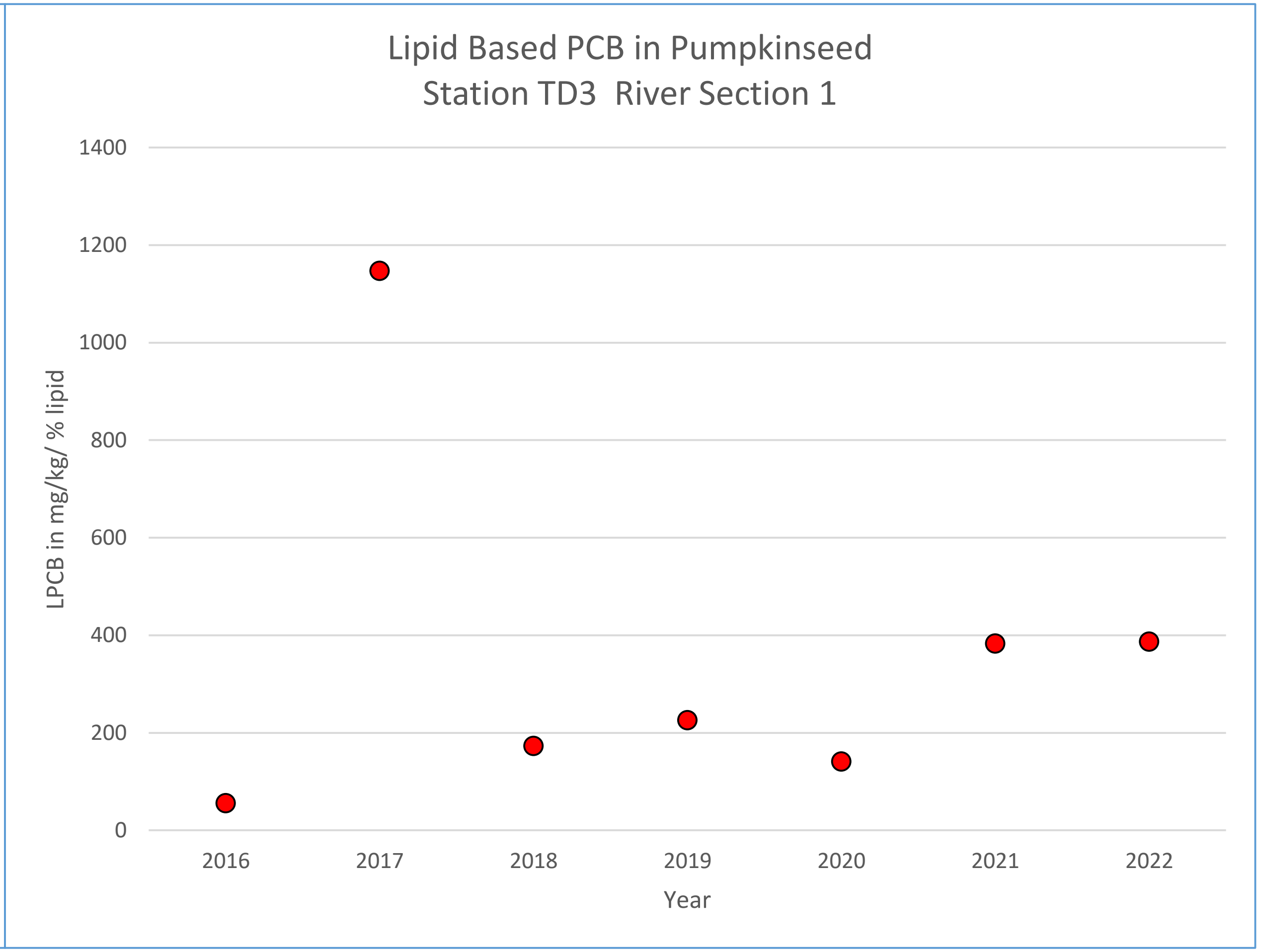
TD3 Pumpkinseed Total PCB



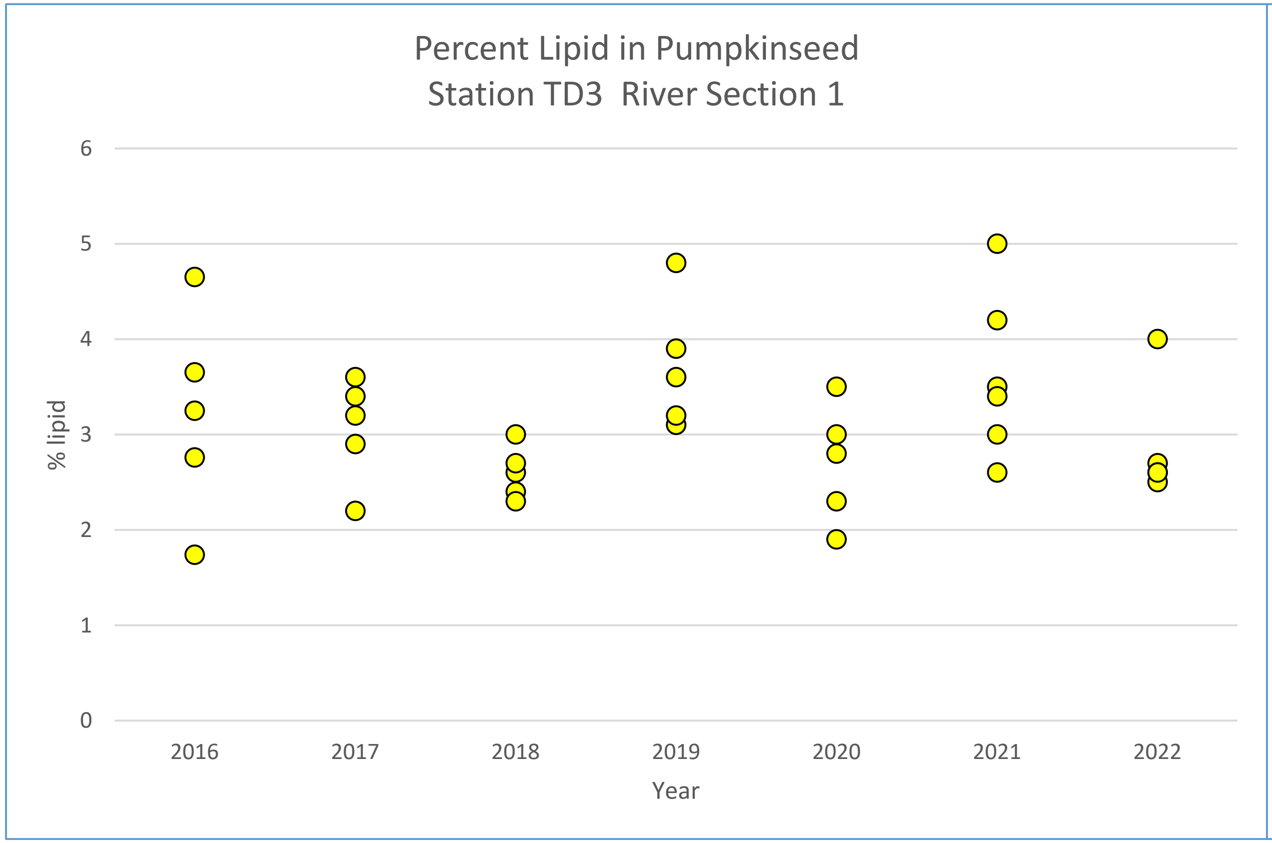


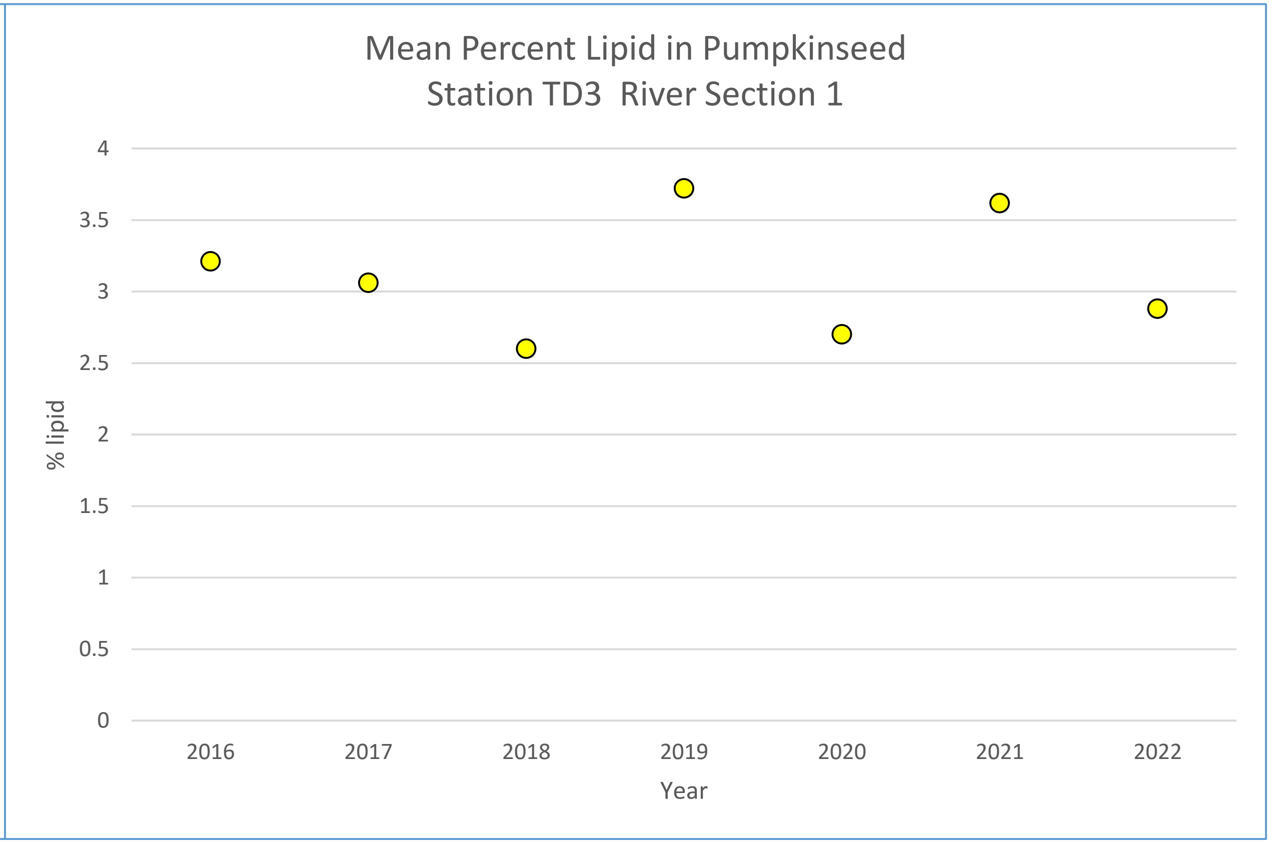
TD3 Pumpkinseed Lipid Based PCB



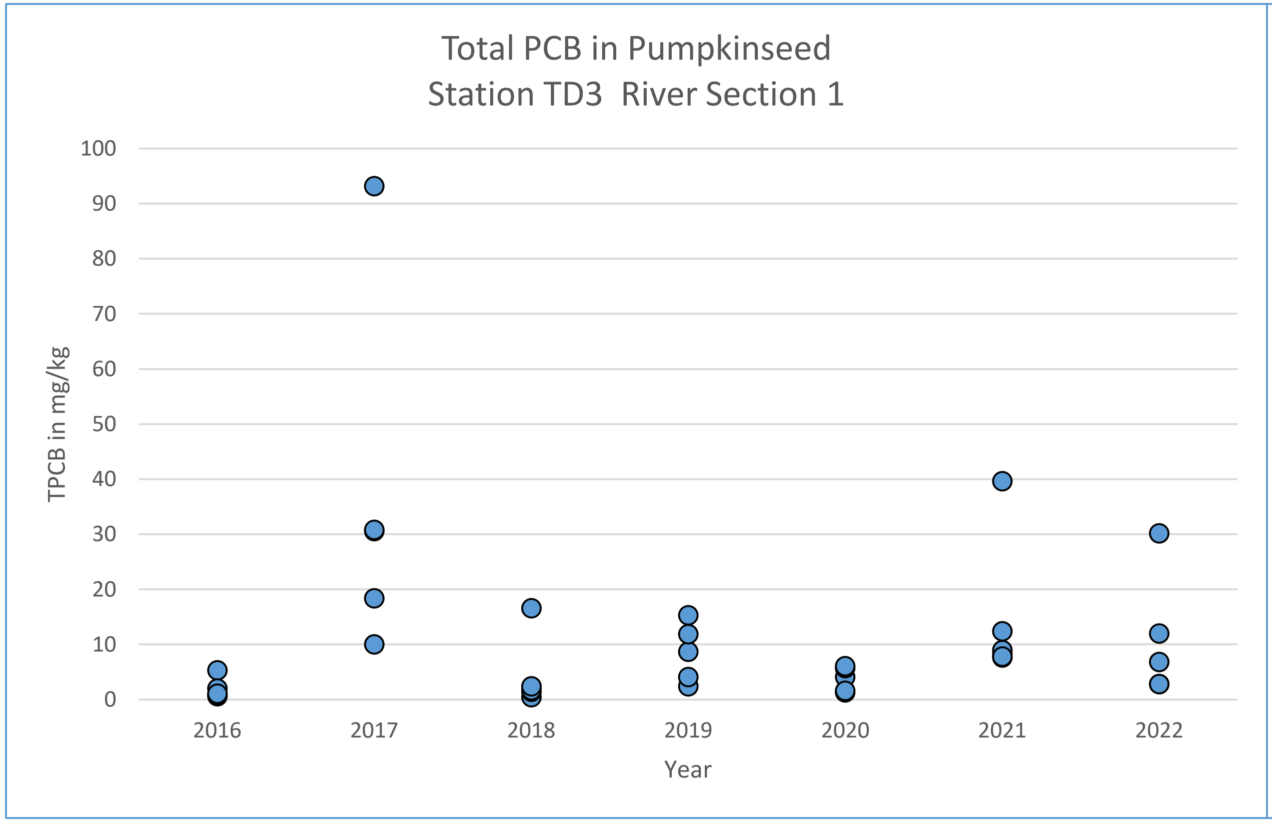


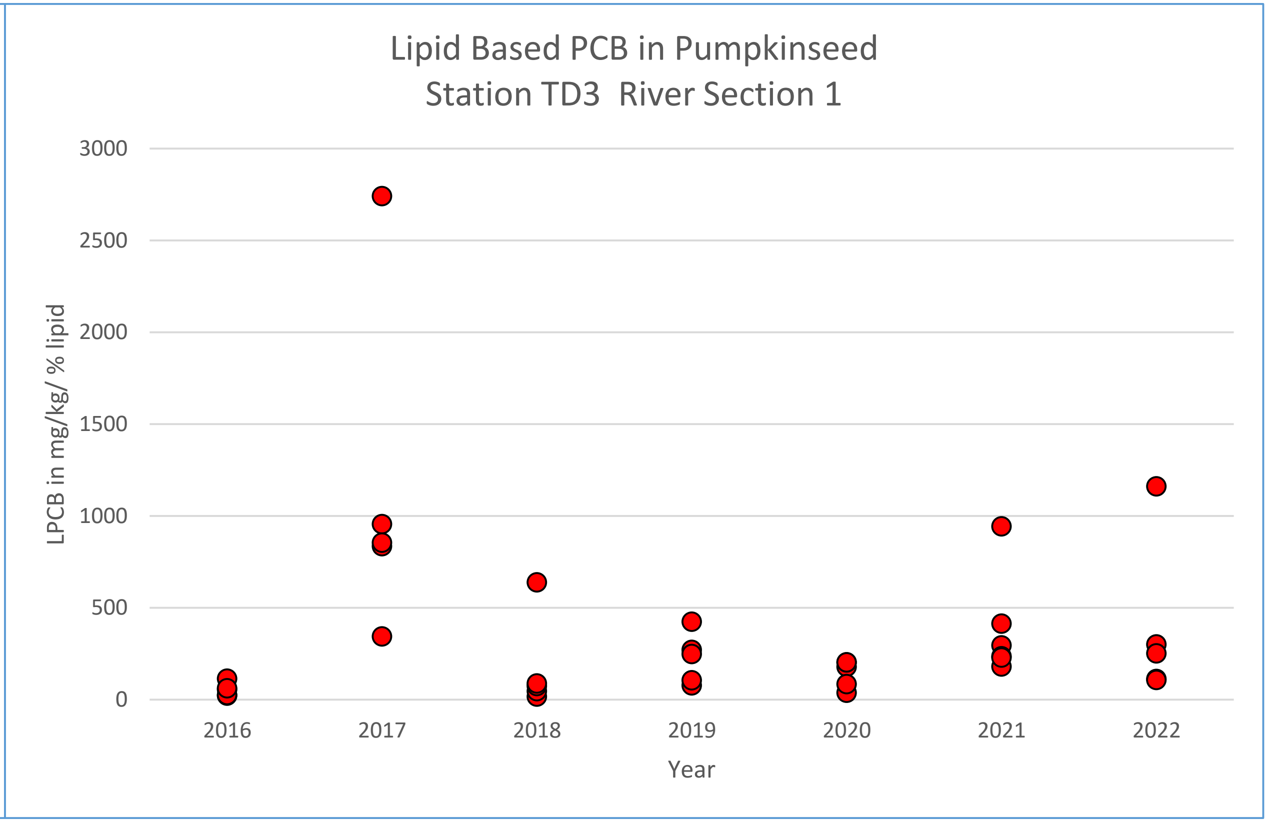
TD3 Pumpkinseed Percent Lipid



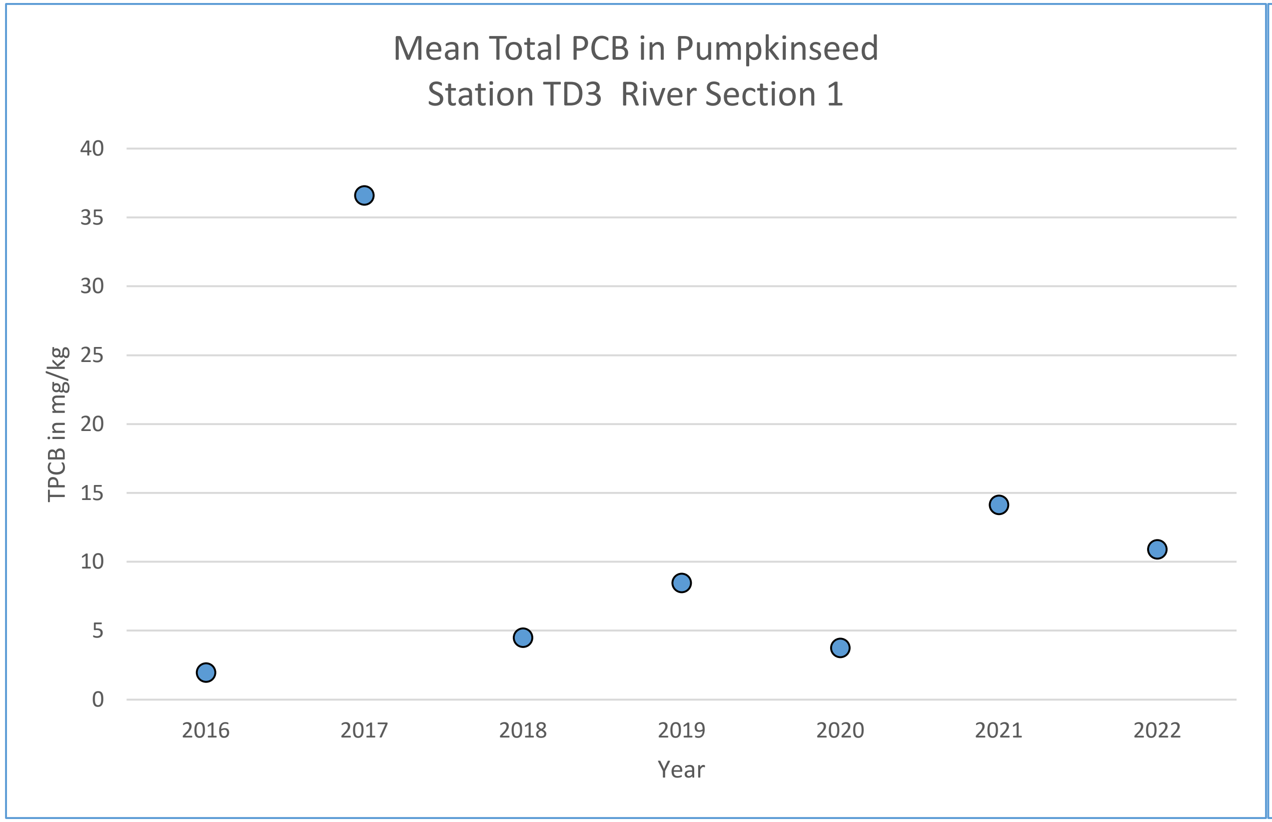


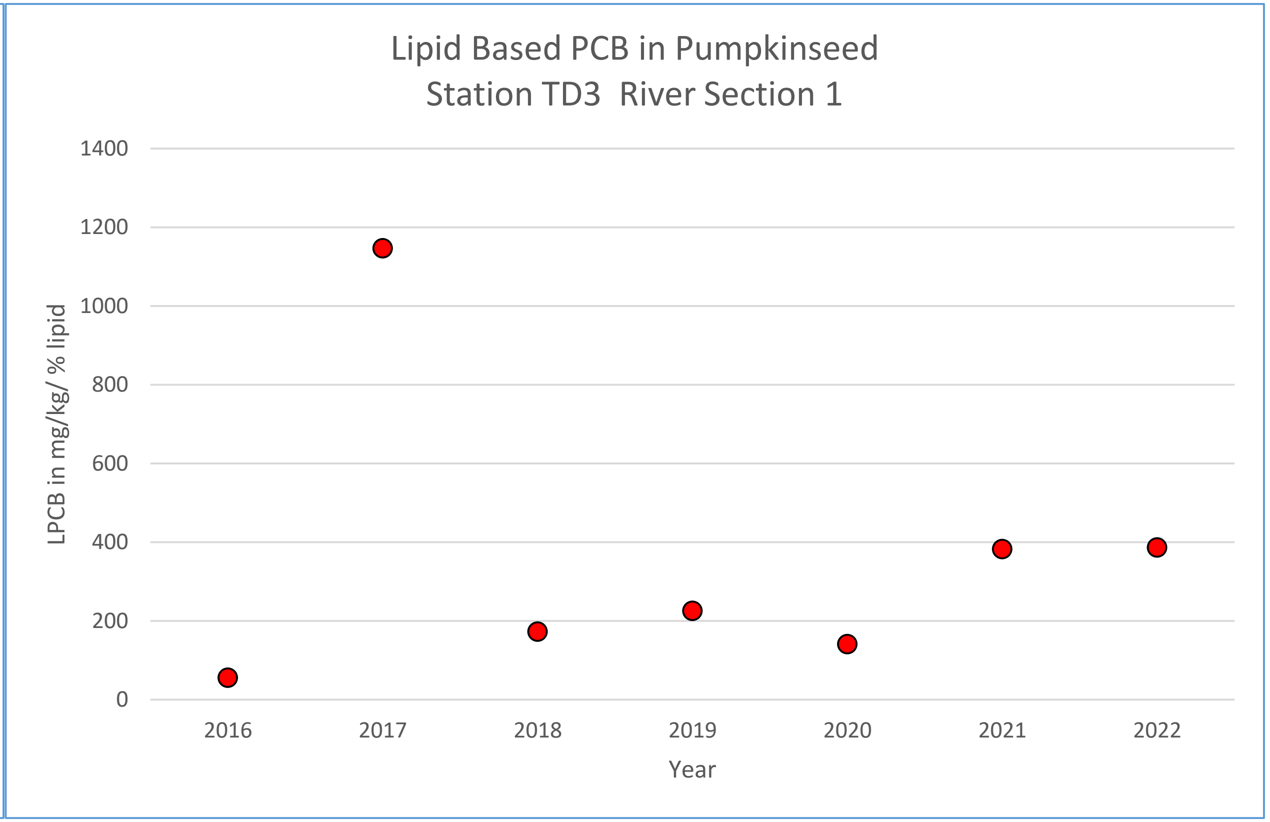
TD3 Pumpkinseed Total PCB and Lipid Based PCB





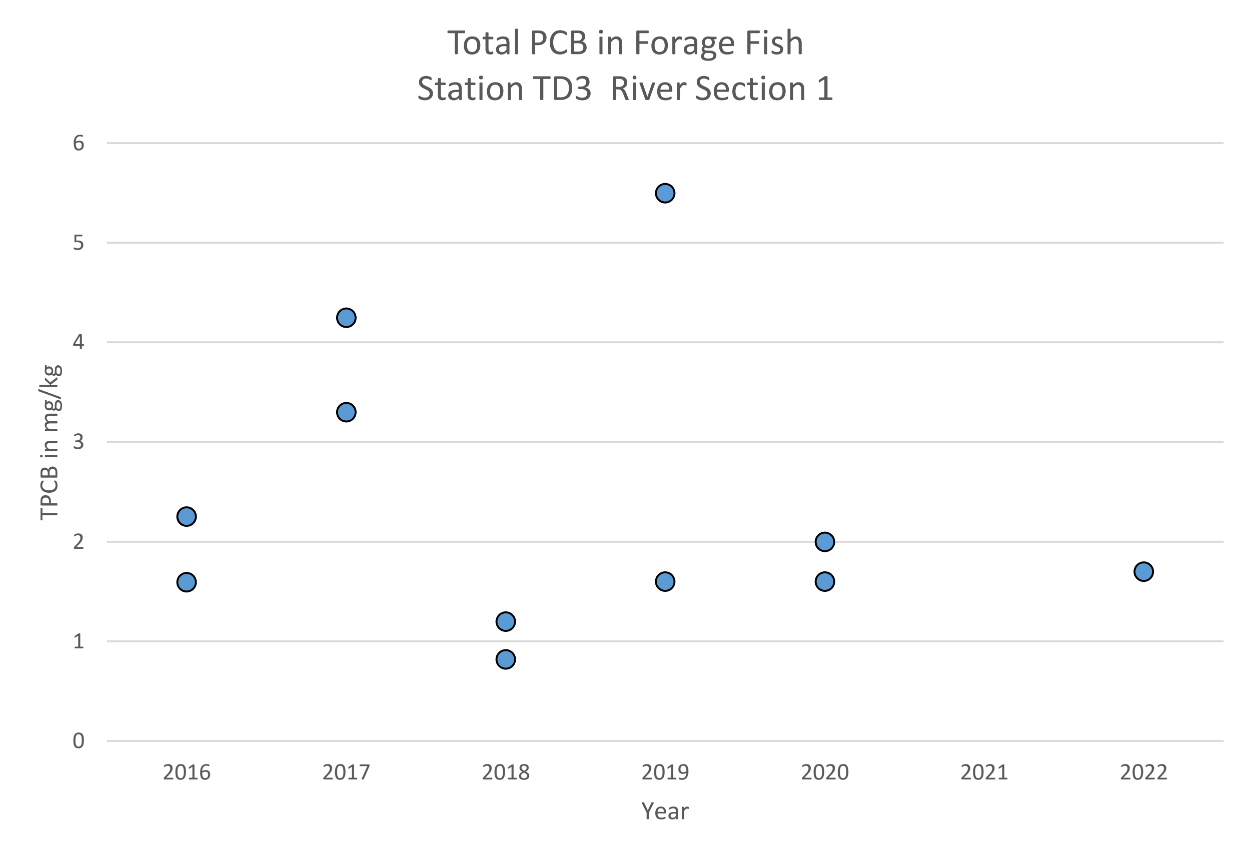
TD3 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

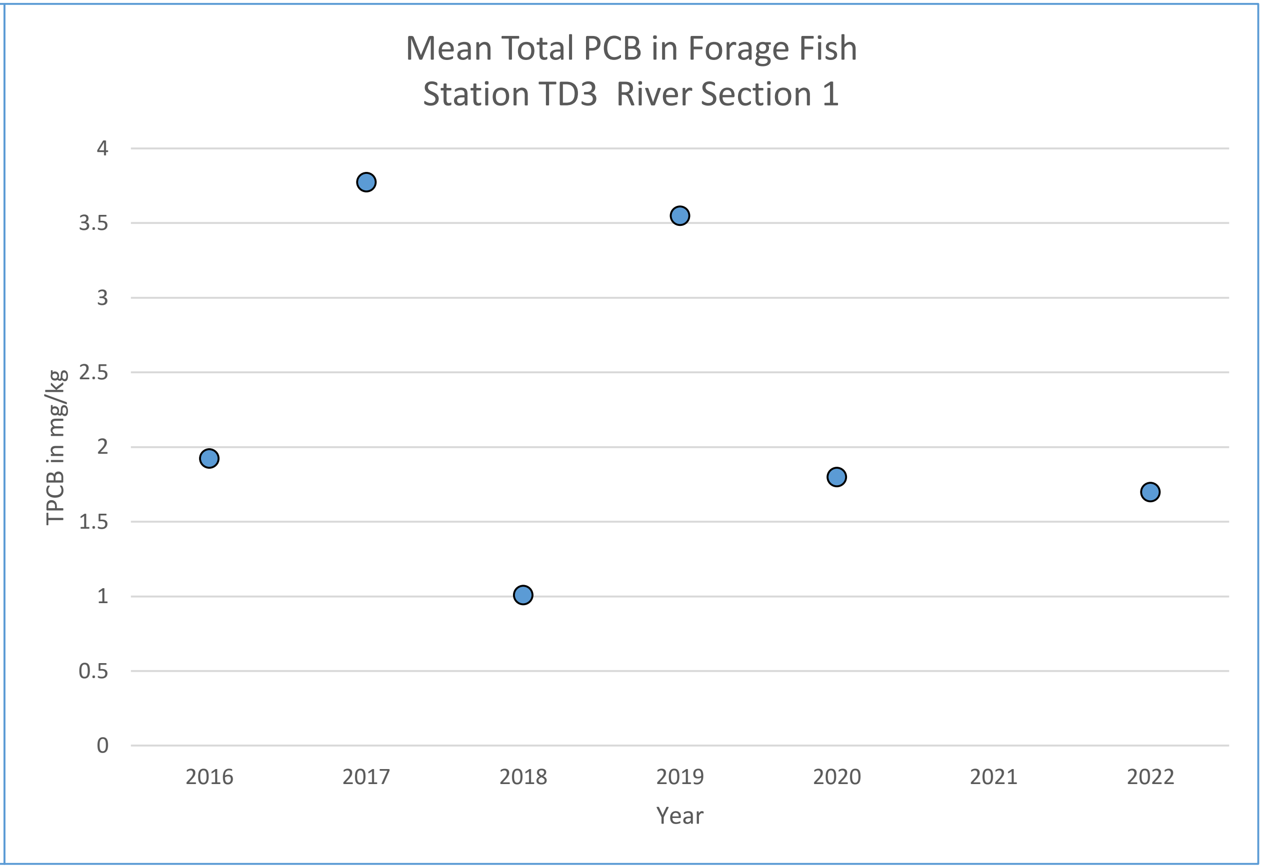




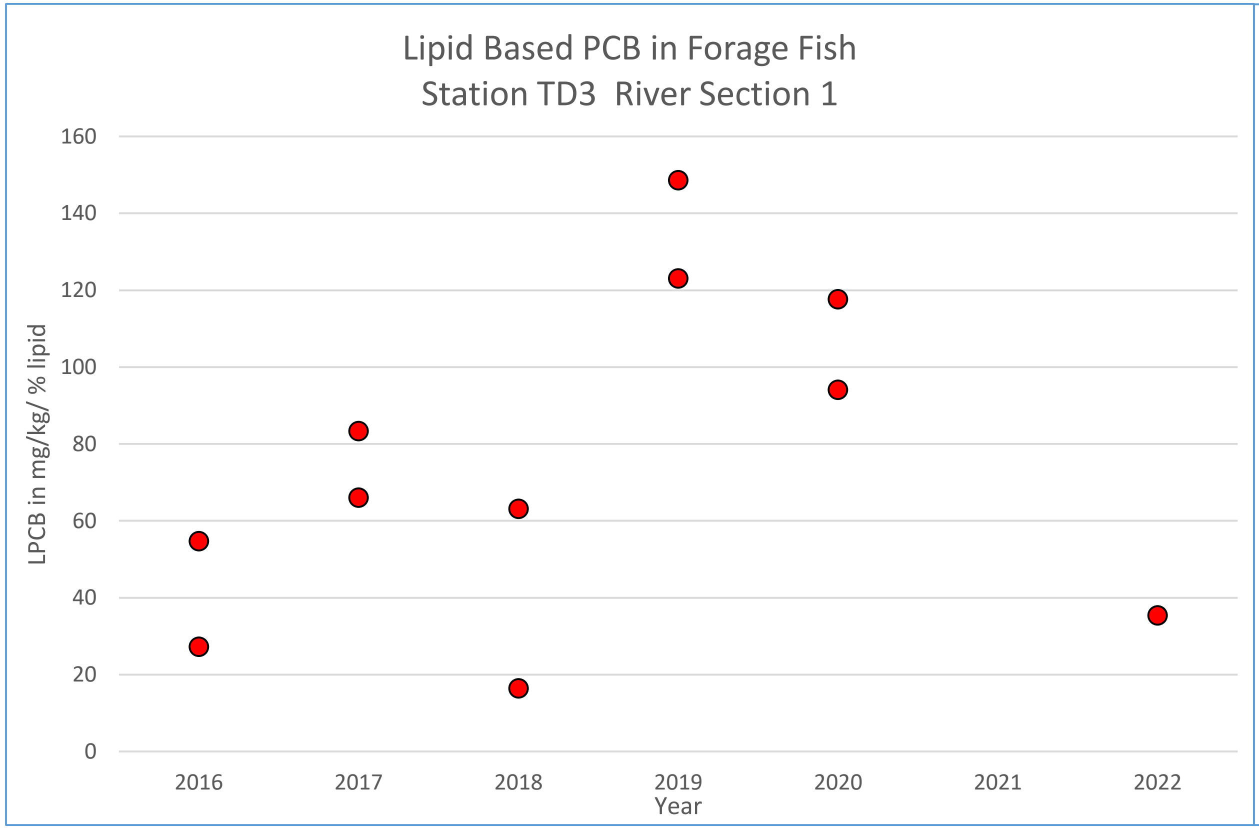
TD3 Forage Fish Data

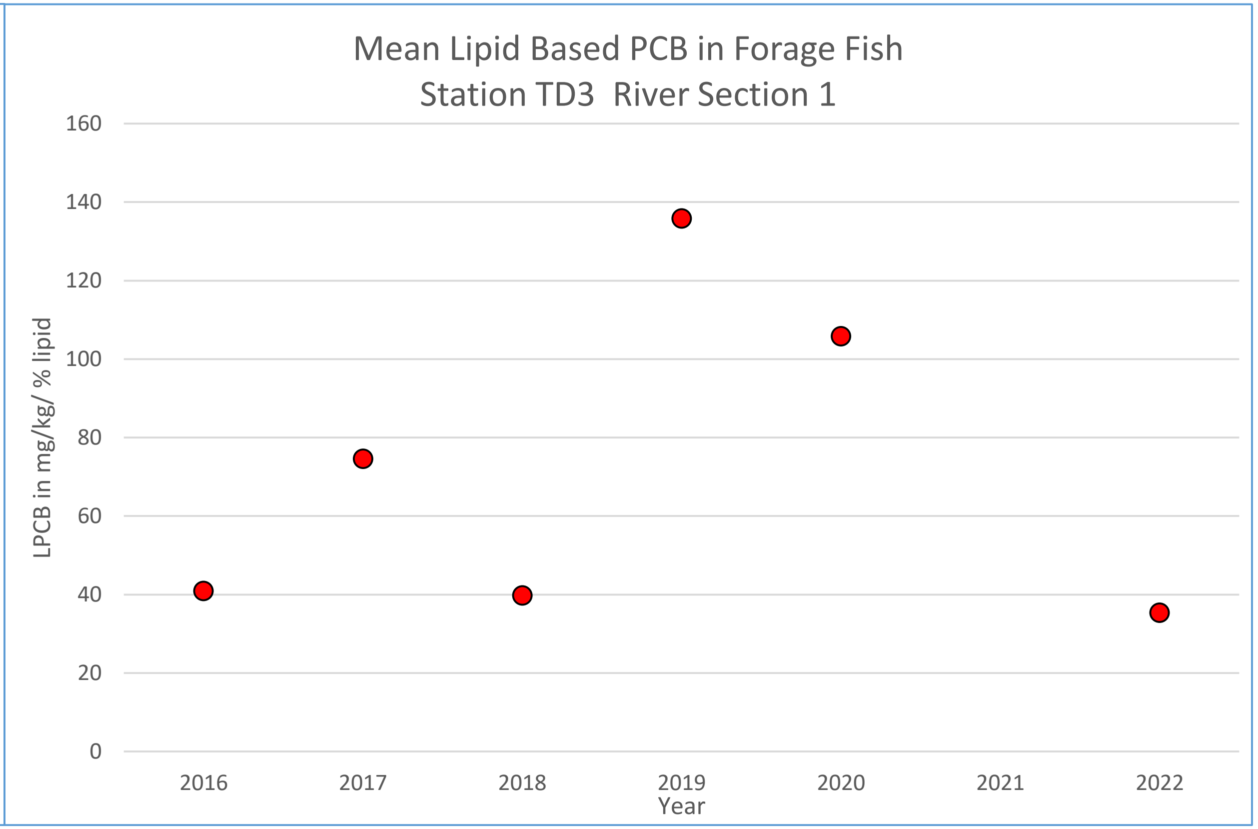
TD3 Forage Fish Total PCB



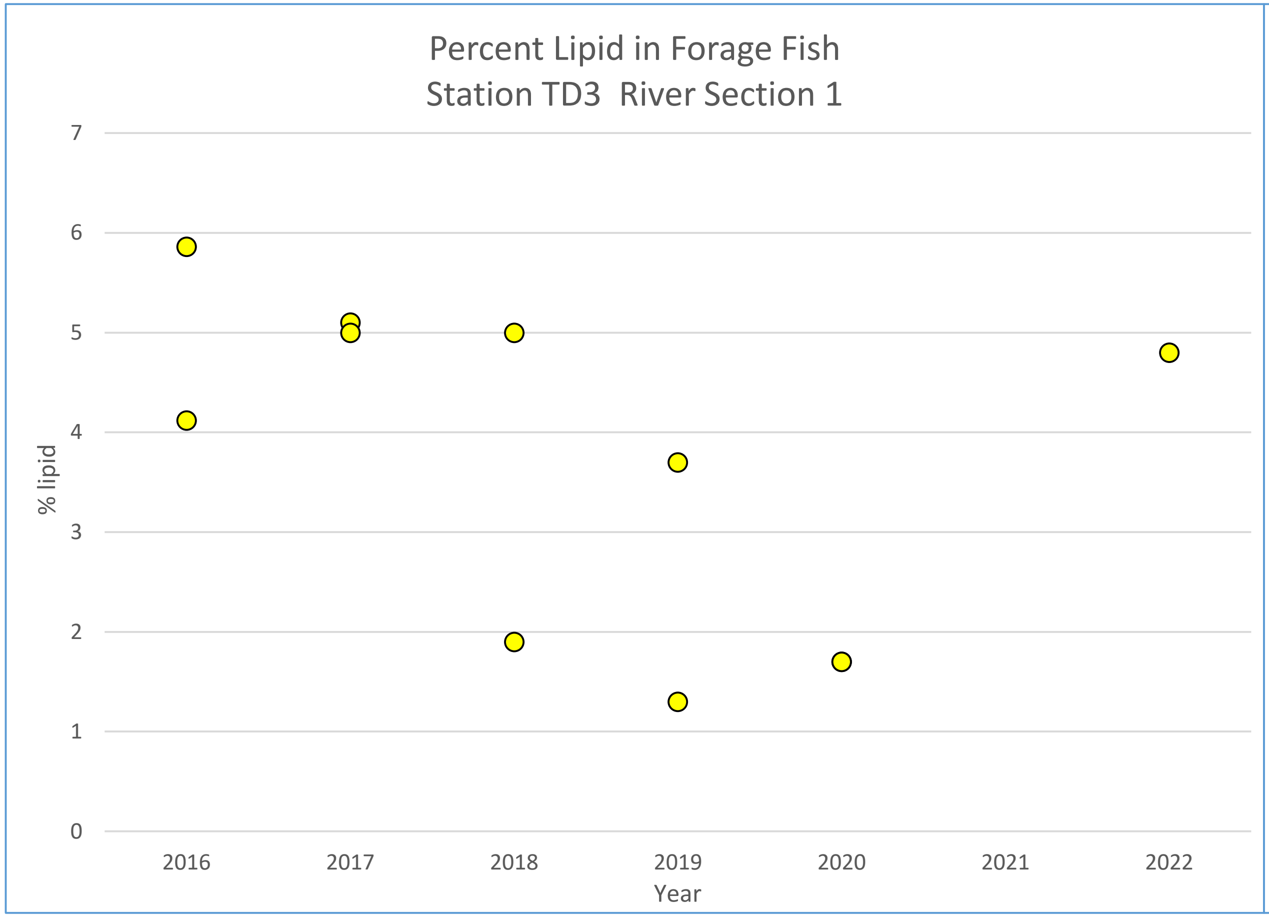


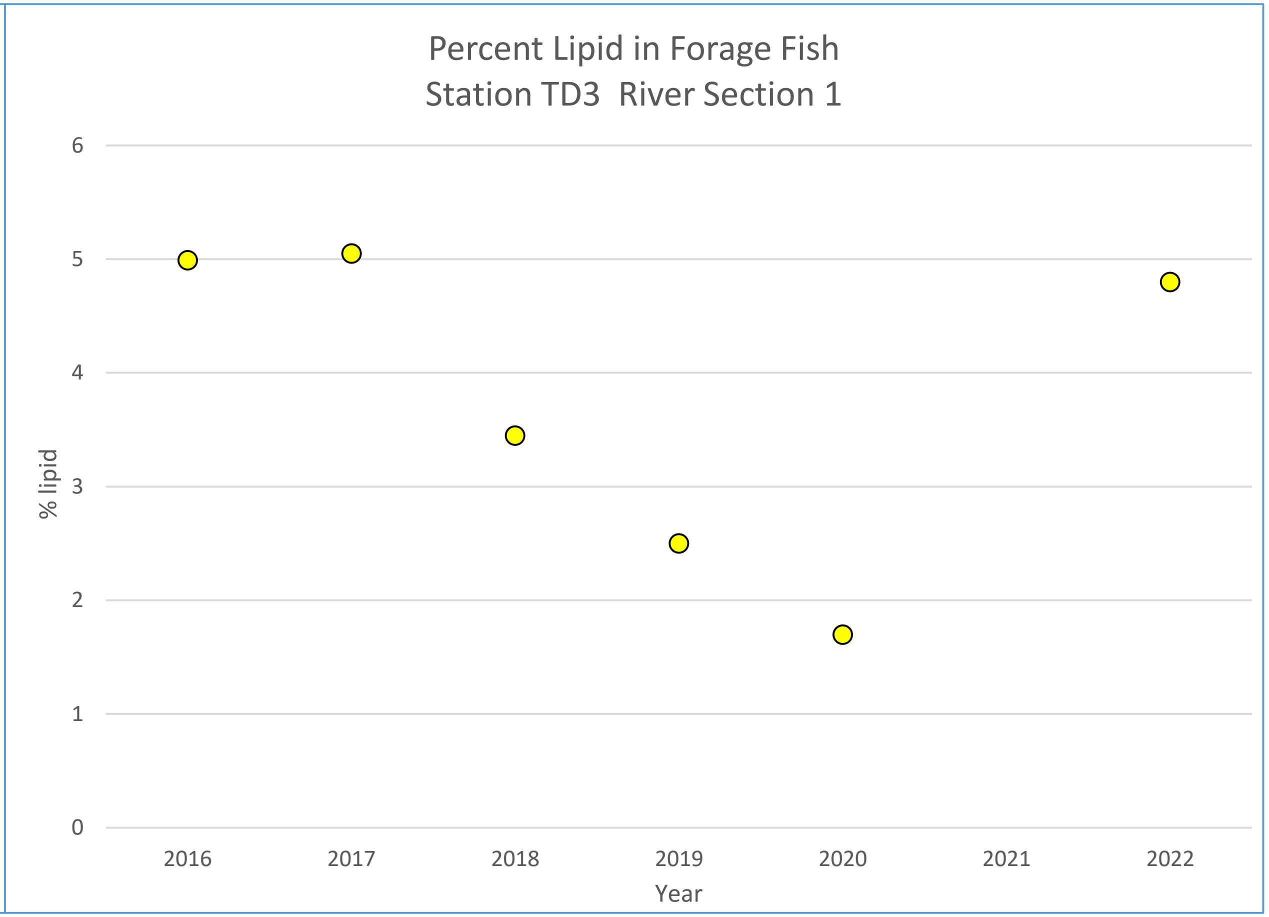
TD3 Forage Fish Lipid Based PCB



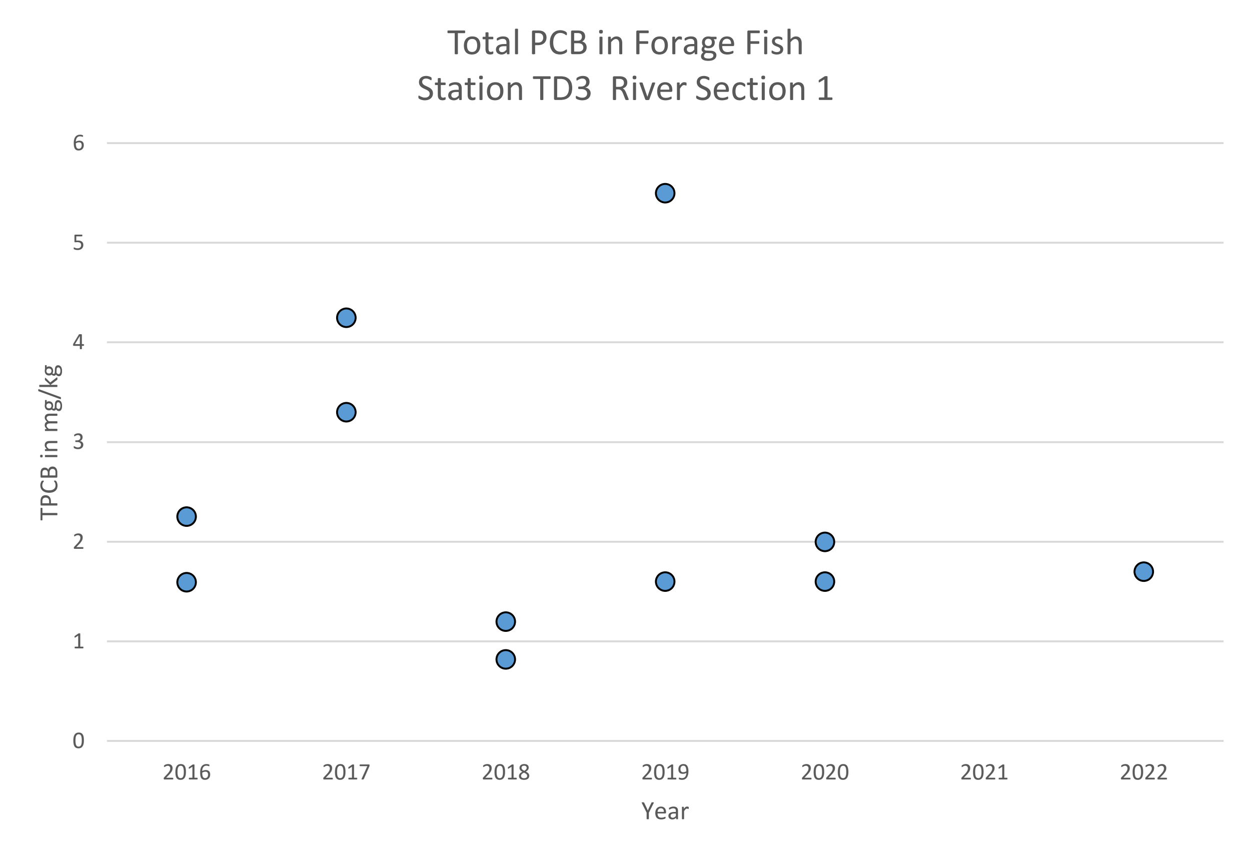


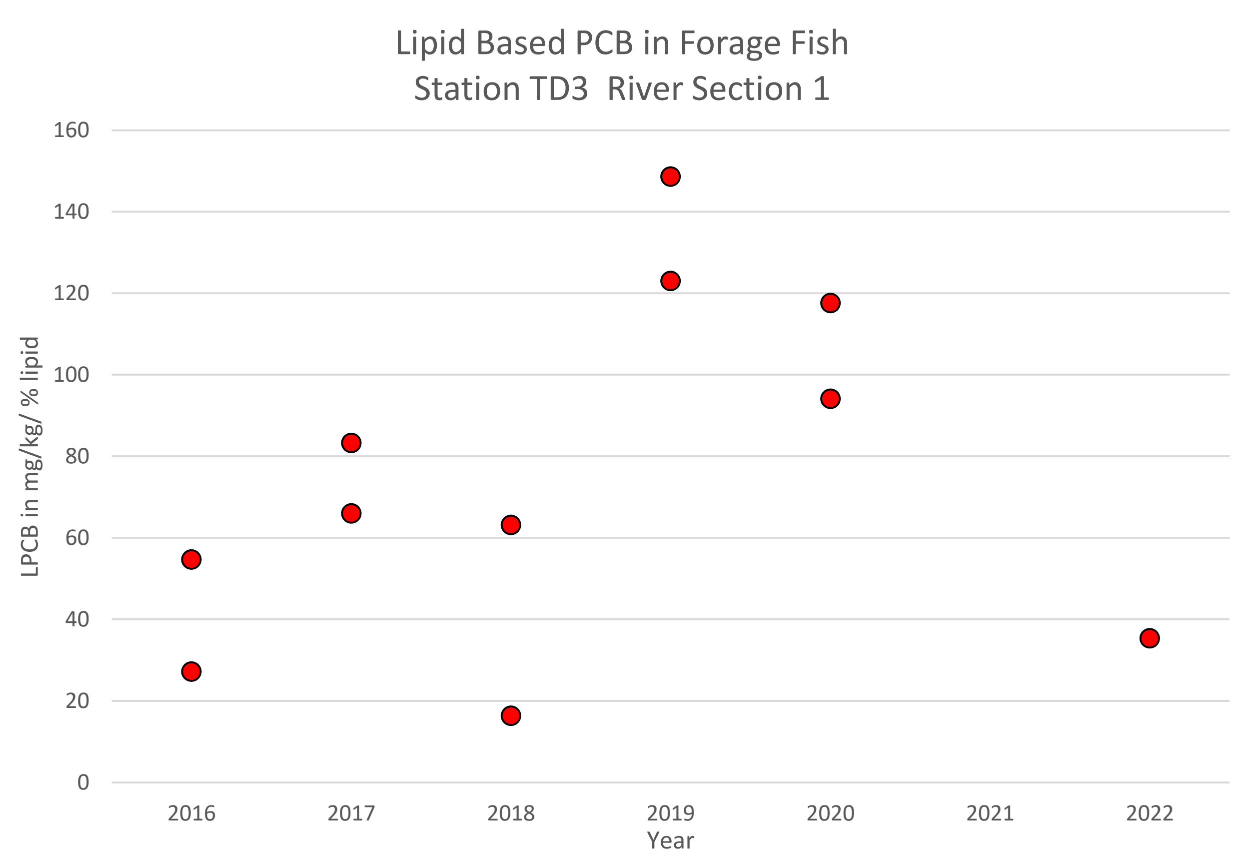
TD3 Forage Fish Percent Lipid



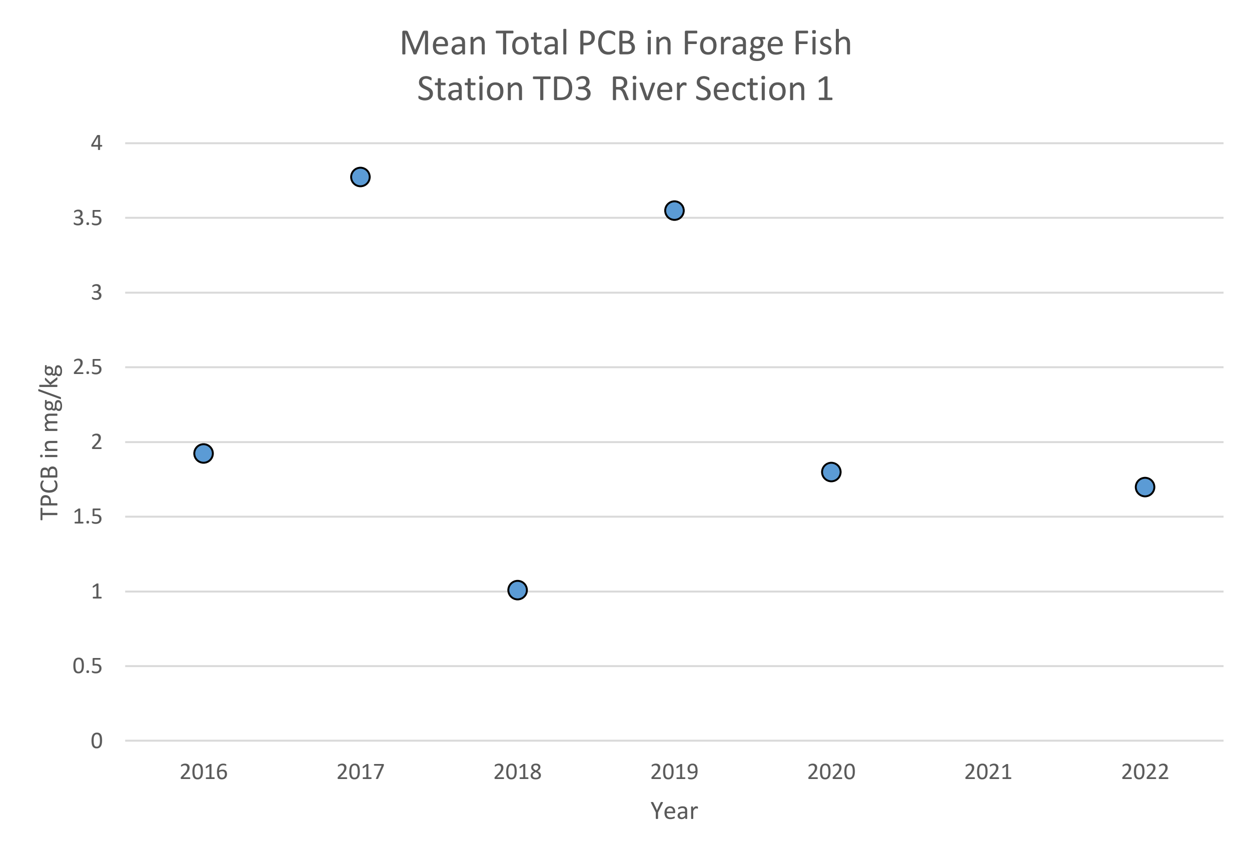


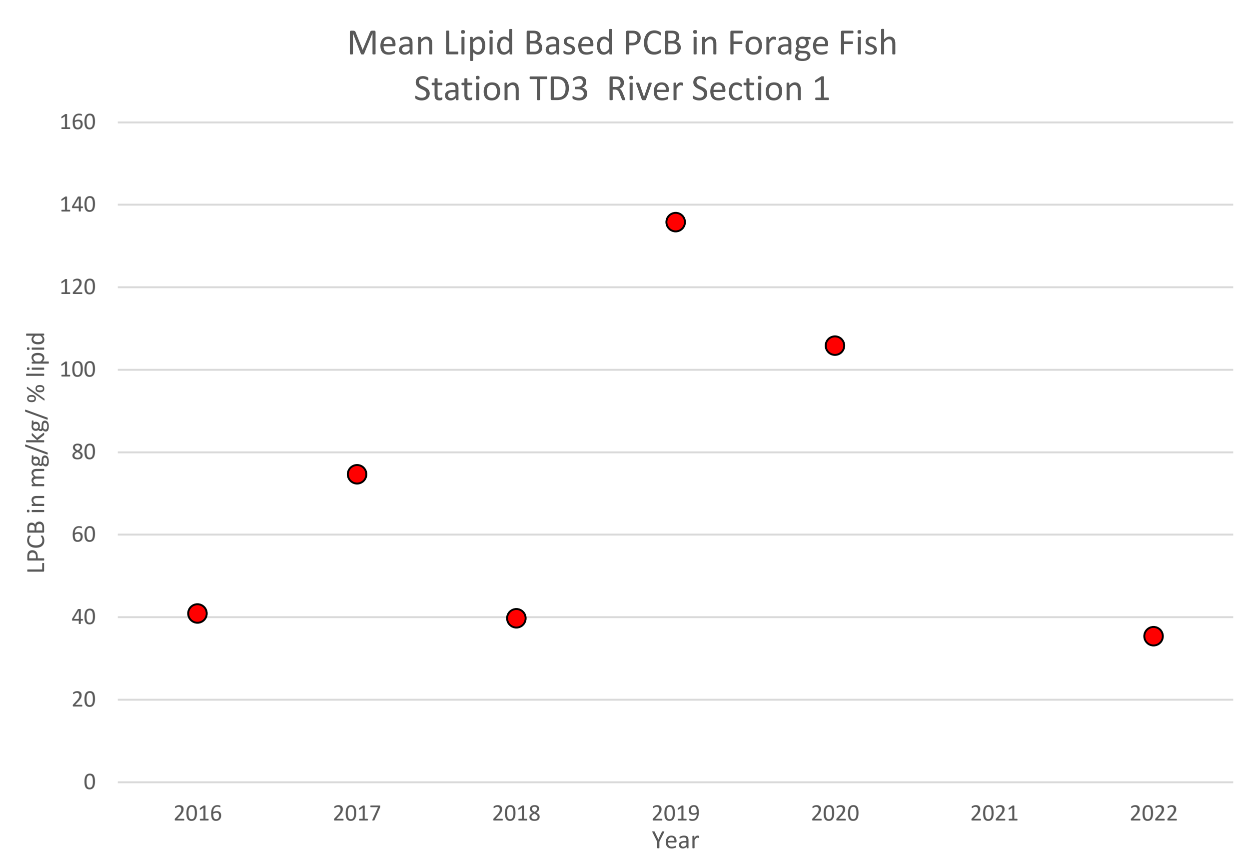
TD3 Forage Fish Total PCB and Lipid Based PCB





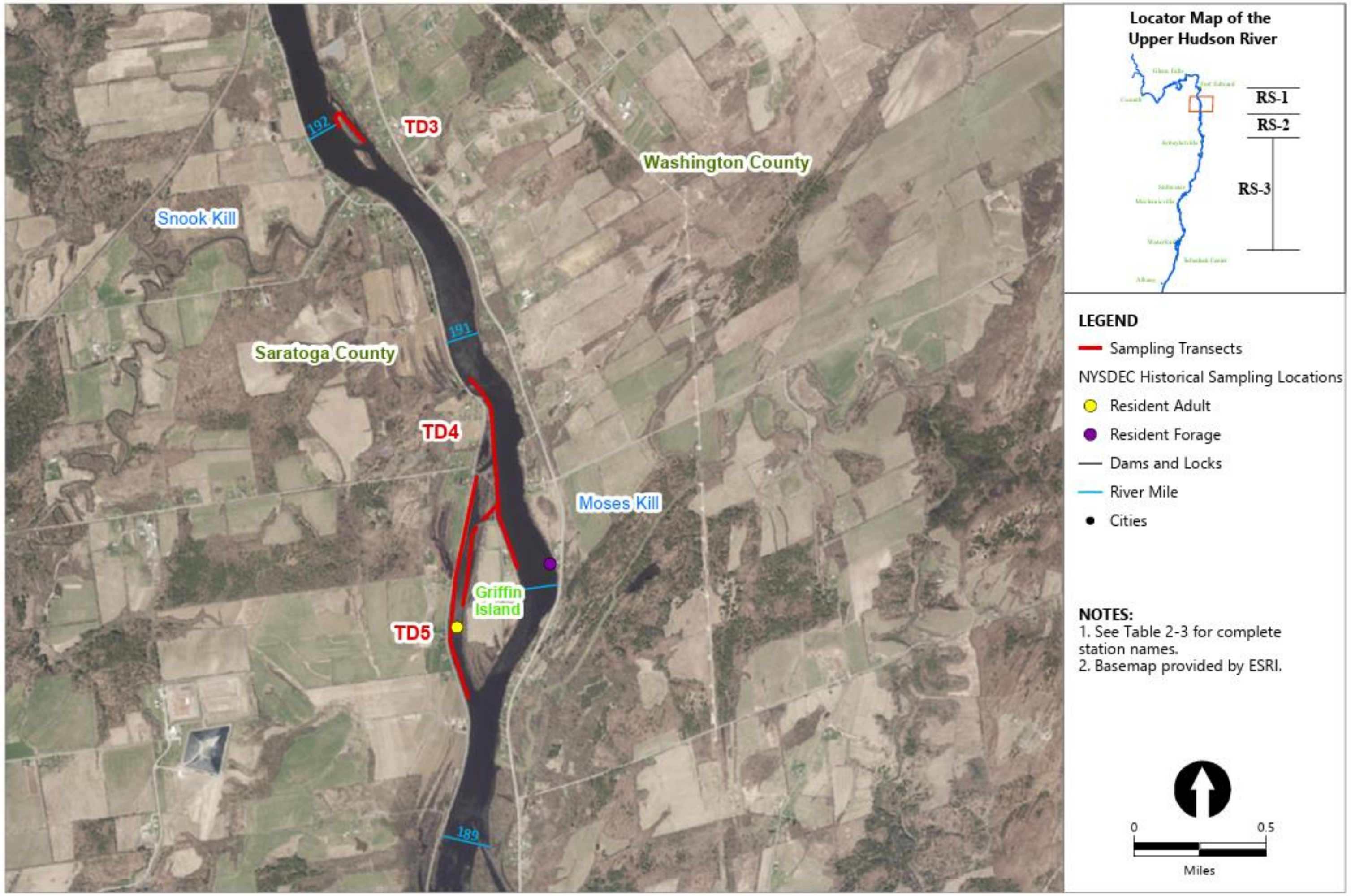
TD3 Forage Fish Mean Total PCB and Mean Lipid Based PCB





Station TD4

Stations TD3, TD4 and TD5



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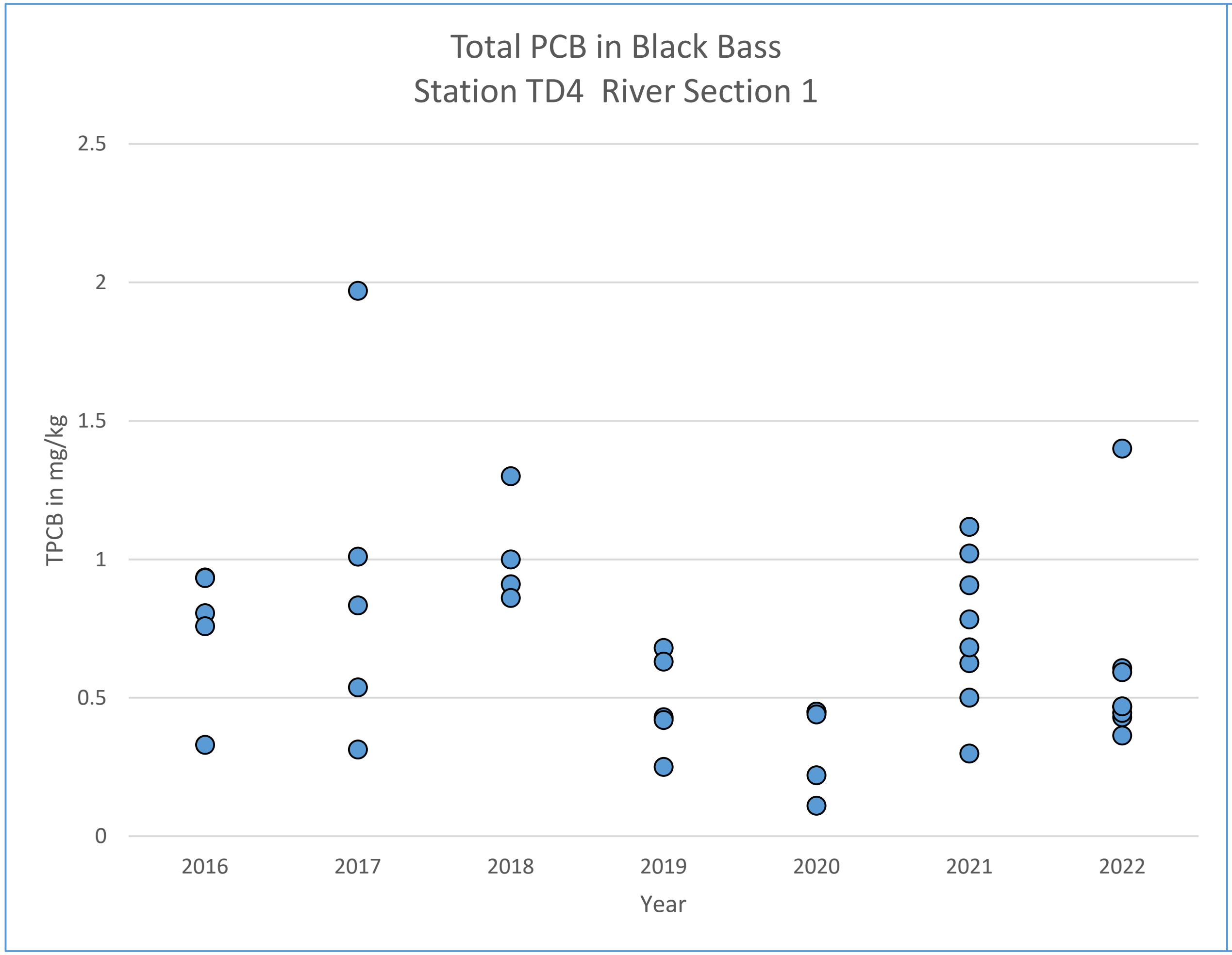
Filepath: H:\E_drive\Projects\GE_Hudson\RAMP\Working\RAMP_Fish\GIS\Projects\RAMP_Fish_2018_Spring_Locations_Upper_Hudson.mxd

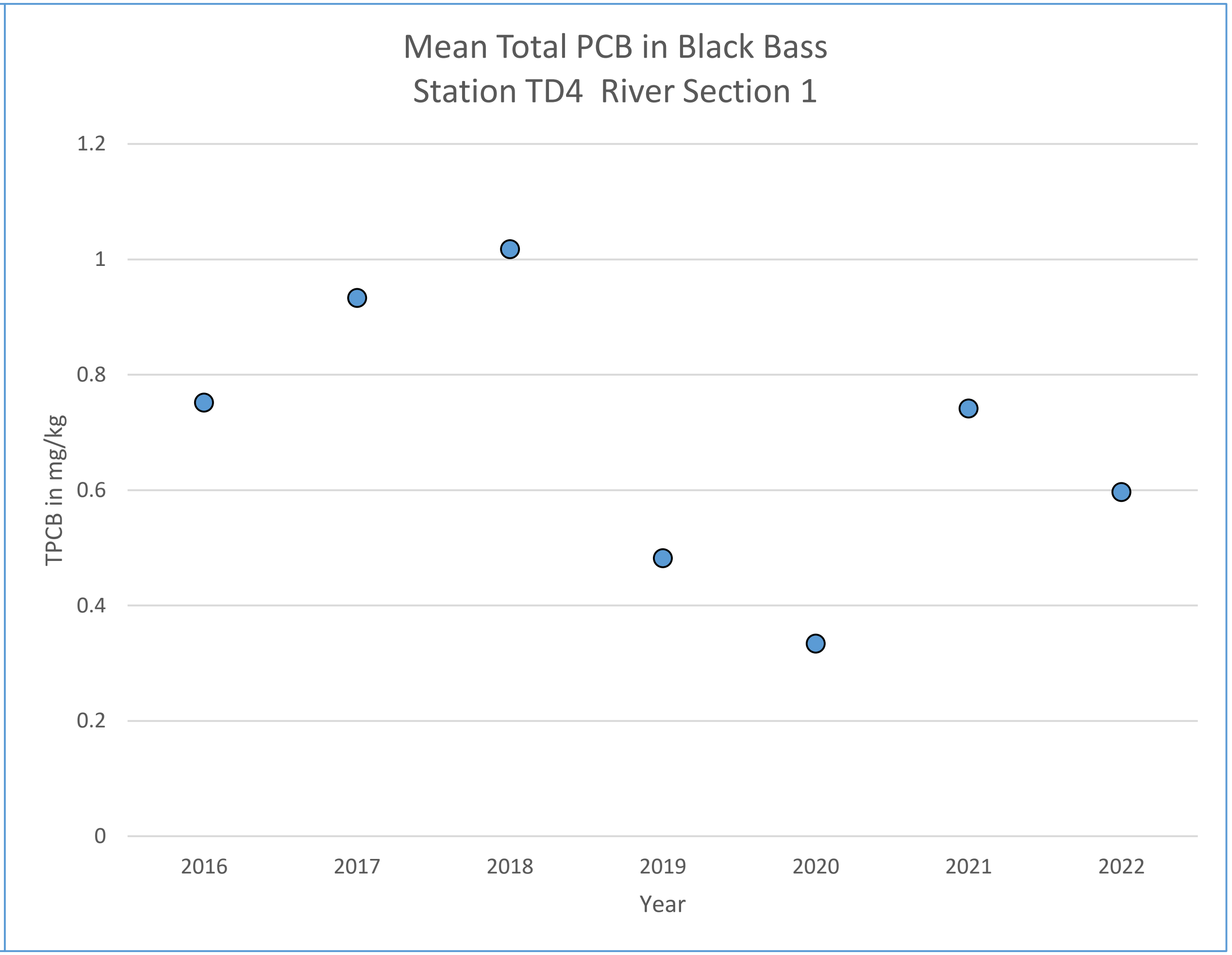
ANCHOR QEA

Figure 2-2c
Spring 2018 Fish Sampling Locations
2018 Water and Fish Data Summary Report
Prepared for the General Electric Company

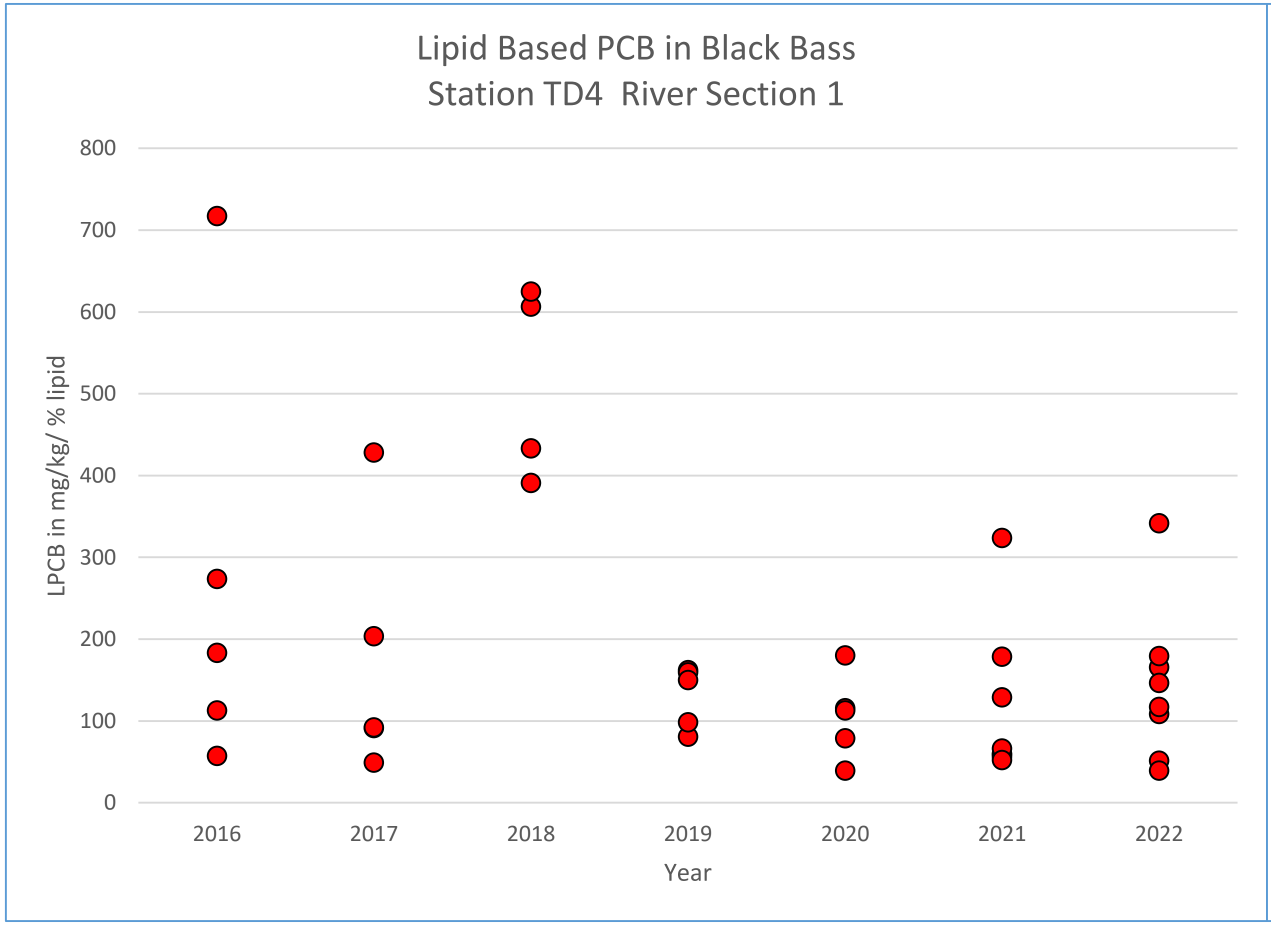
TD4 Black Bass Data

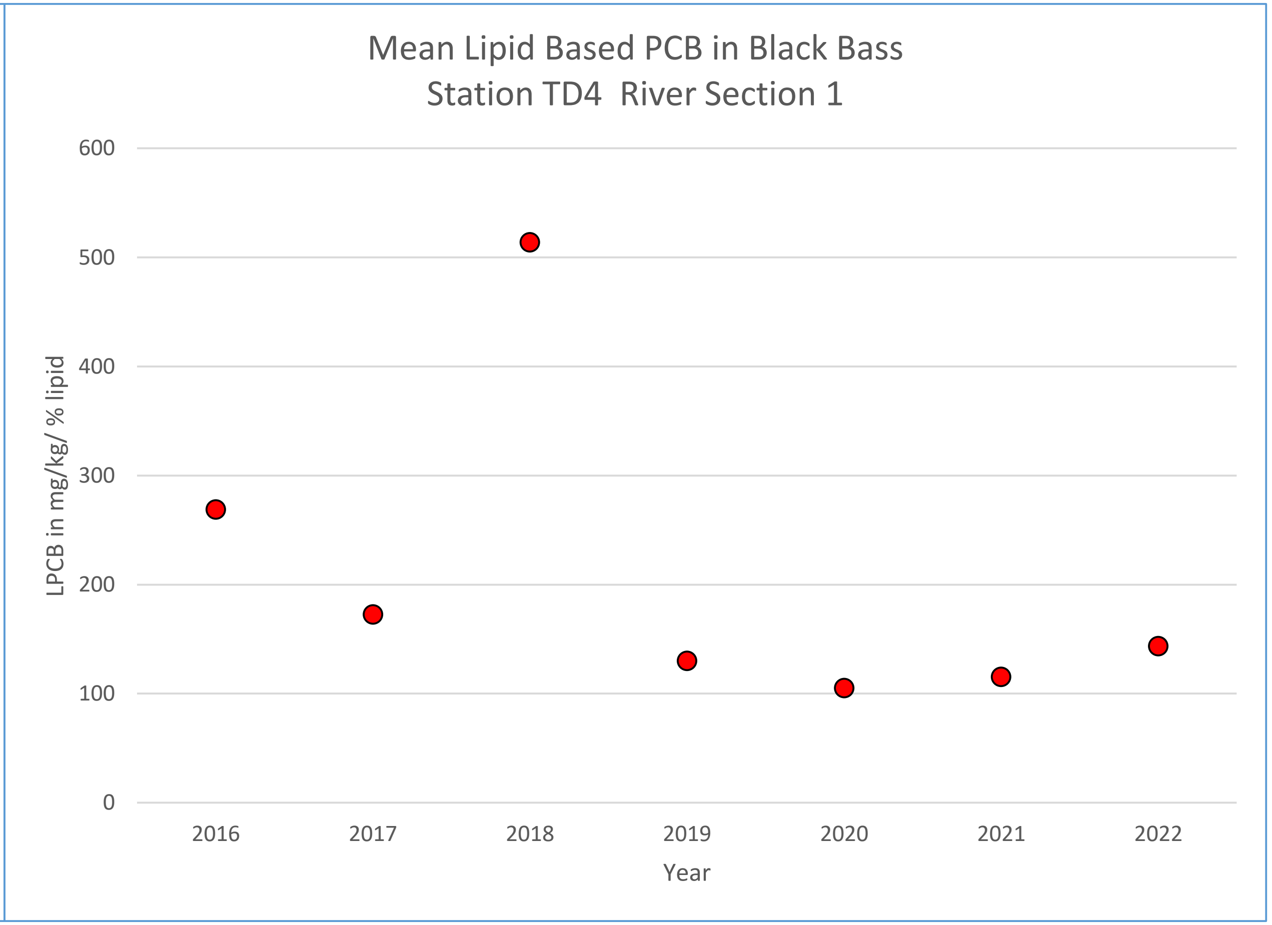
TD4 Black Bass Total PCB



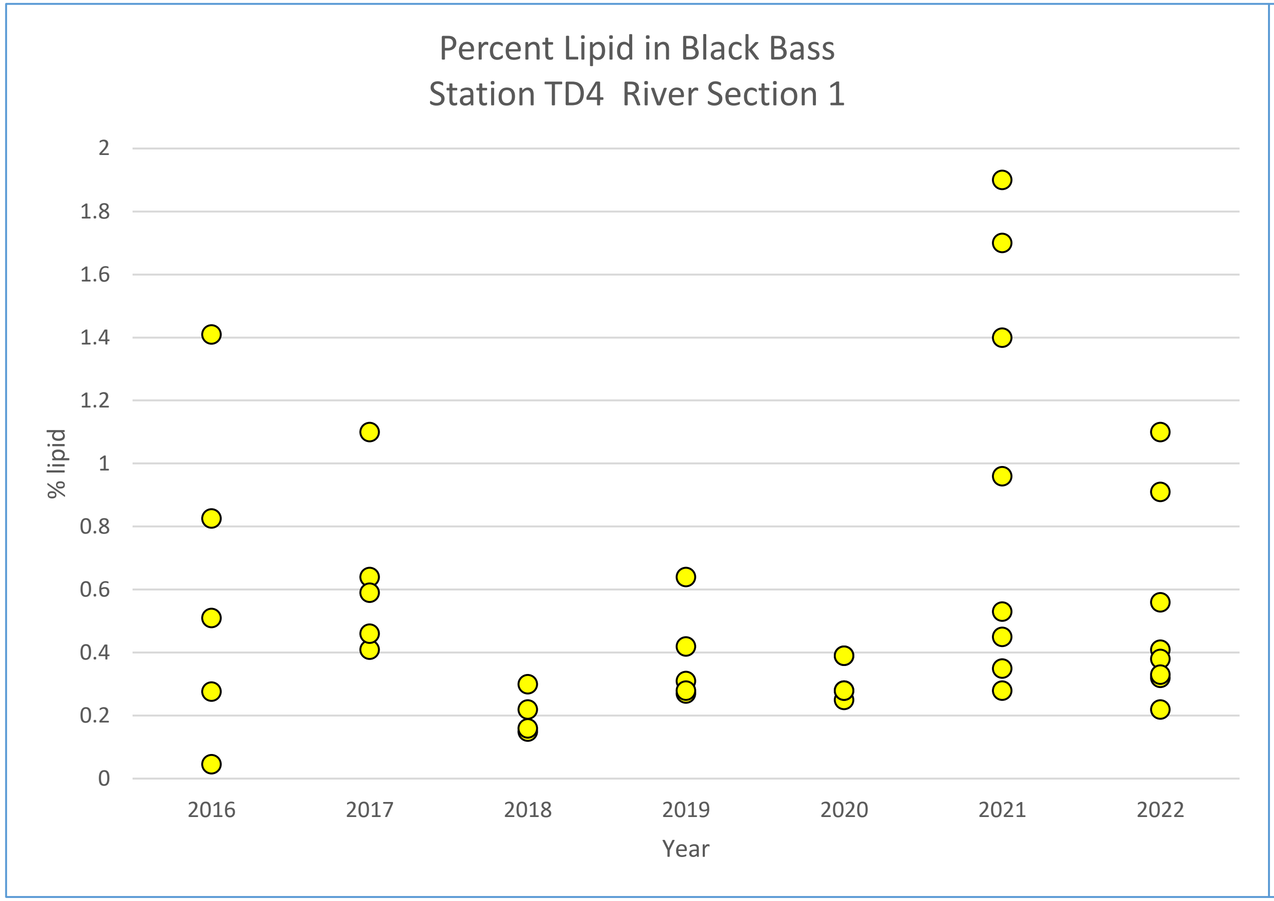


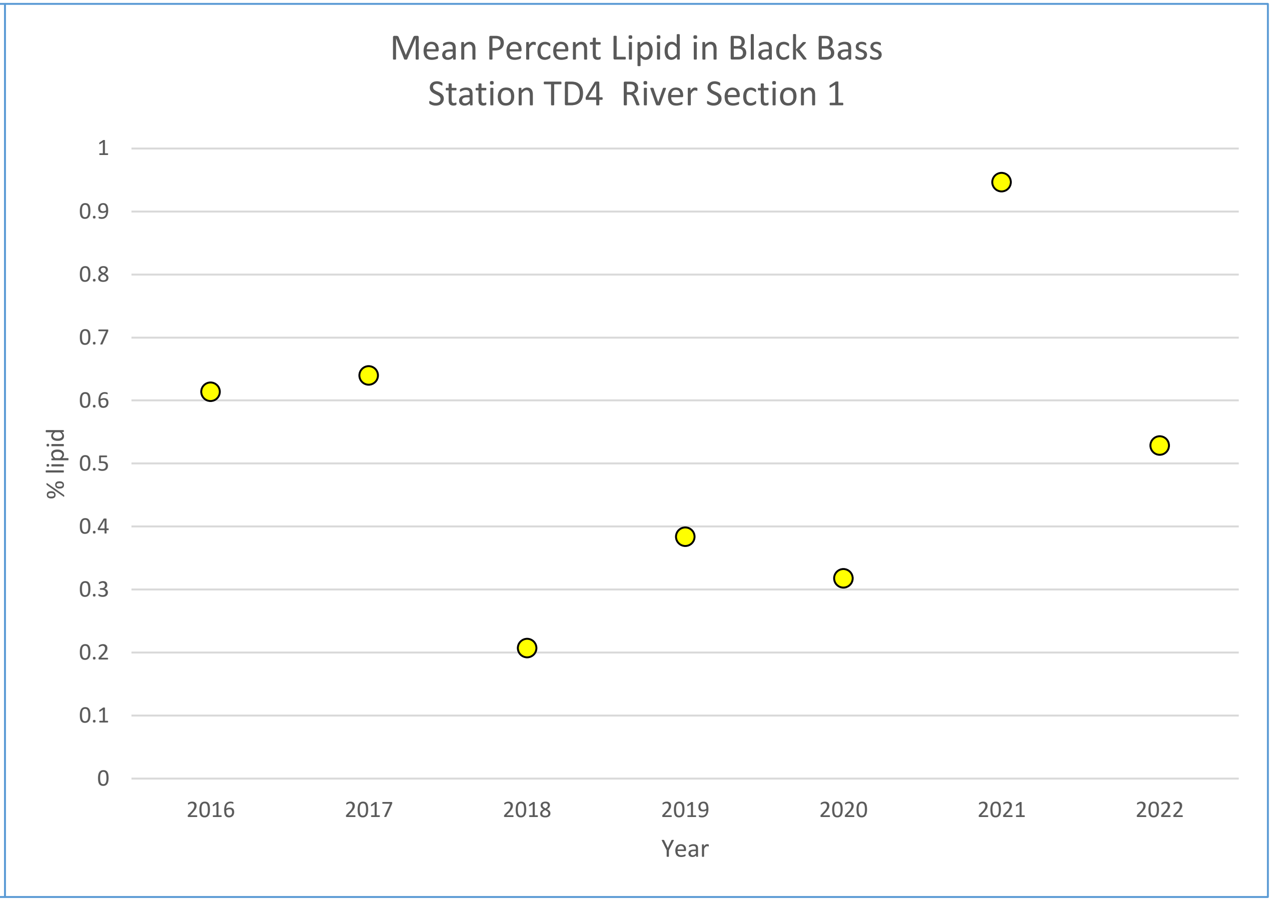
TD4 Black Bass Lipid Based PCB



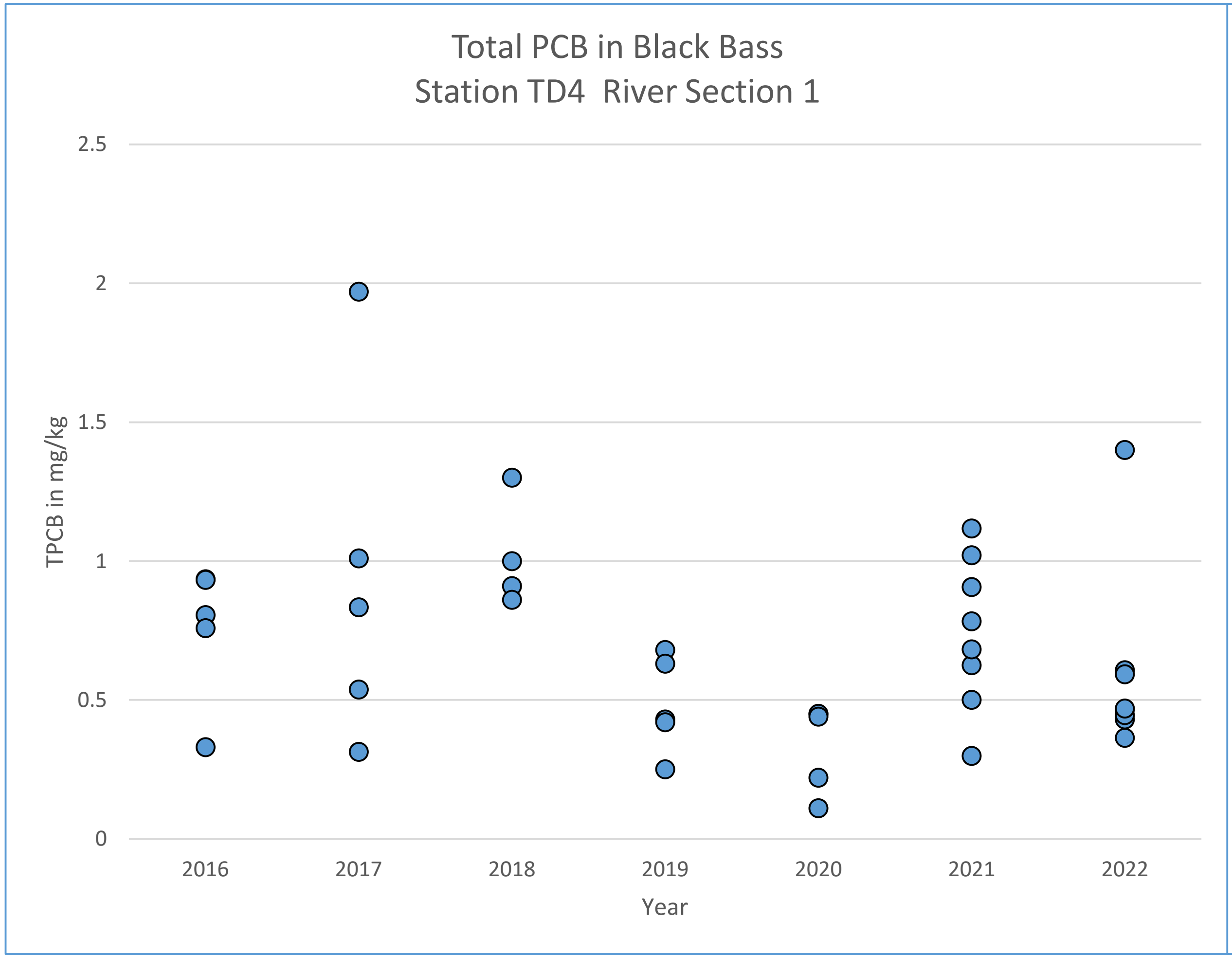


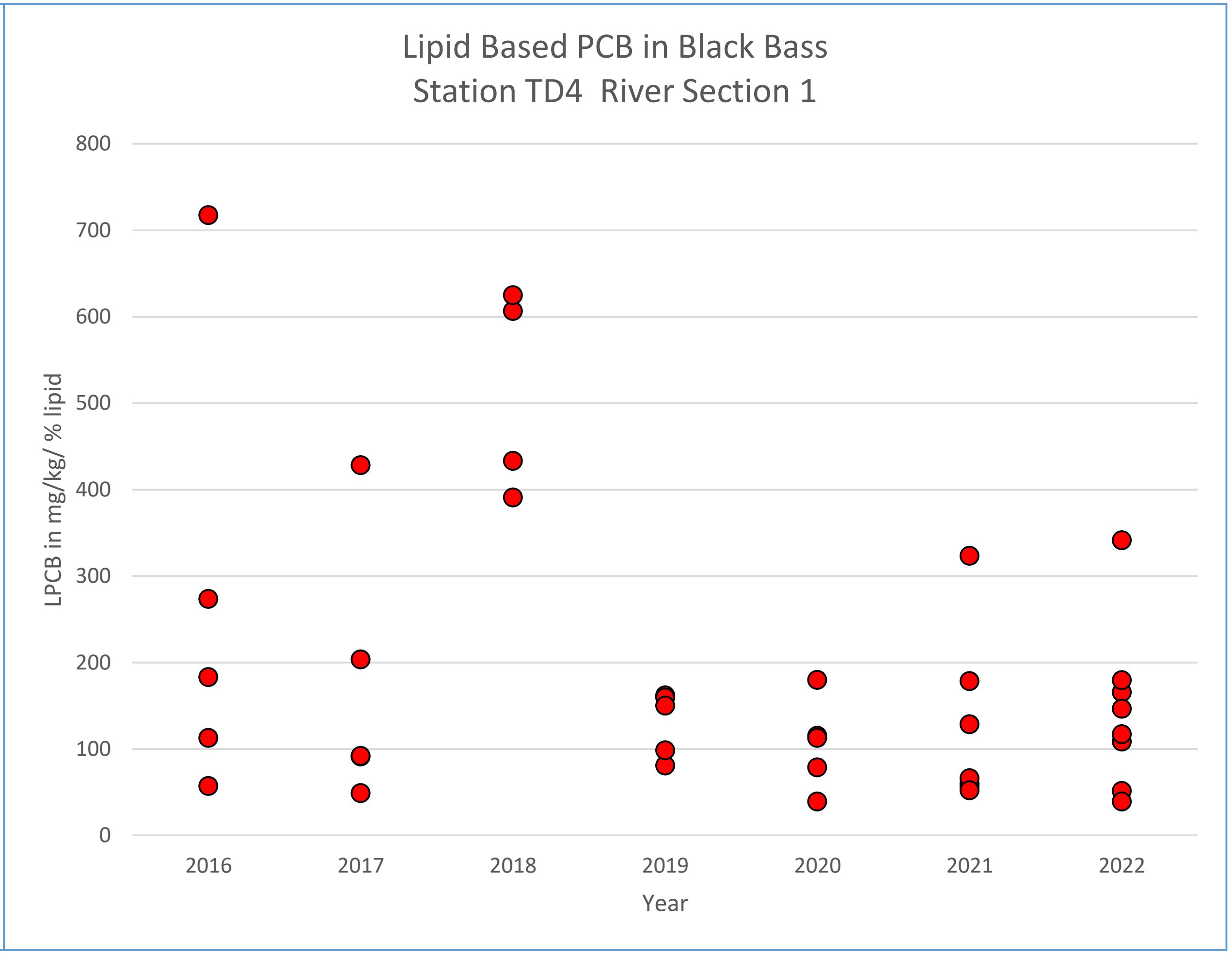
TD4 Black Bass Percent Lipid



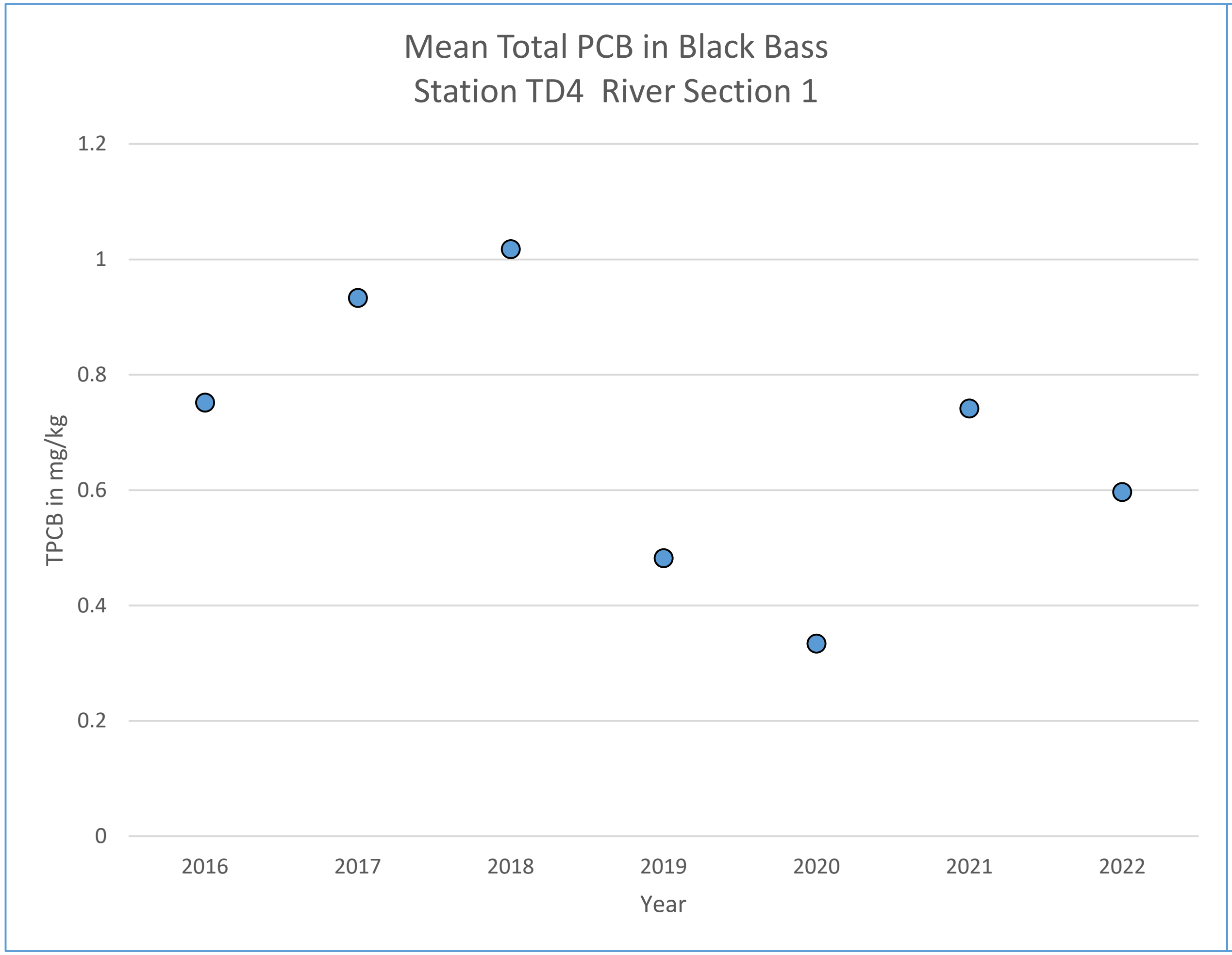


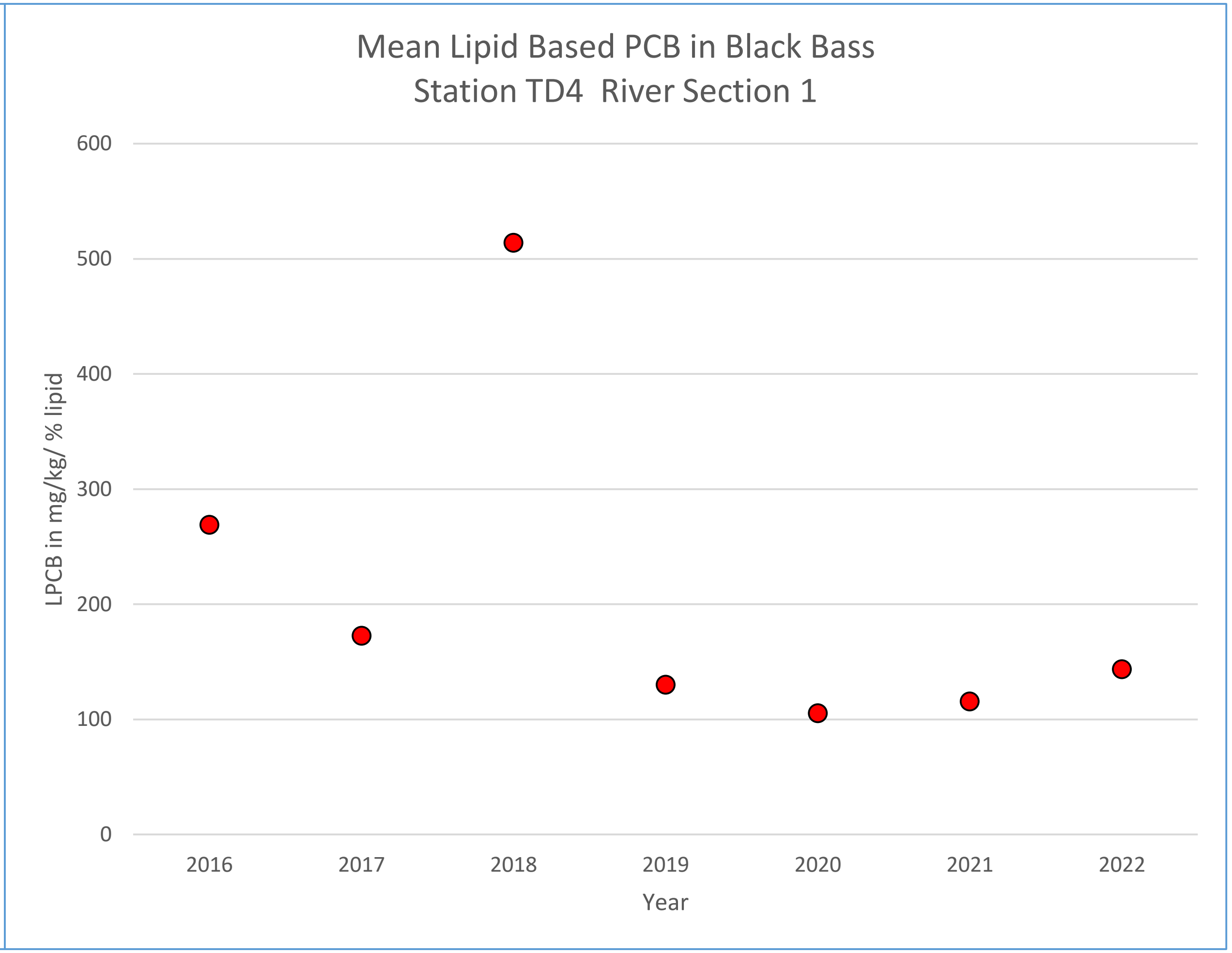
TD4 Black Bass Total PCB and Lipid Based PCB





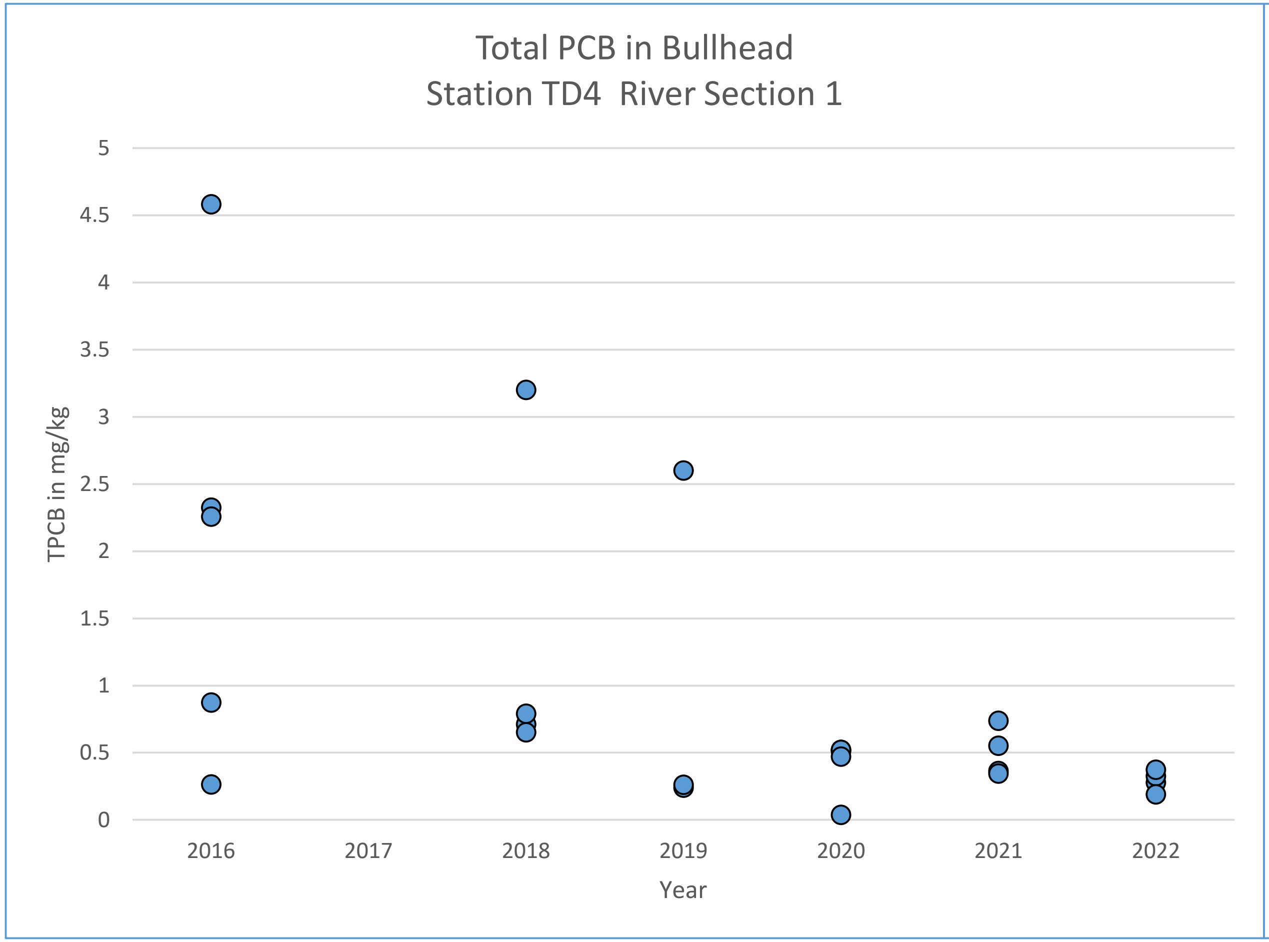
TD4 Black Bass Mean Total PCB and Mean Lipid Based PCB

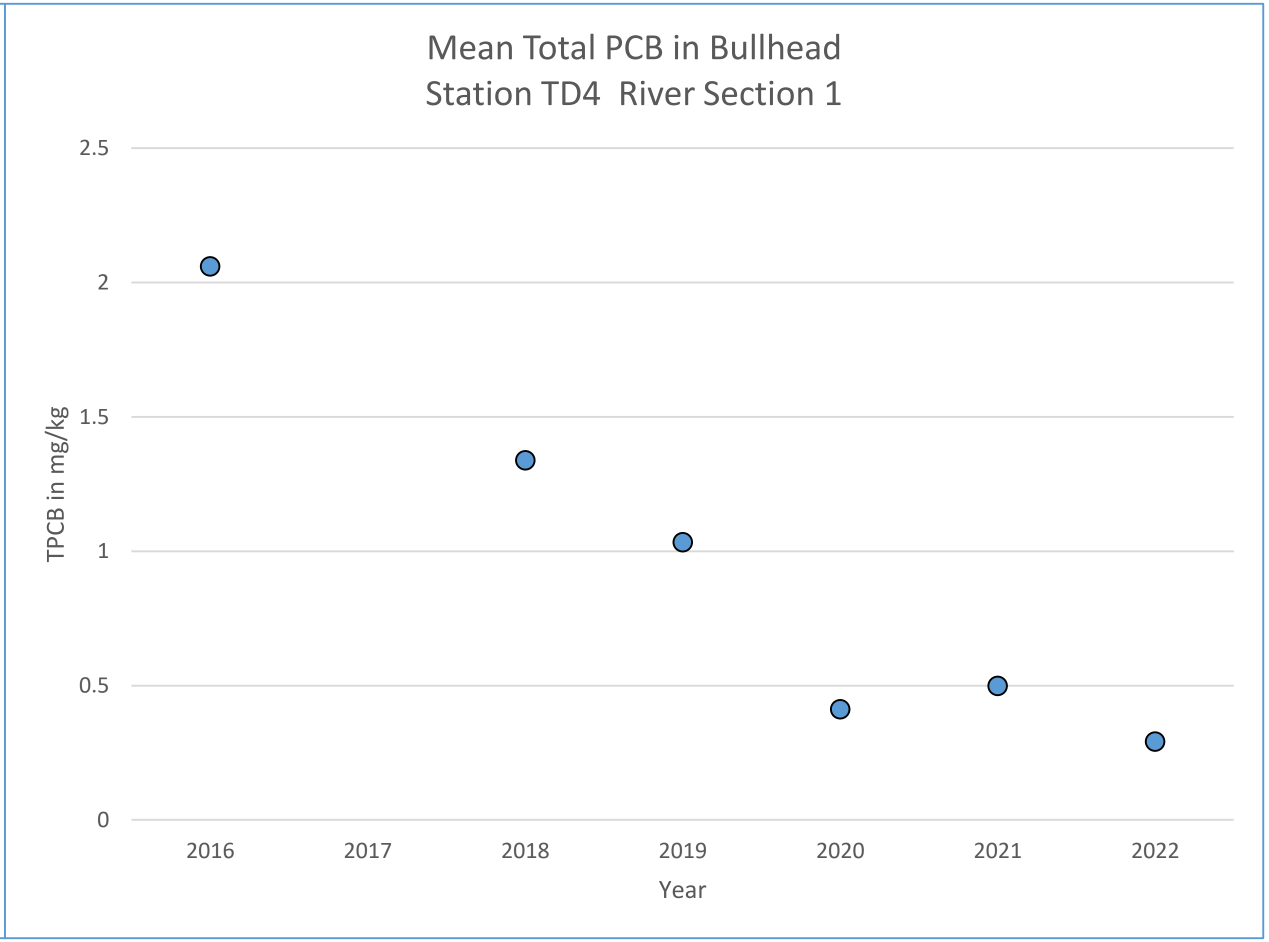




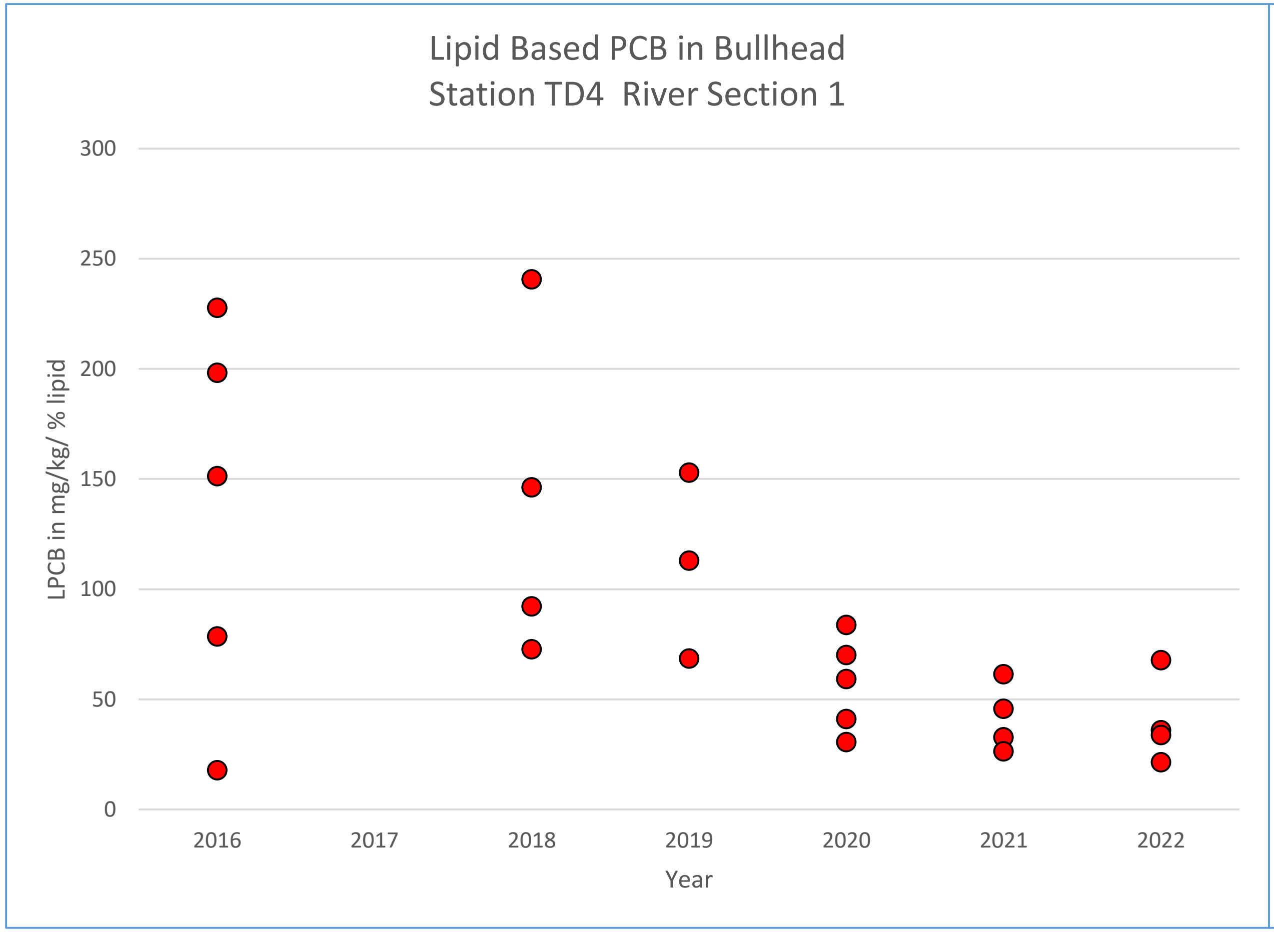
TD4 Bullhead Data

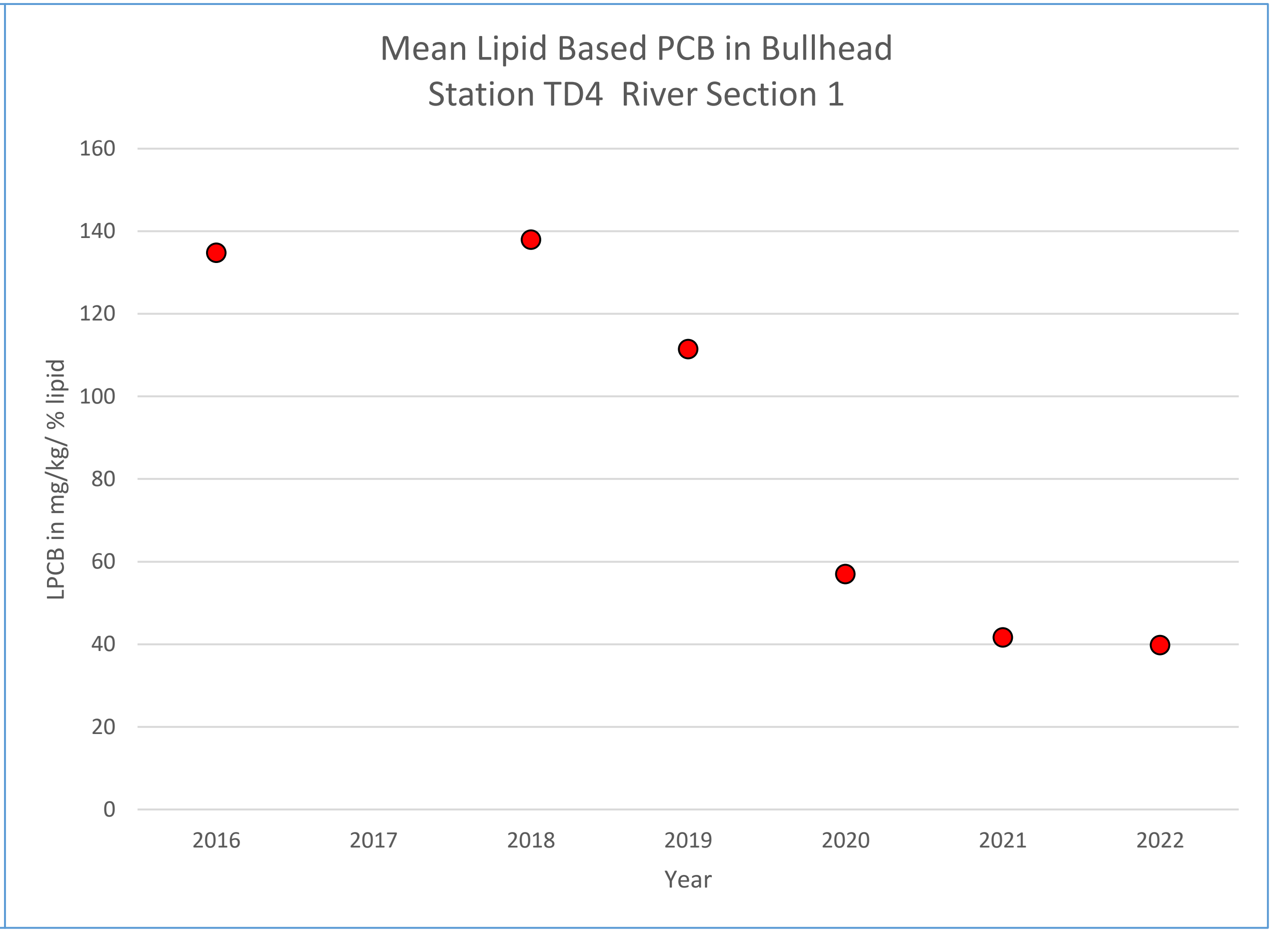
TD4 Bullhead Total PCB



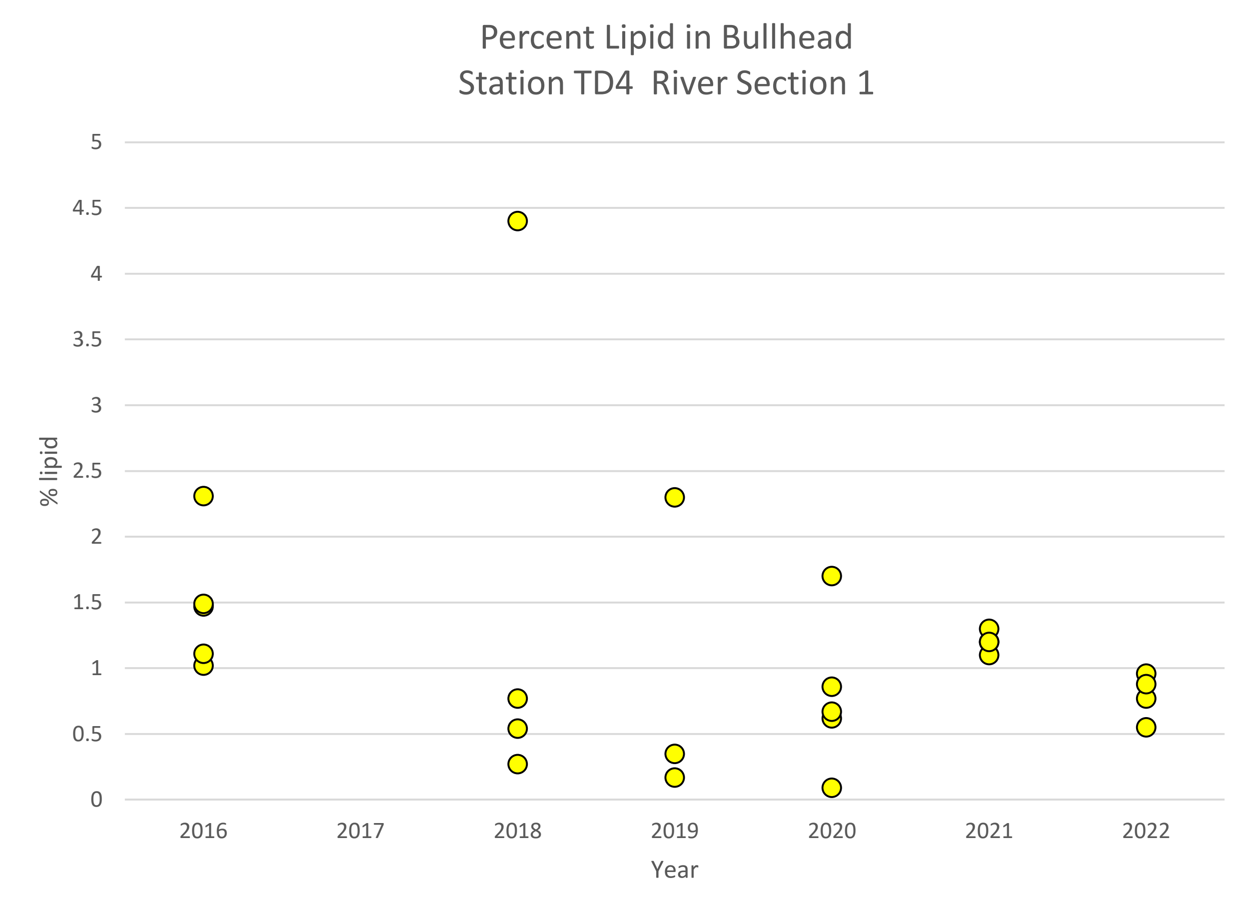


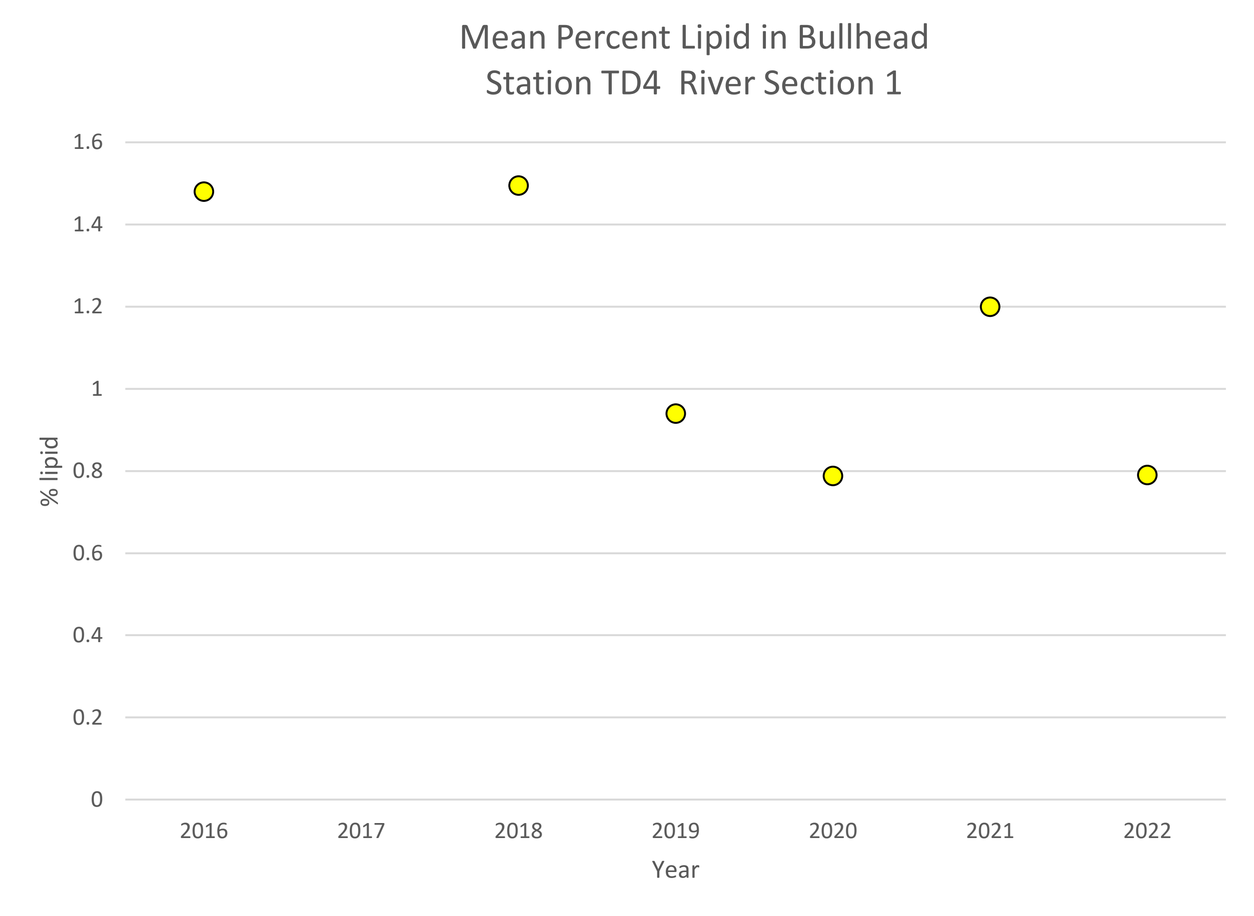
TD4 Bullhead Lipid Based PCB



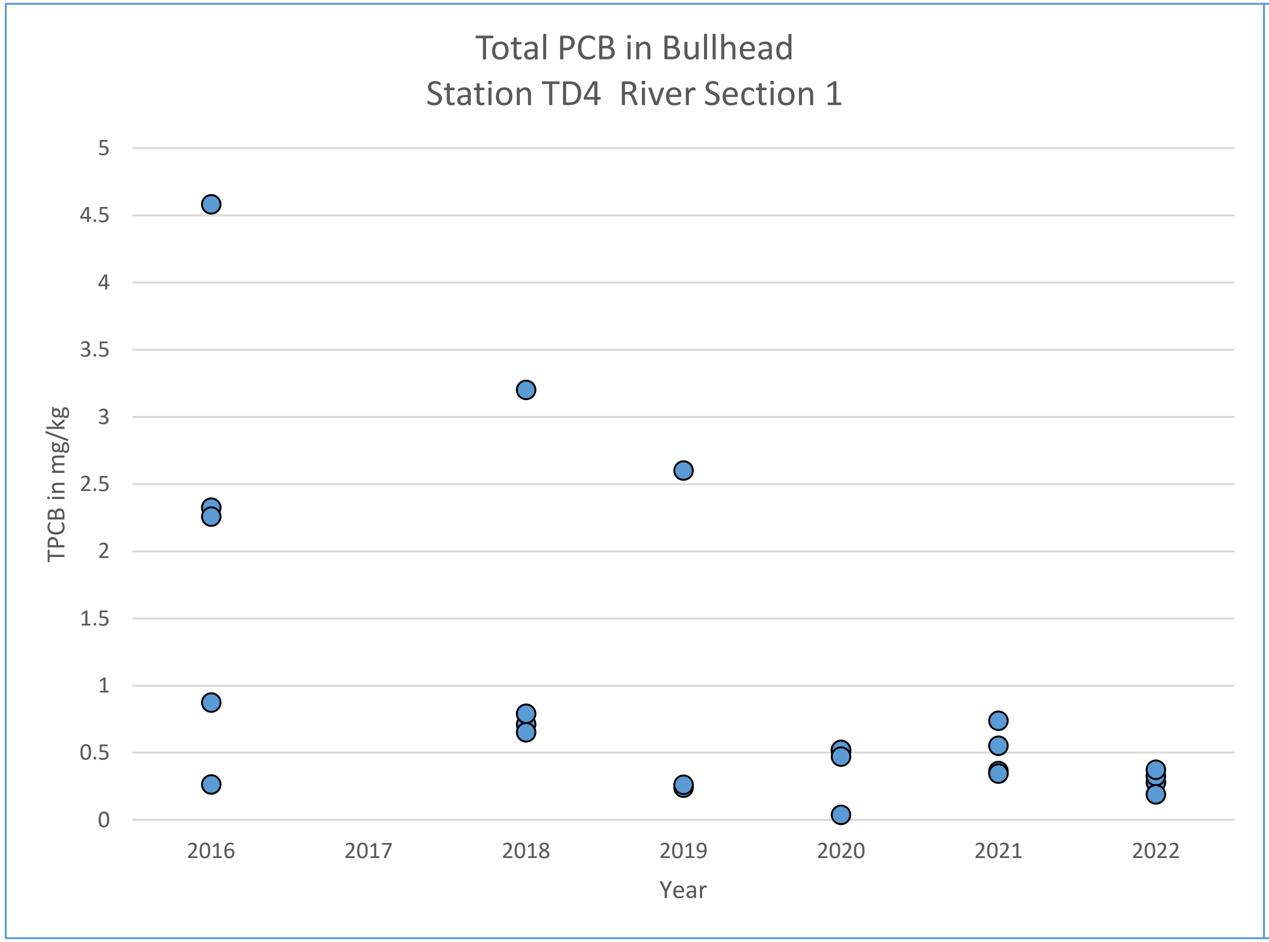


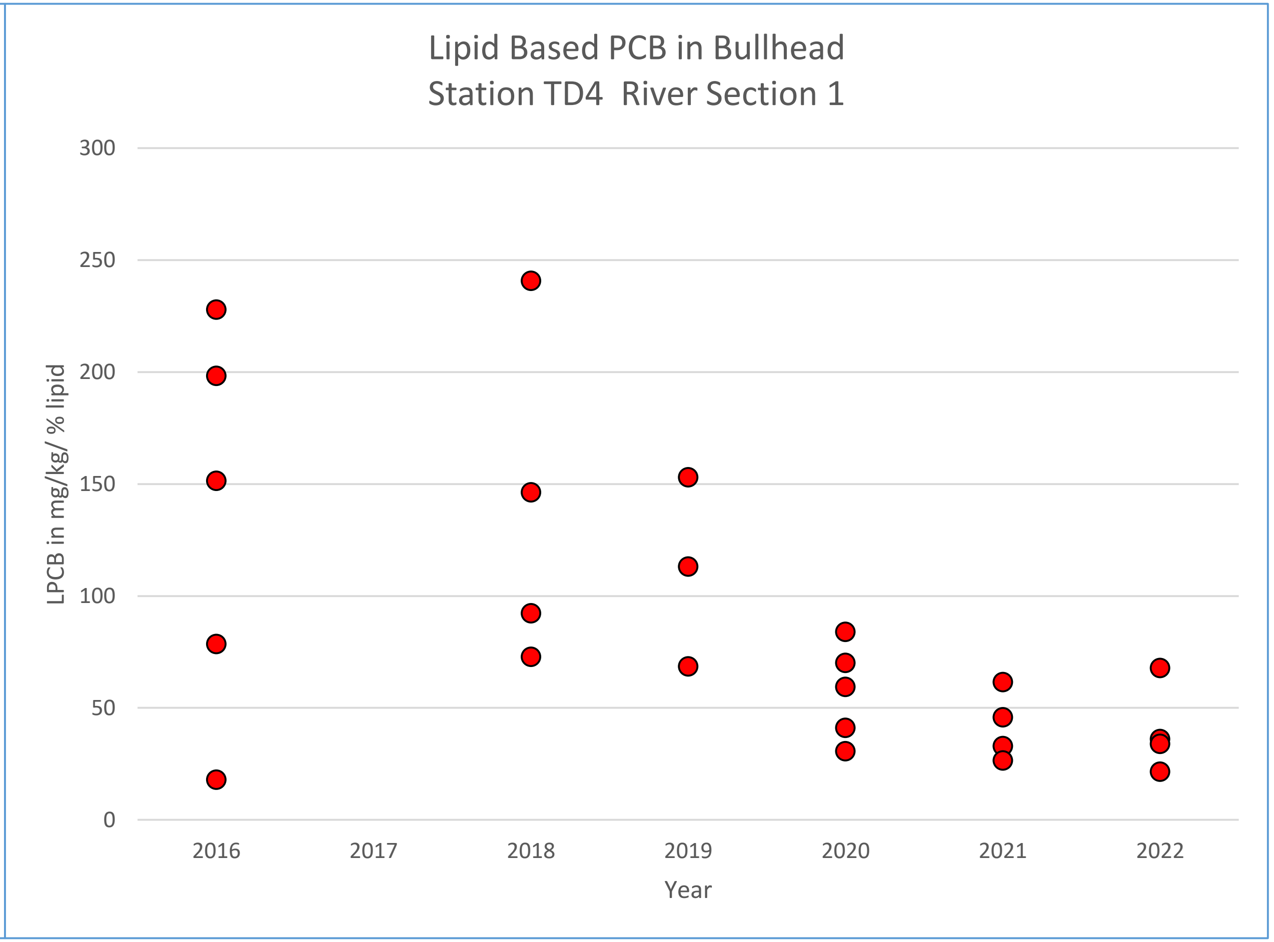
TD4 Bullhead Percent Lipid



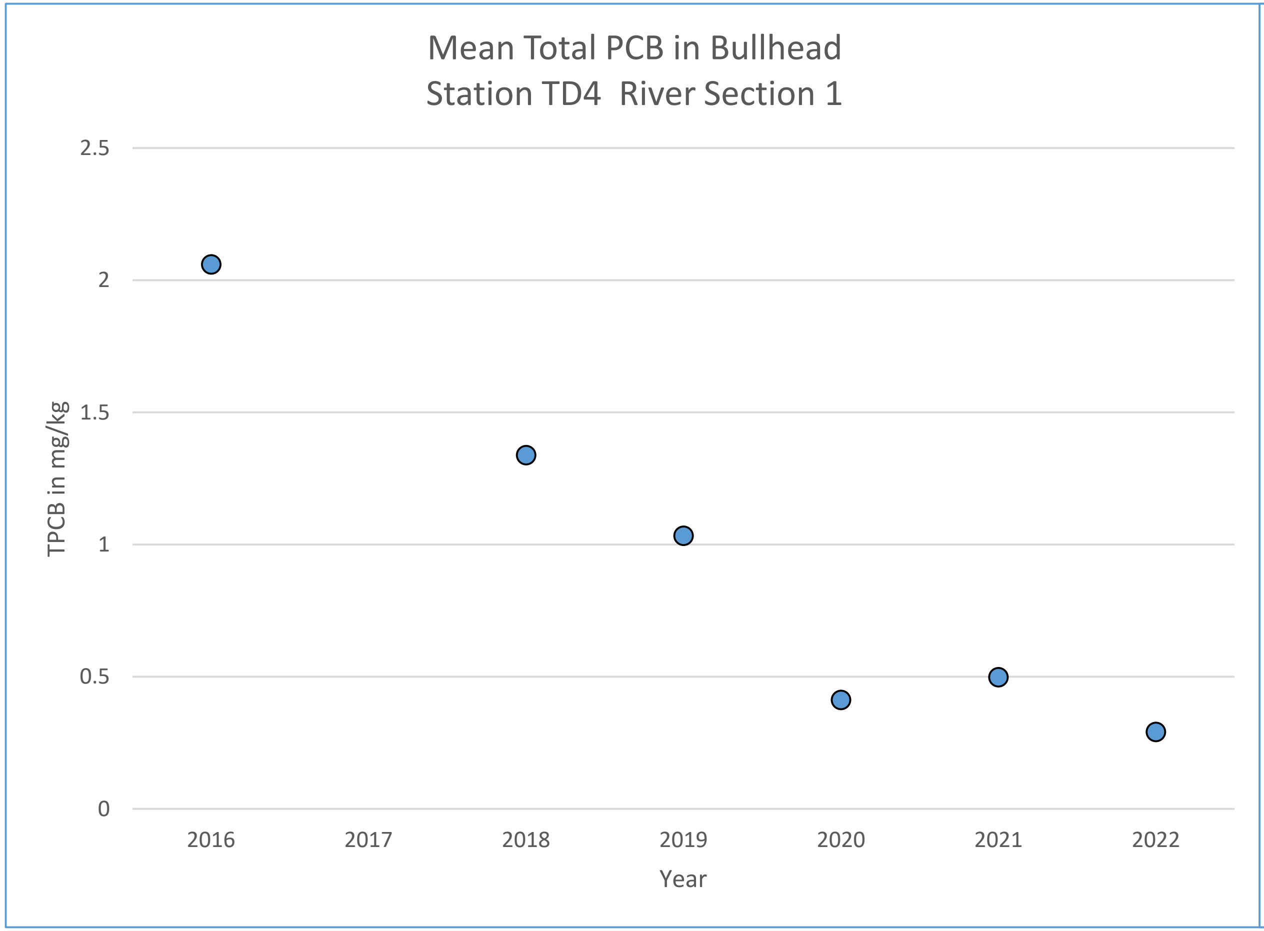


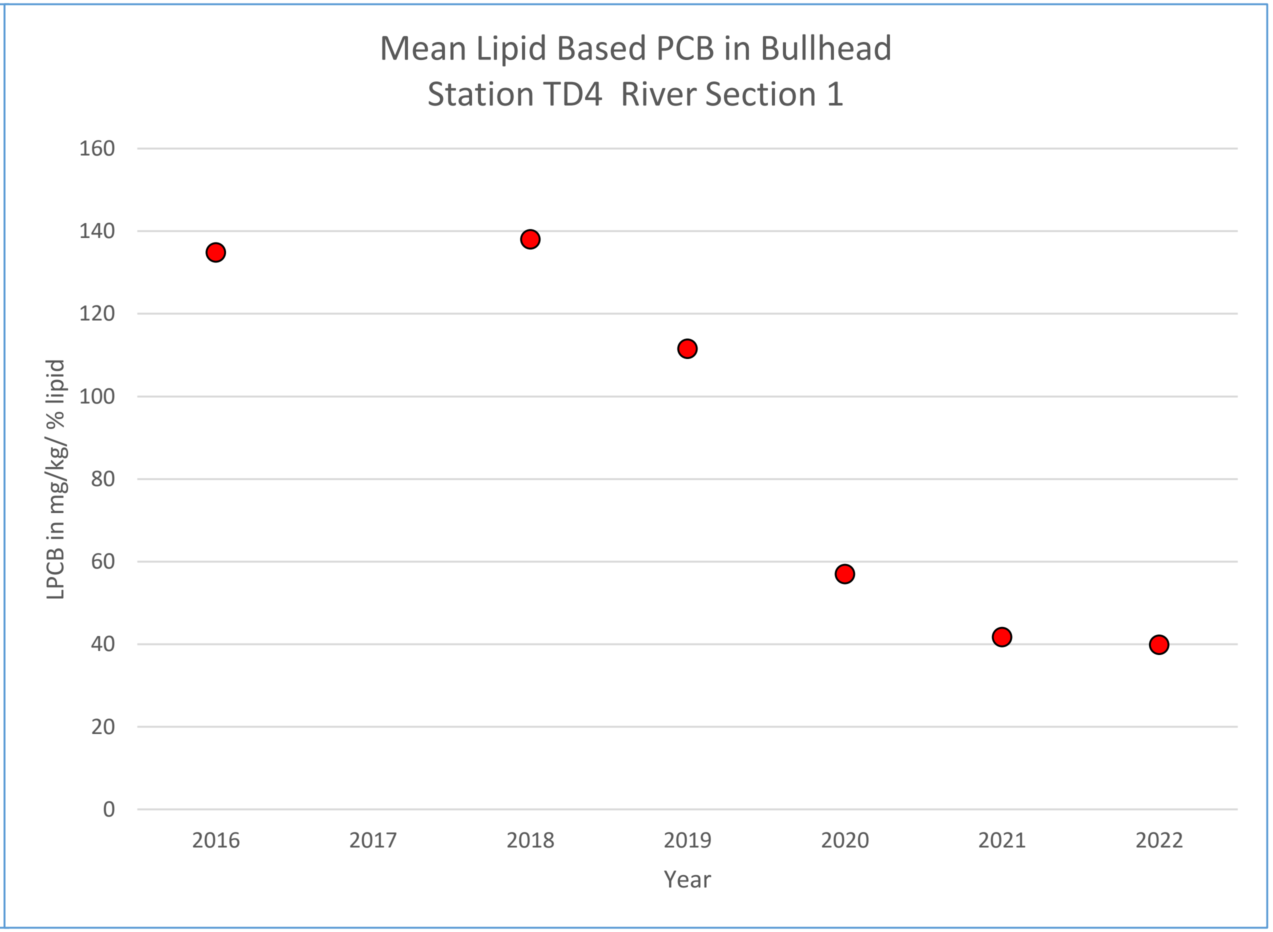
TD4 Bullhead Total PCB and Lipid Based PCB





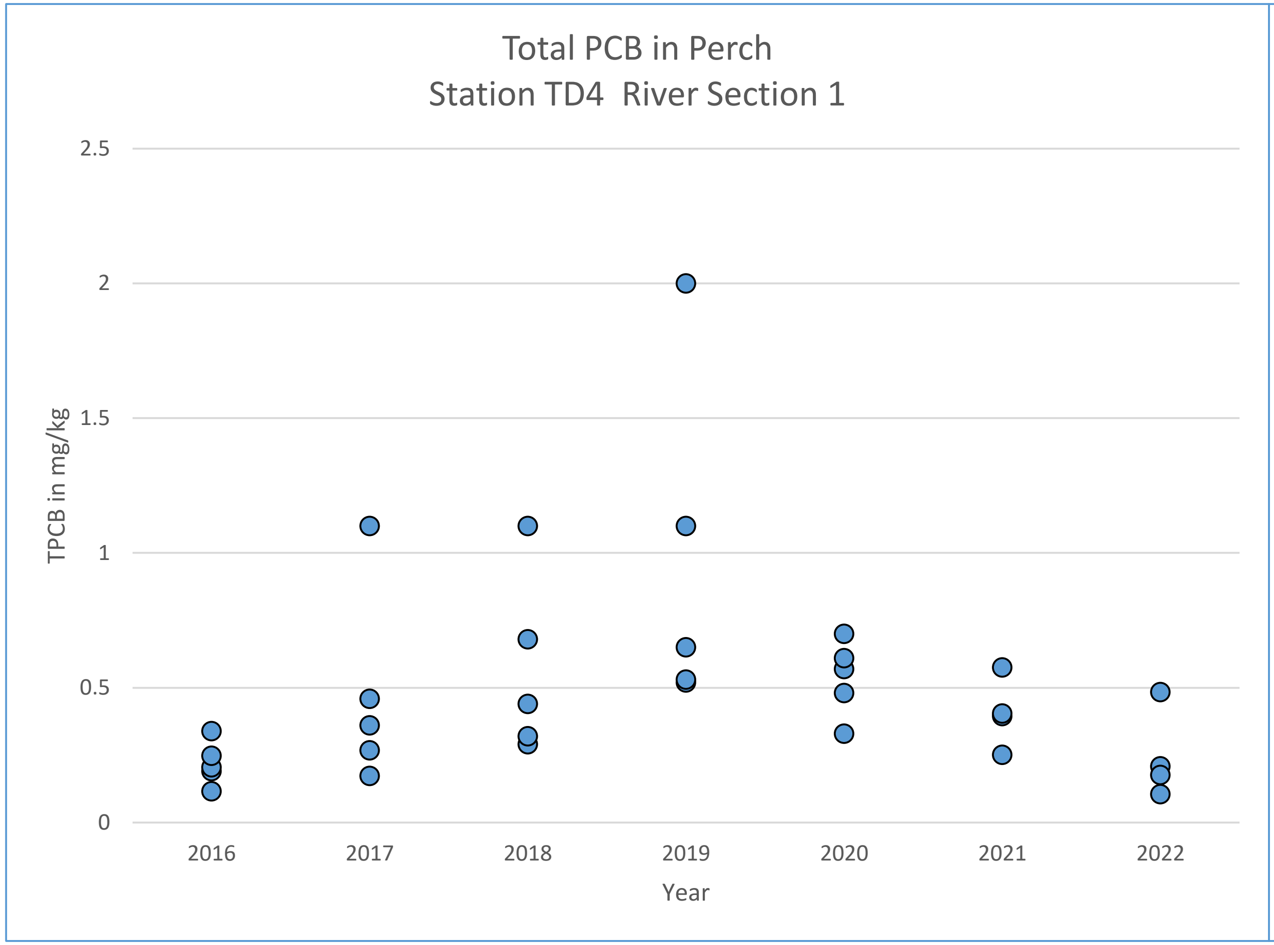
TD4 Bullhead Mean Total PCB and Mean Lipid Based PCB

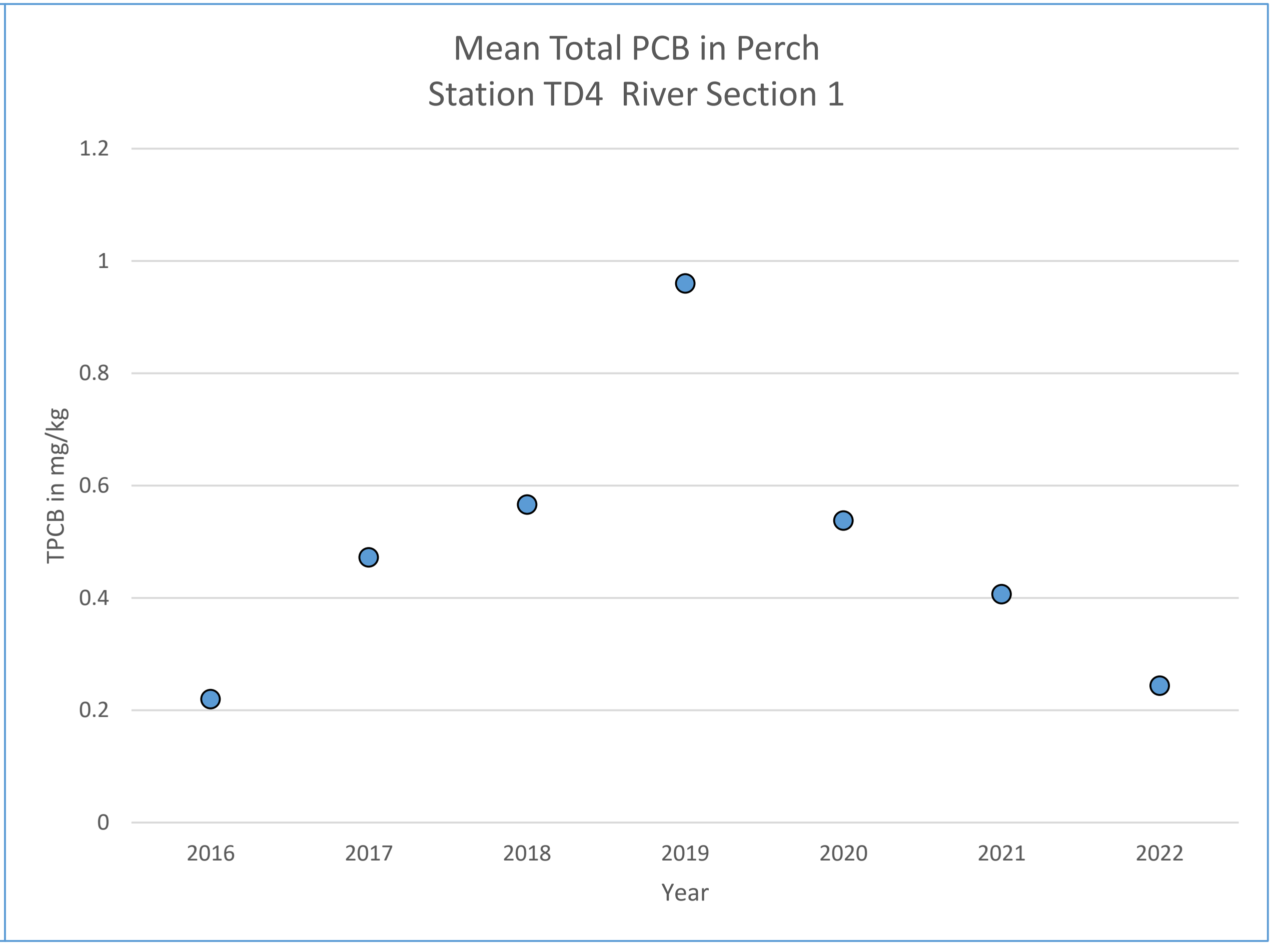




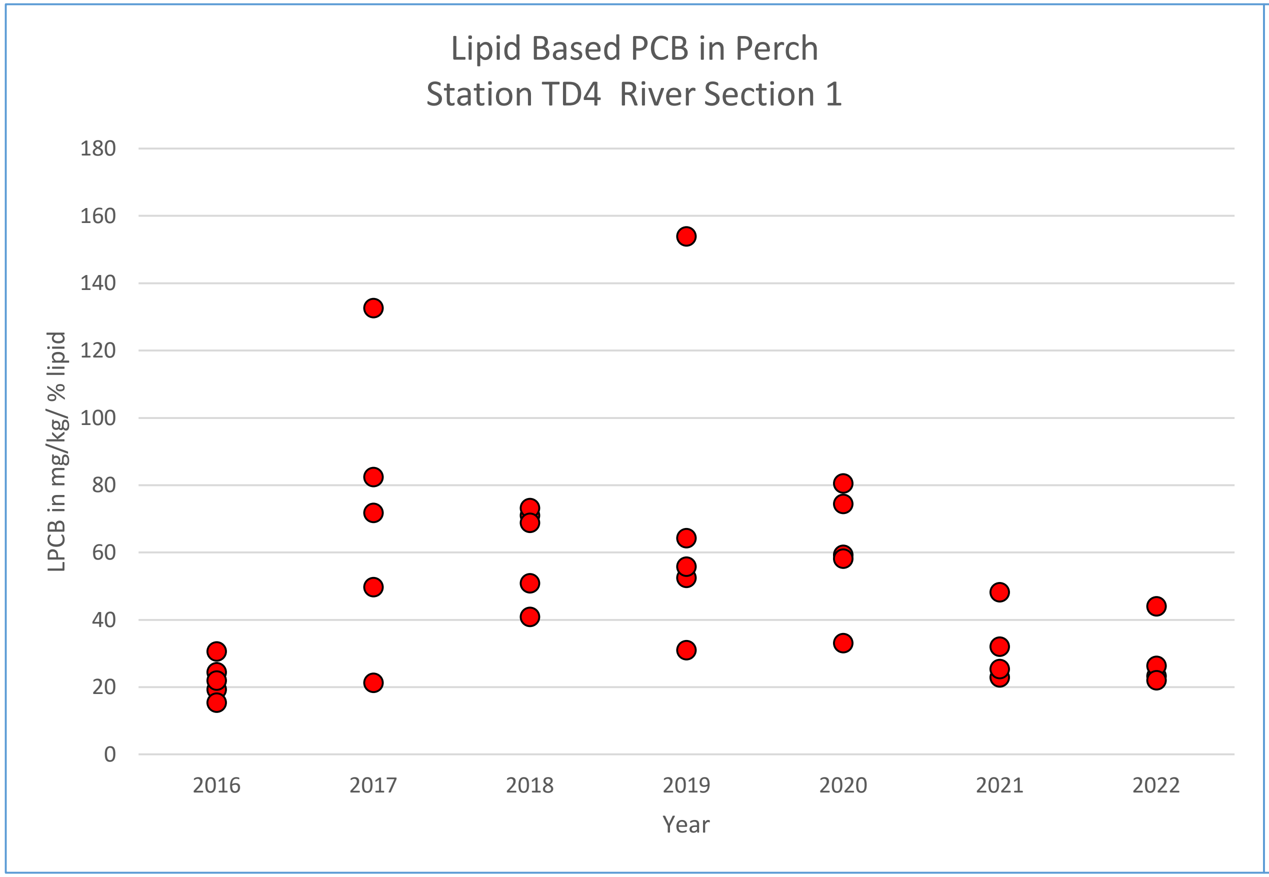
TD4 Perch Data

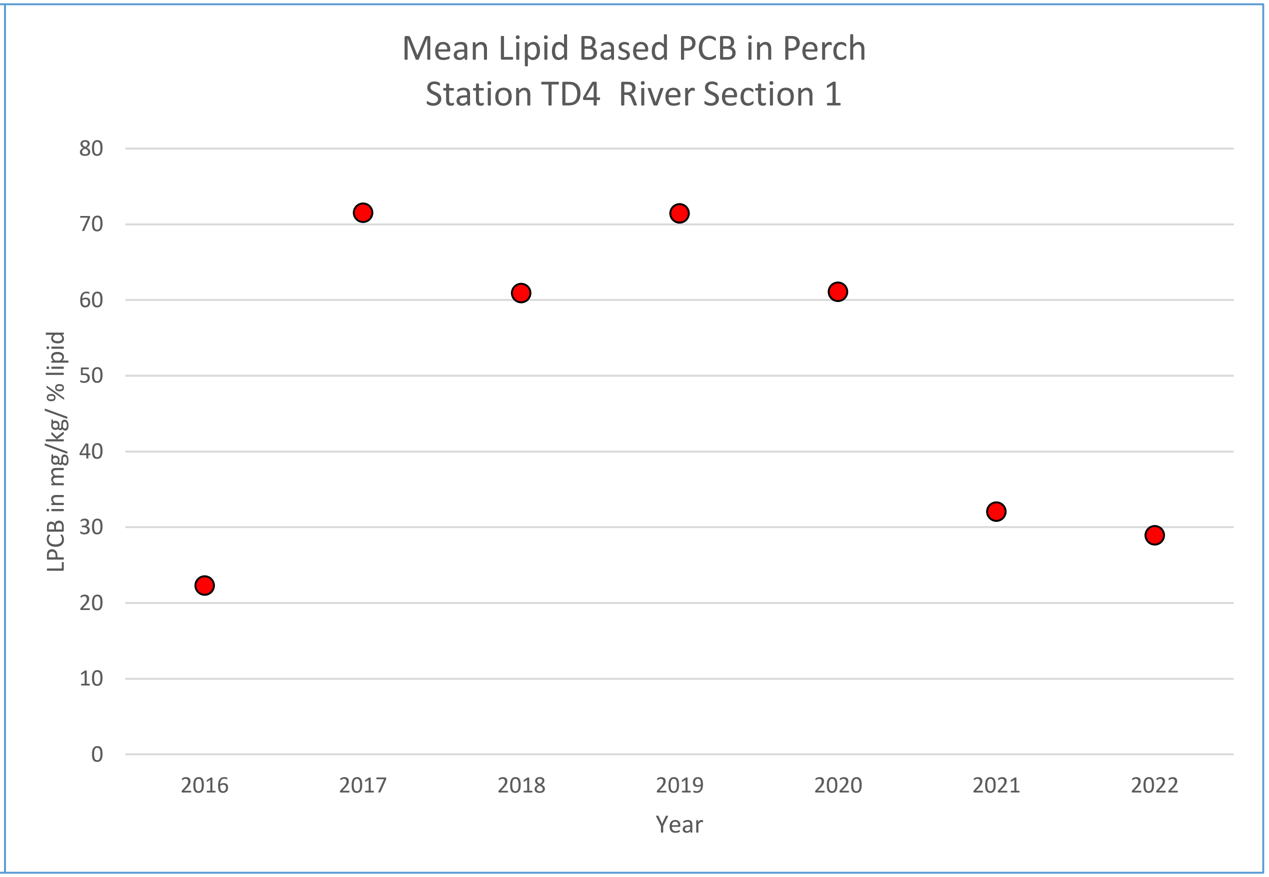
TD4 Perch Total PCB



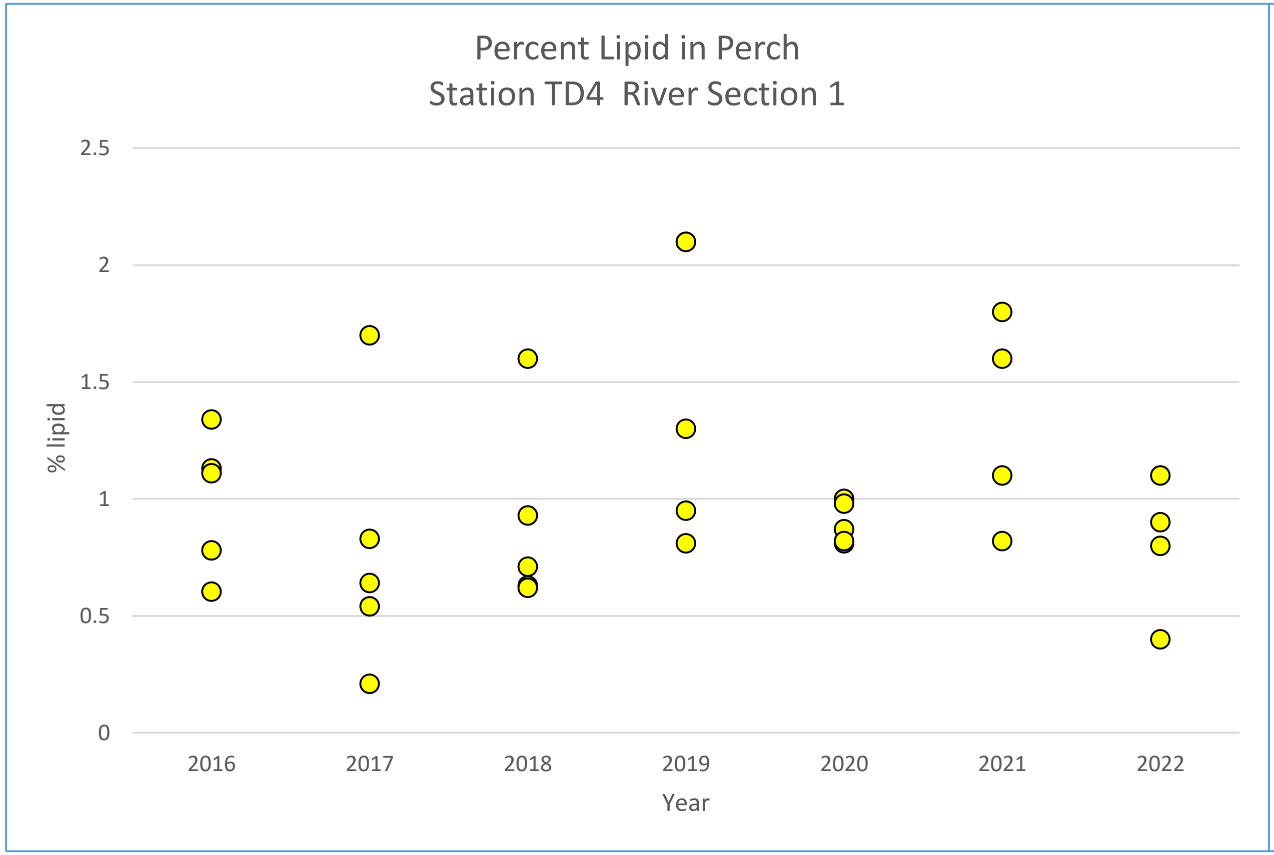


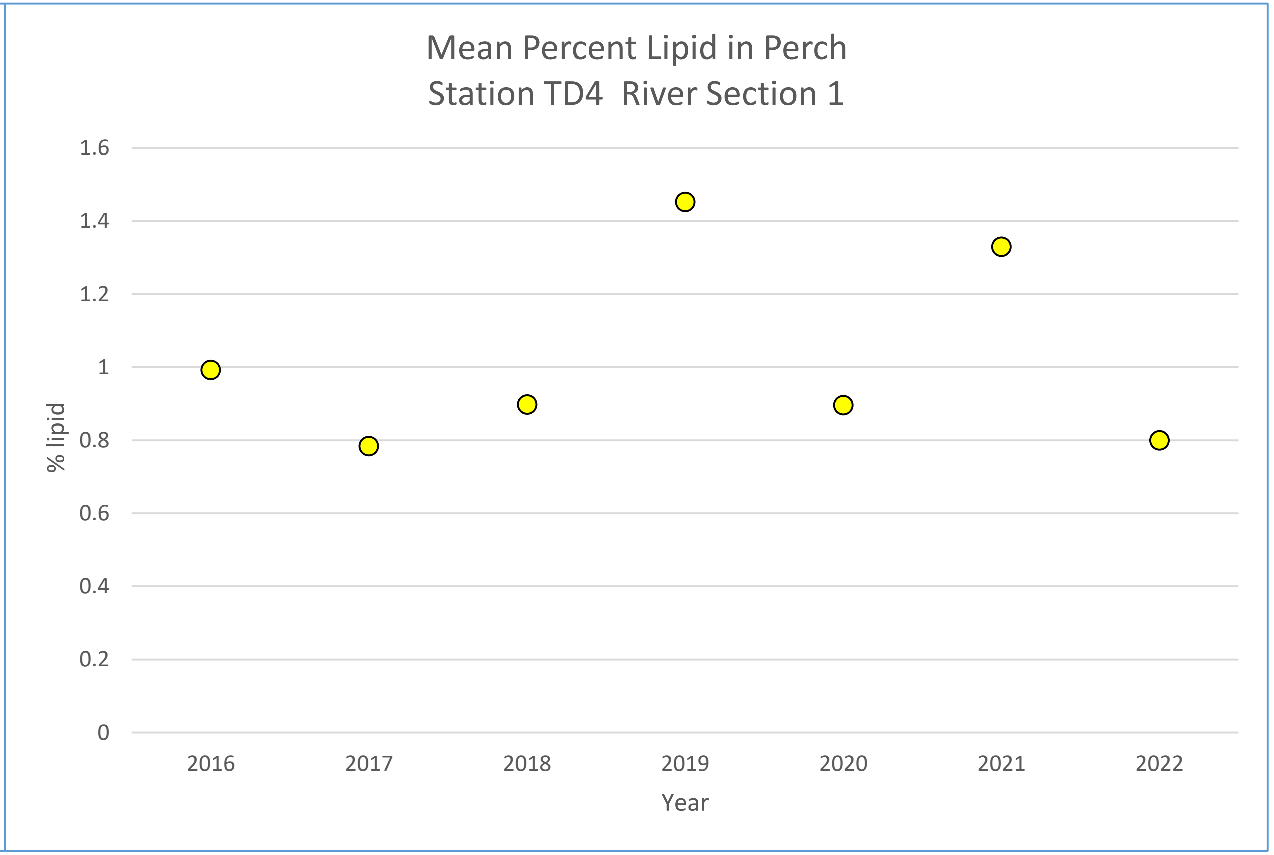
TD4 Perch Lipid Based PCB



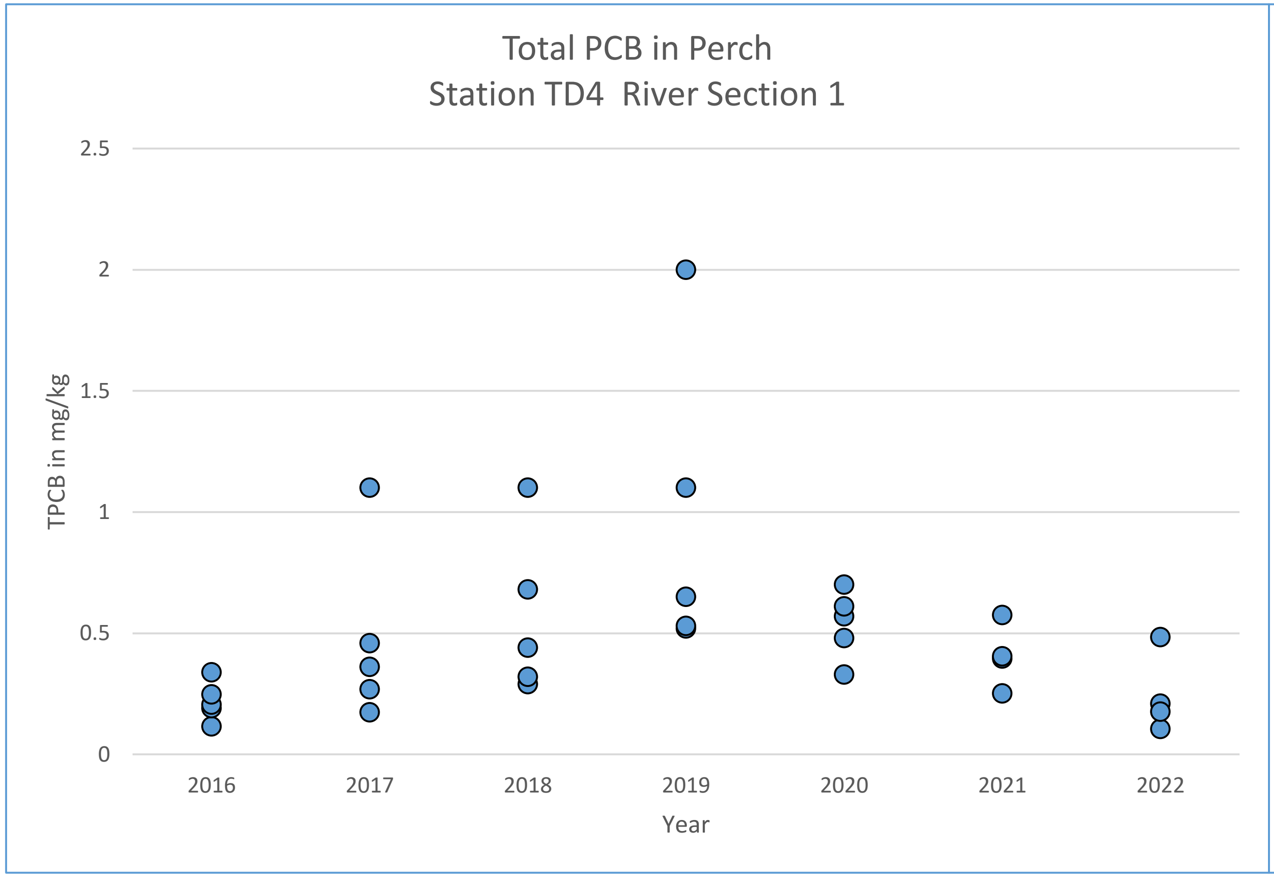


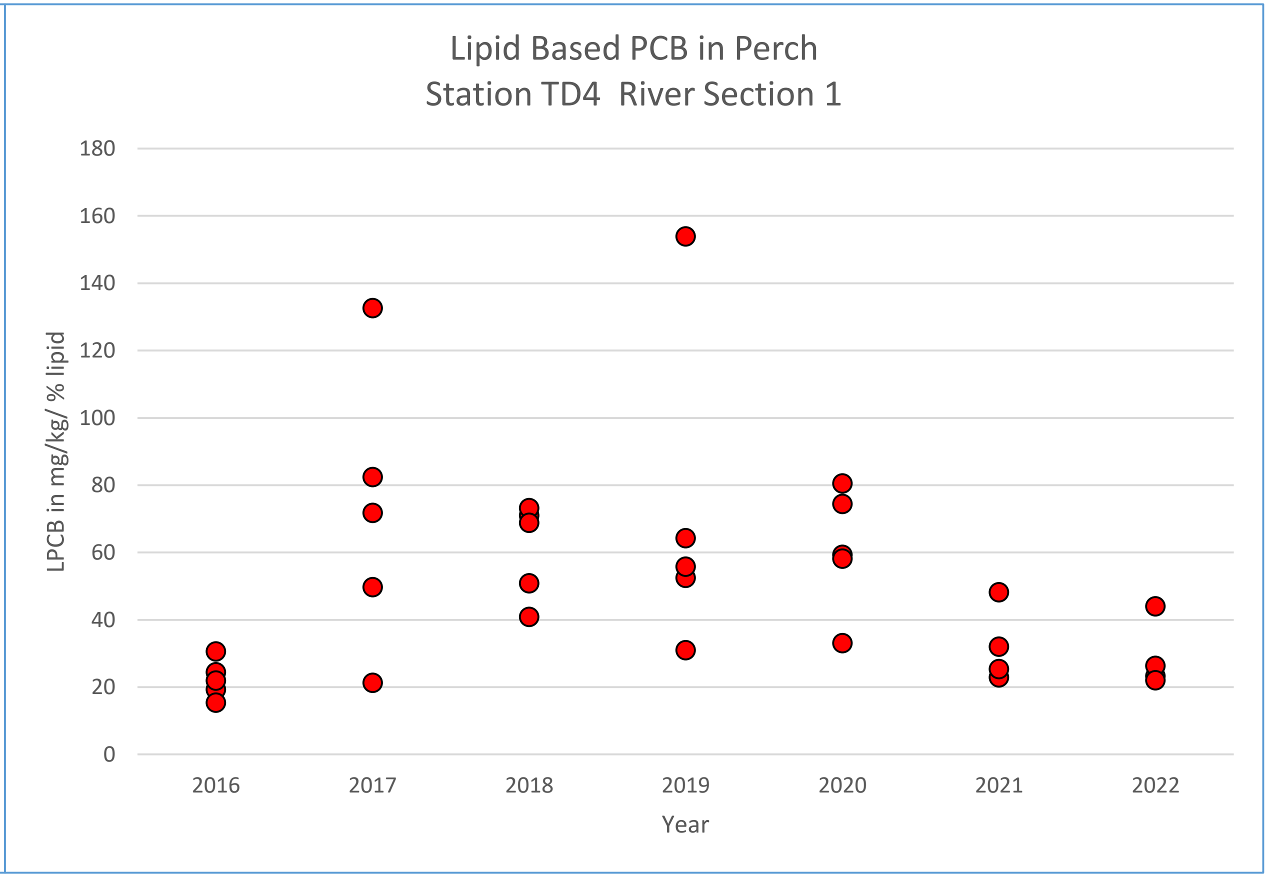
TD4 Perch Percent Lipid



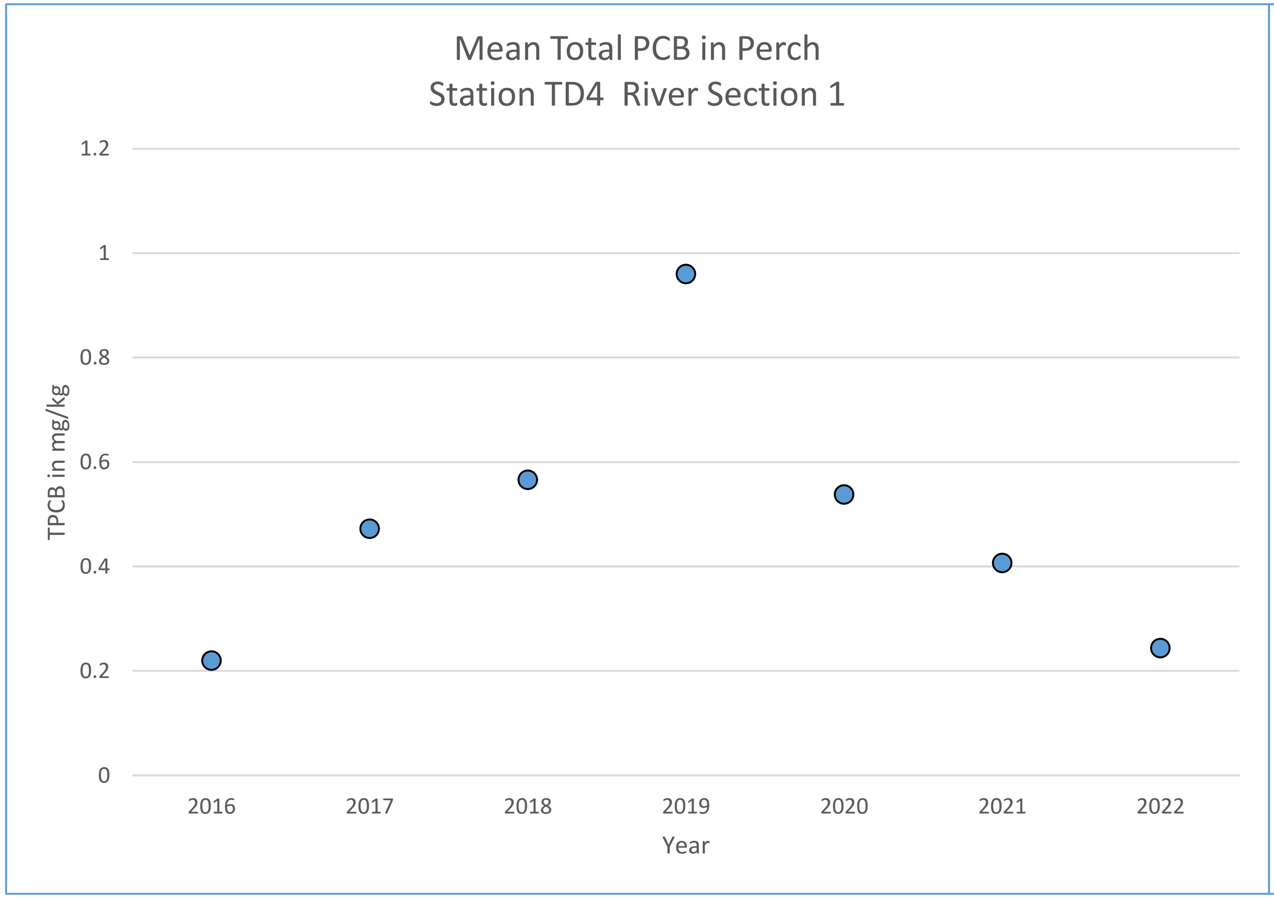


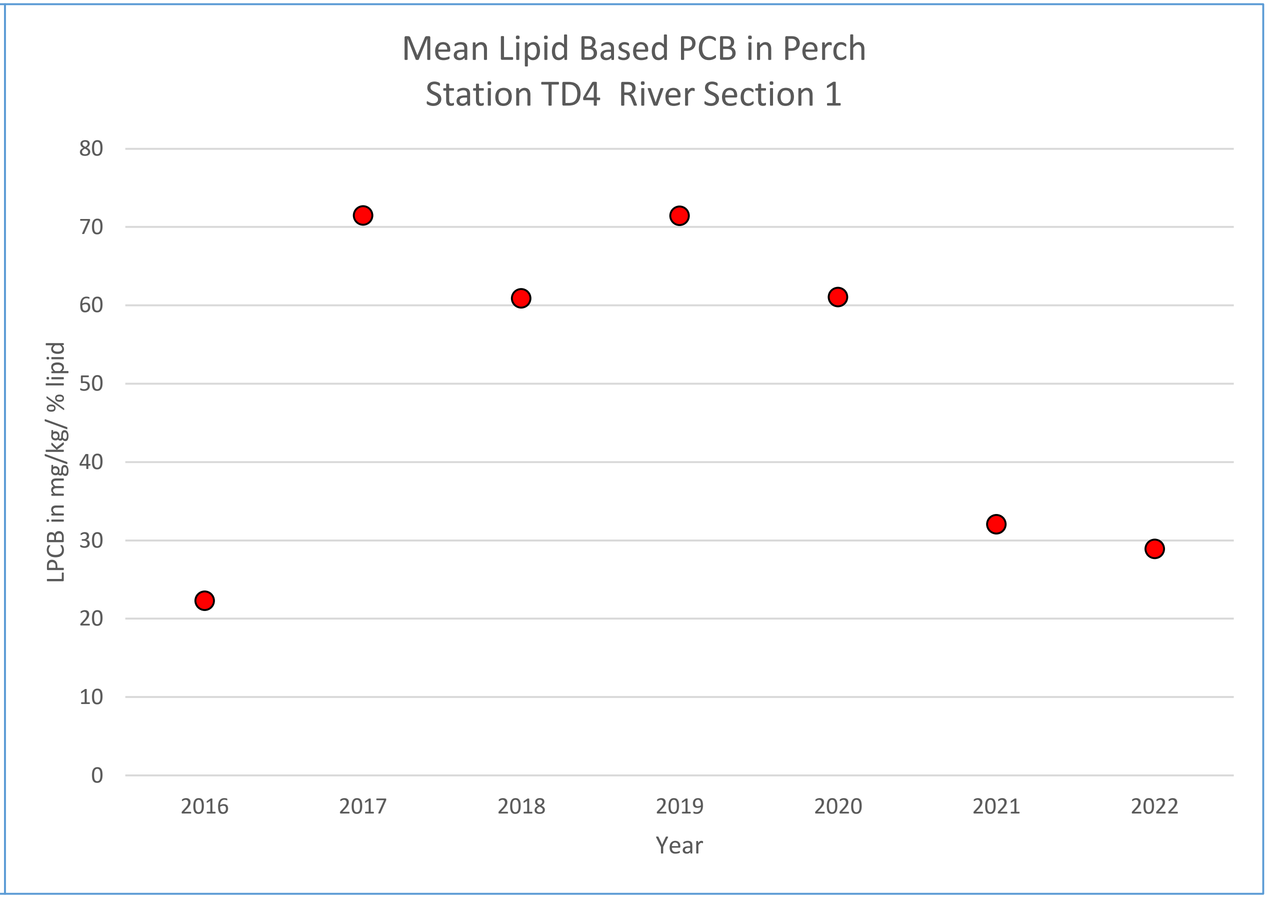
TD4 Perch Total PCB and Lipid Based PCB





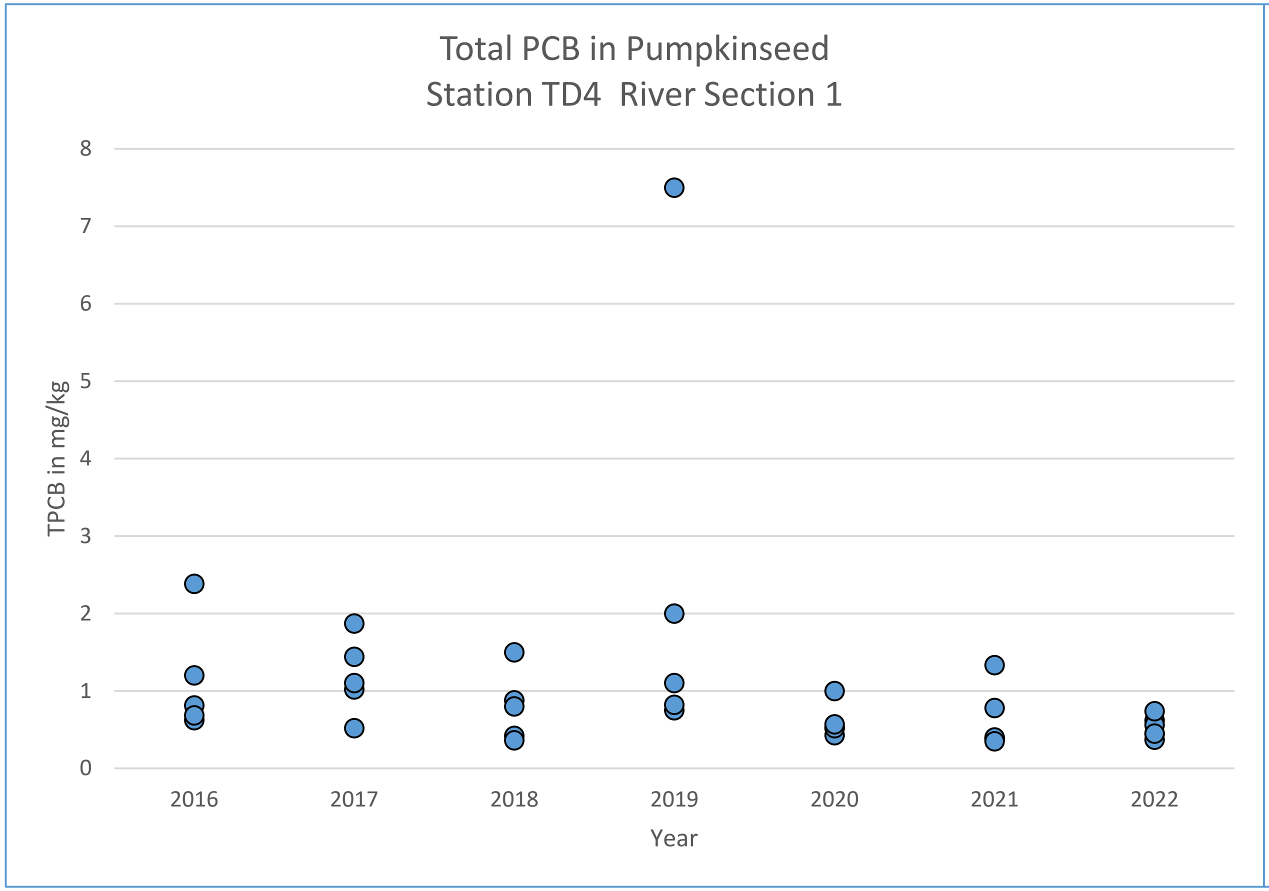
TD4 Perch Mean Total PCB and Mean Lipid Based PCB

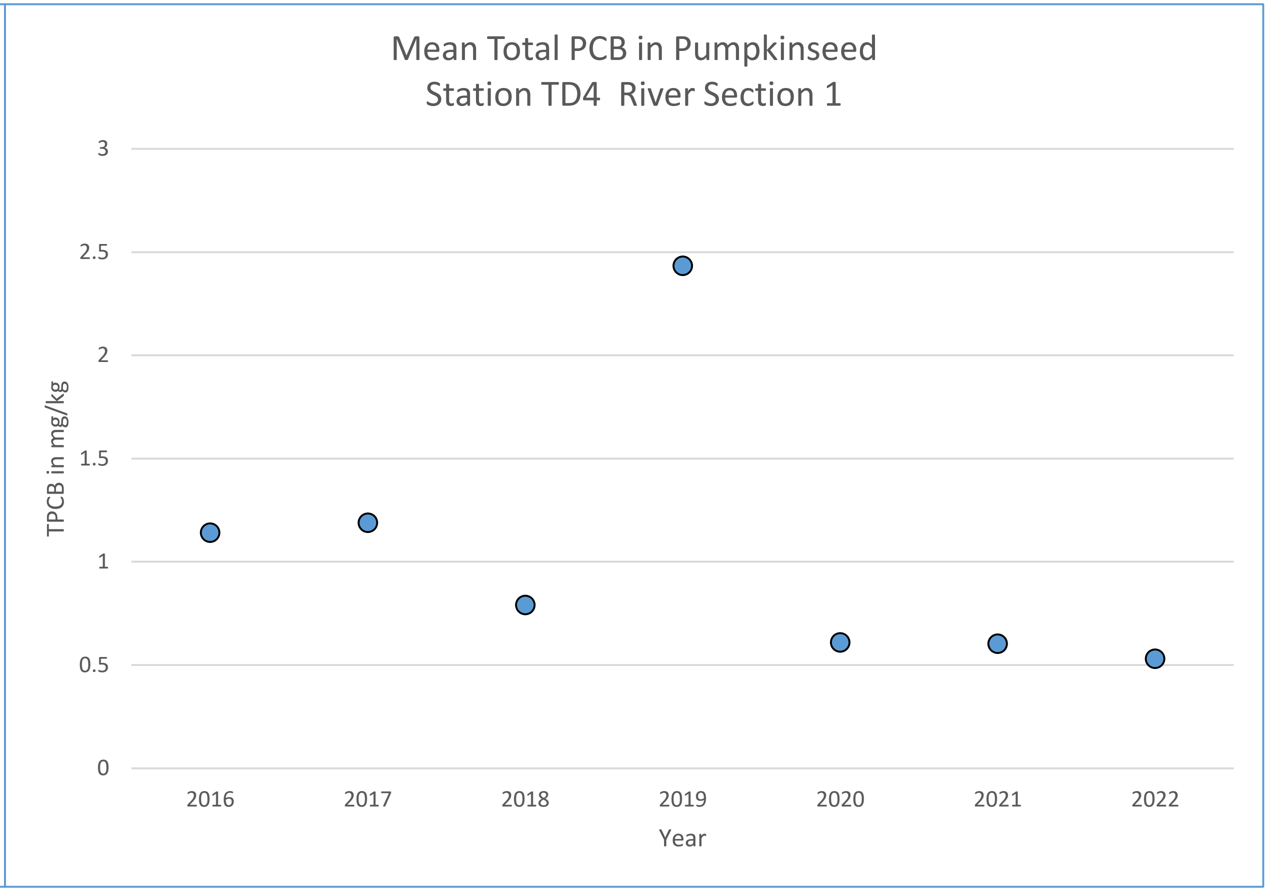




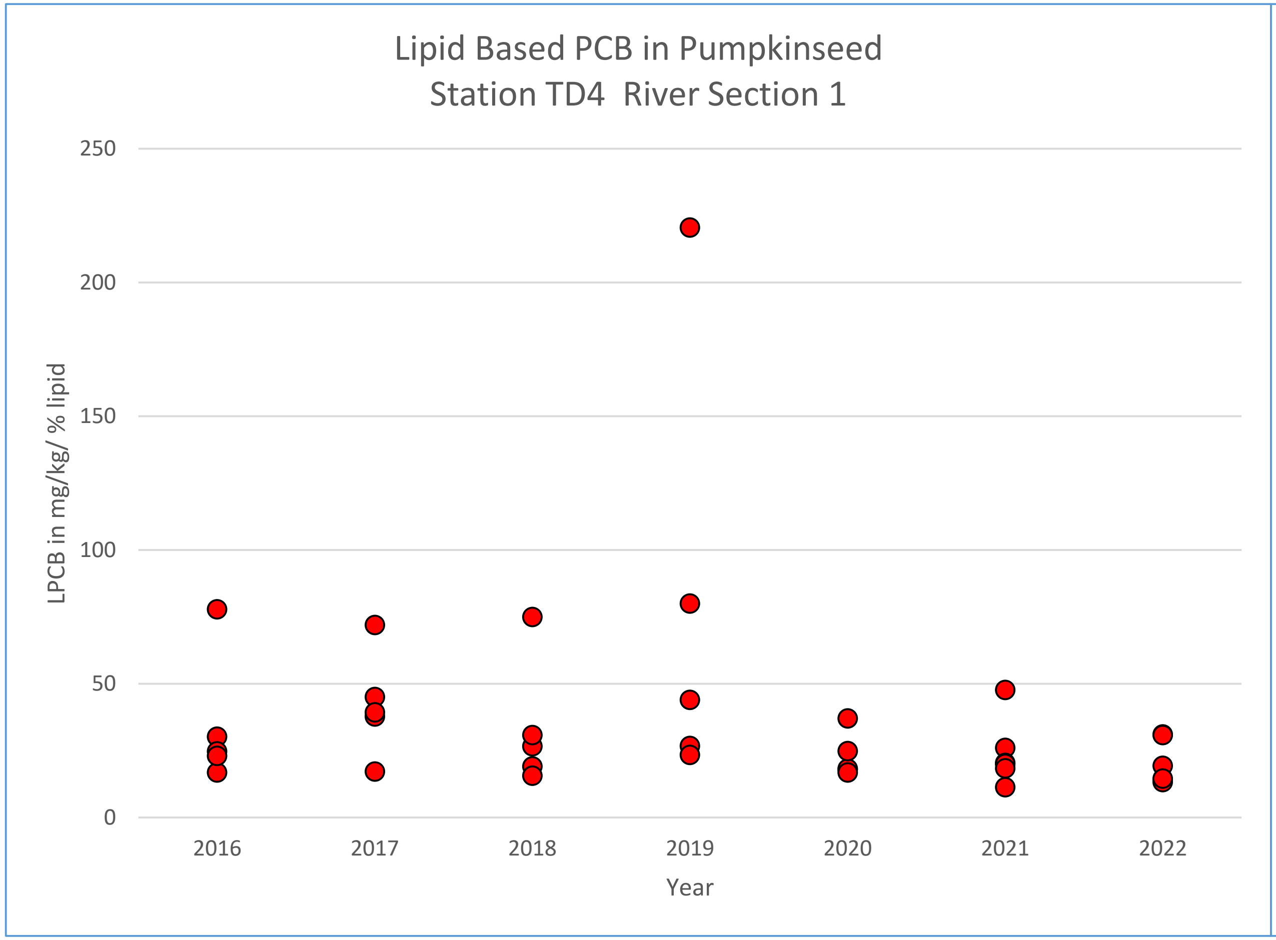
TD4 Pumpkinseed Data

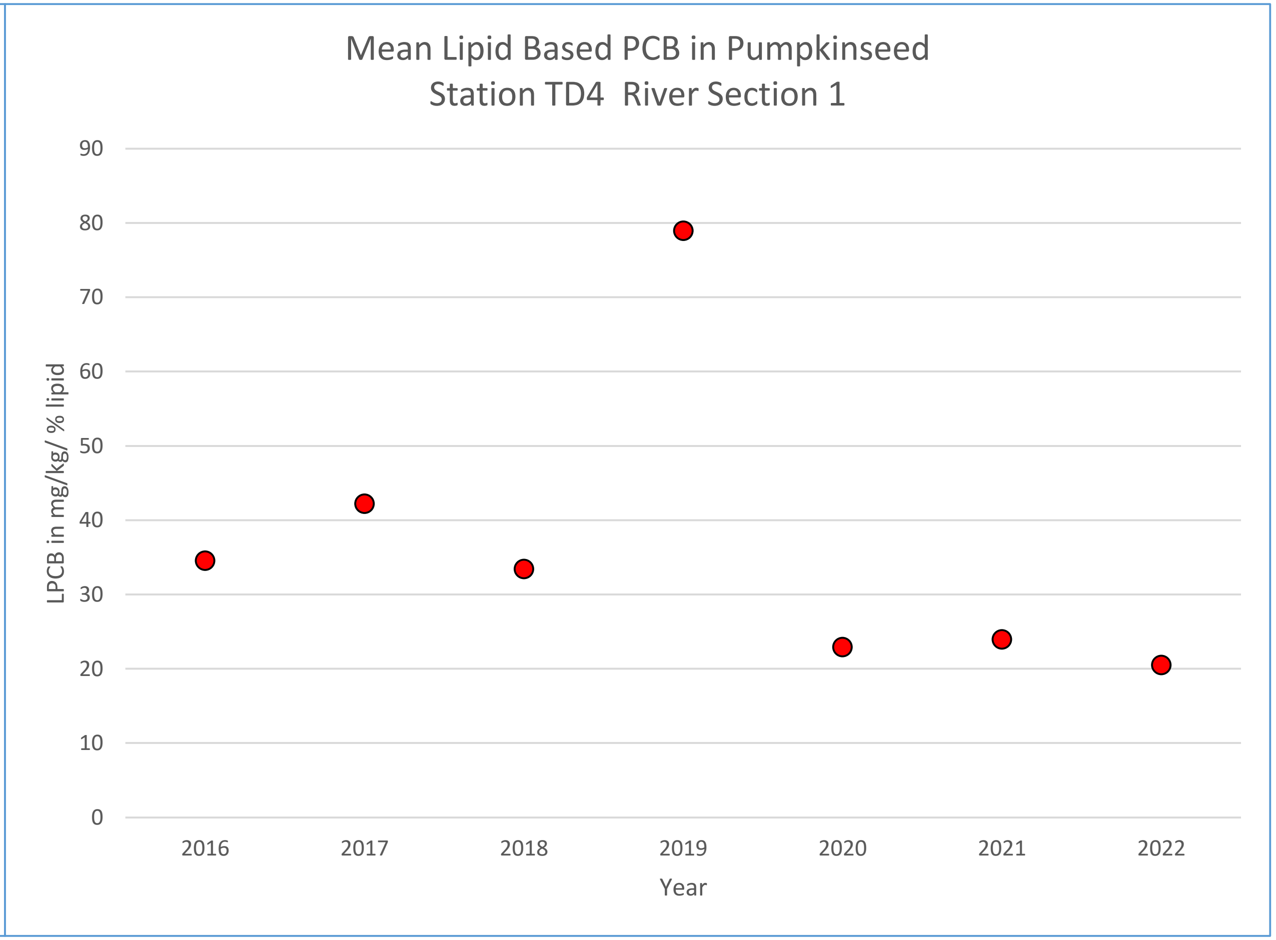
TD4 Pumpkinseed Total PCB



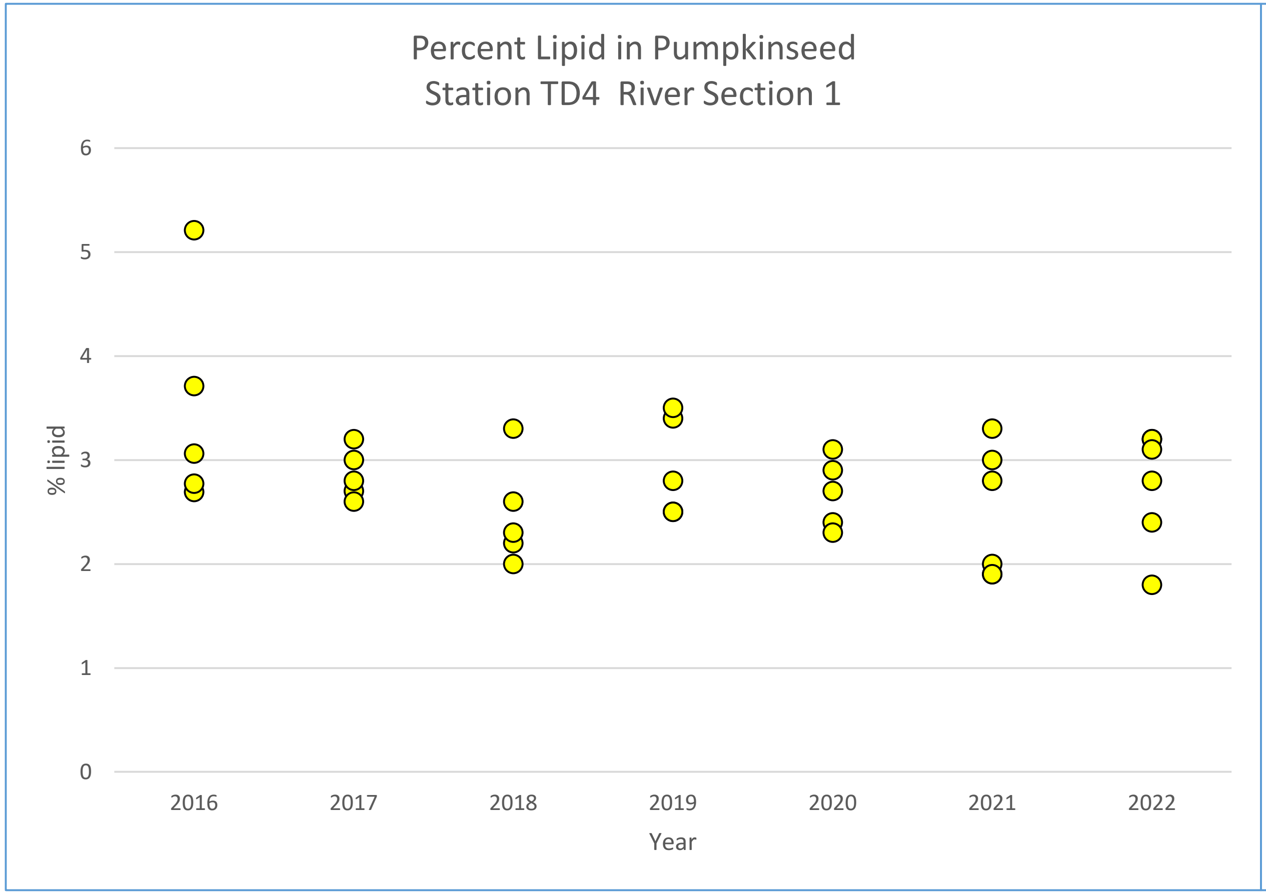


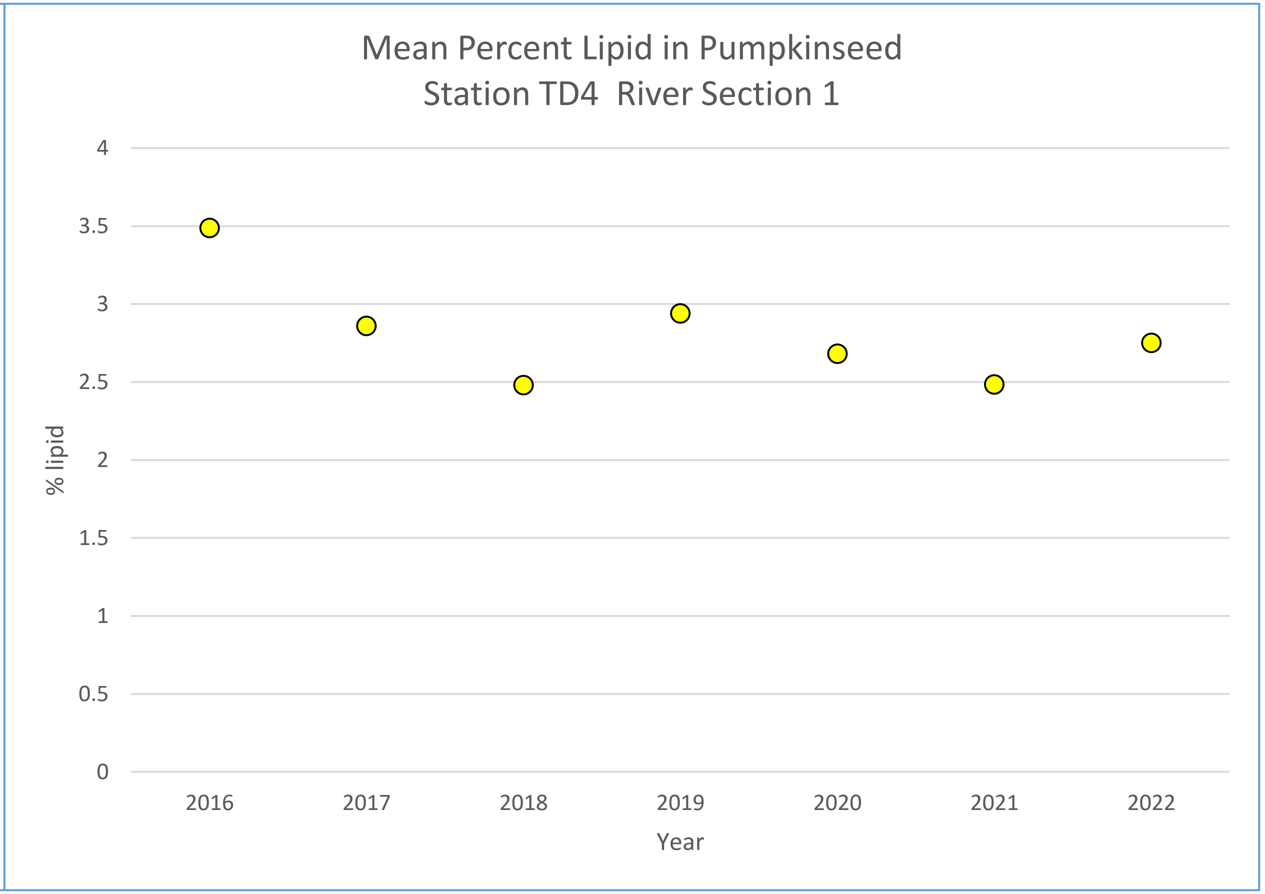
TD4 Pumpkinseed Lipid Based PCB



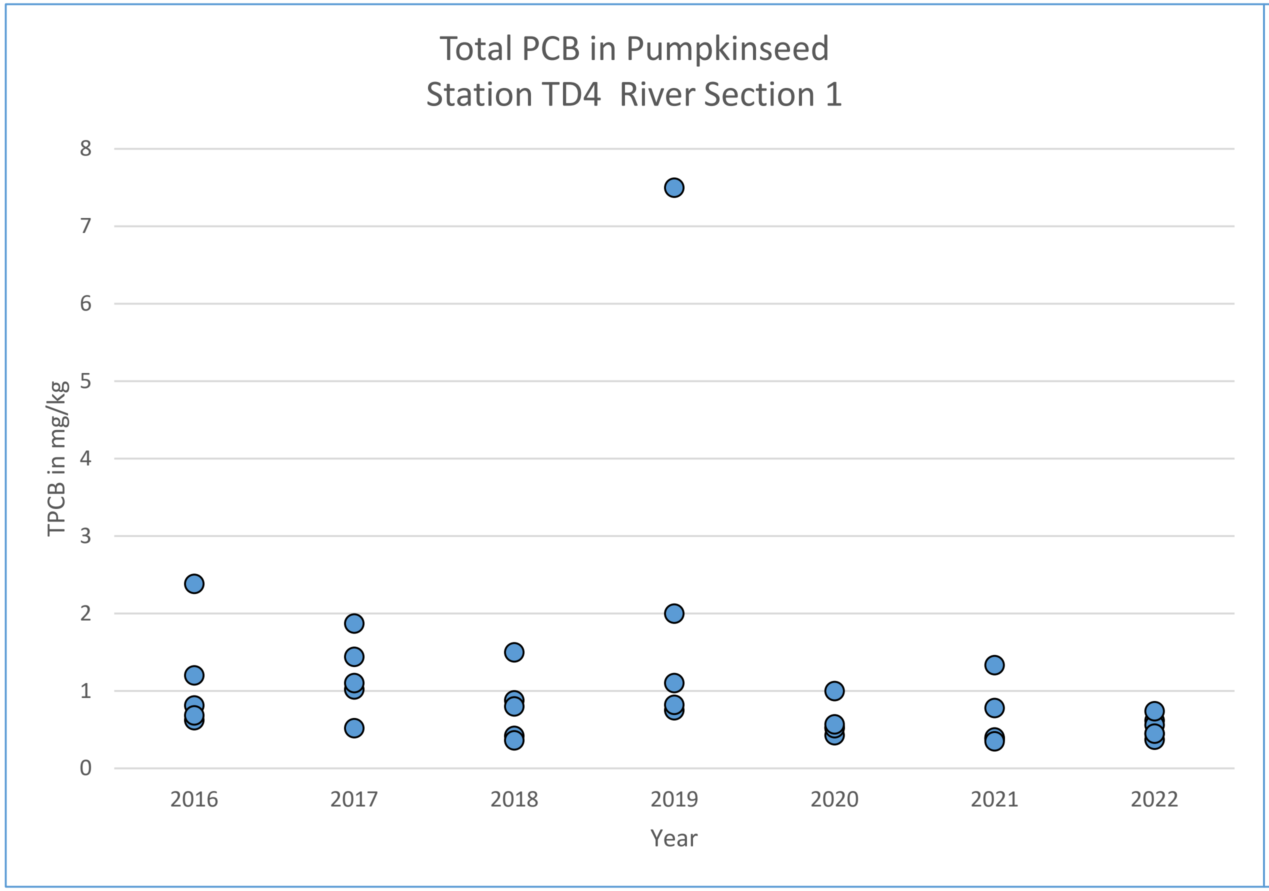


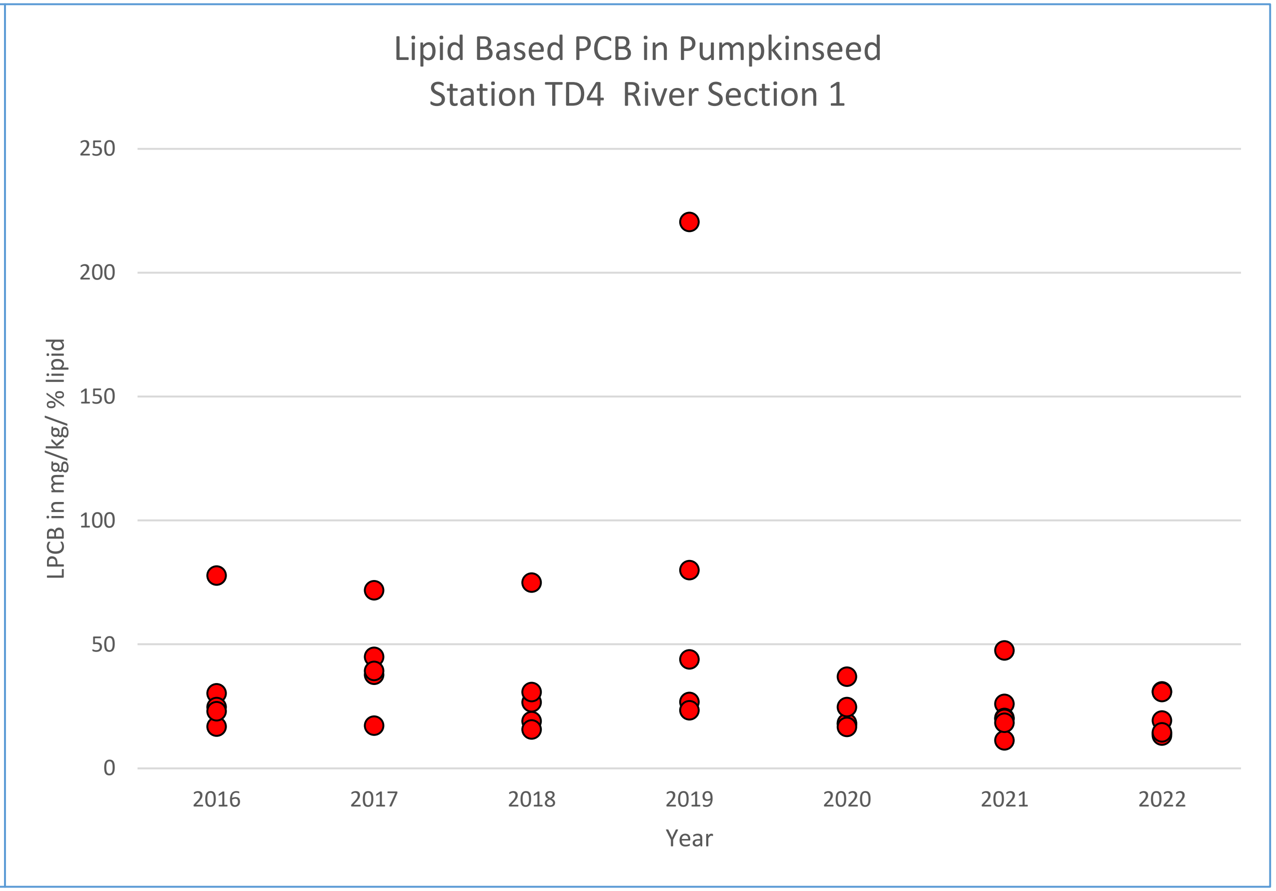
TD4 Pumpkinseed Percent Lipid



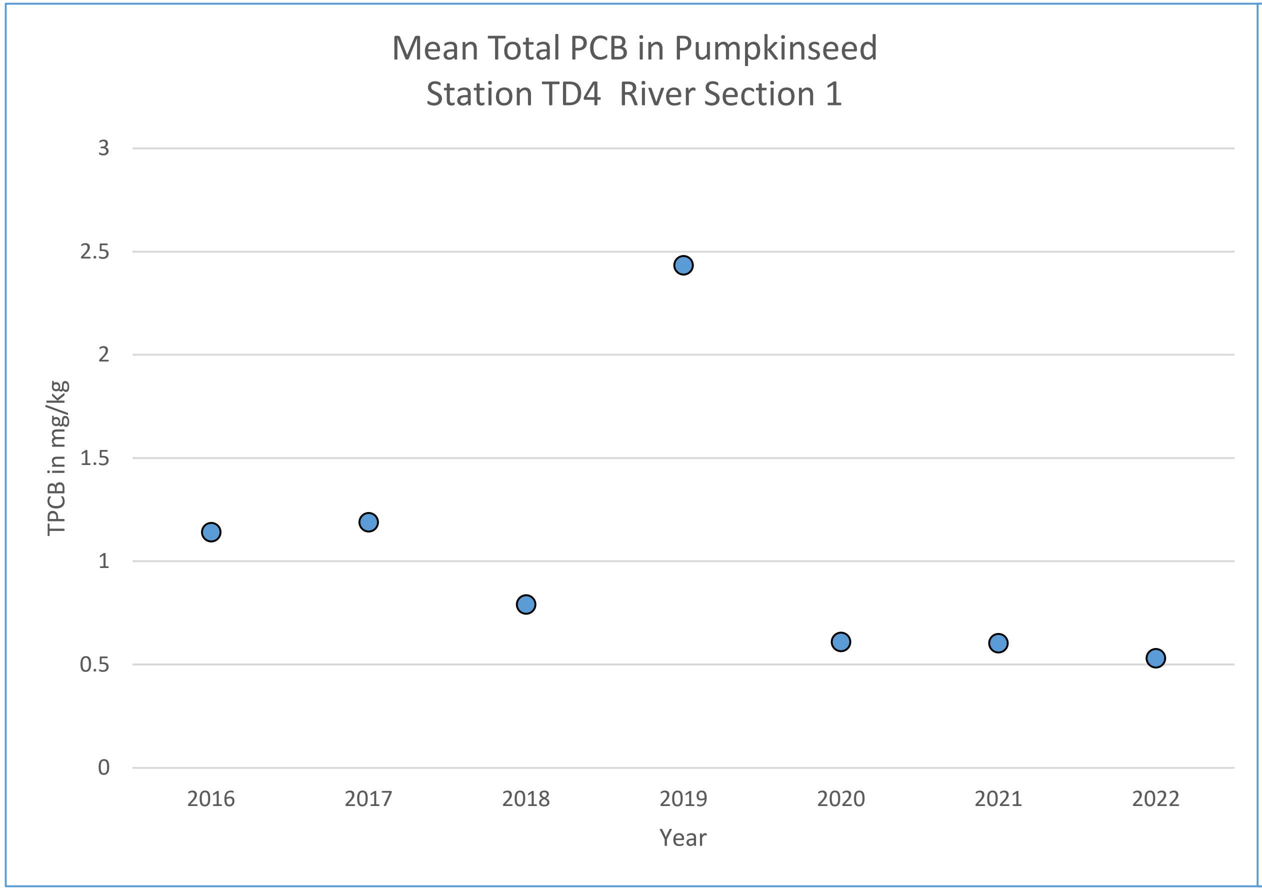


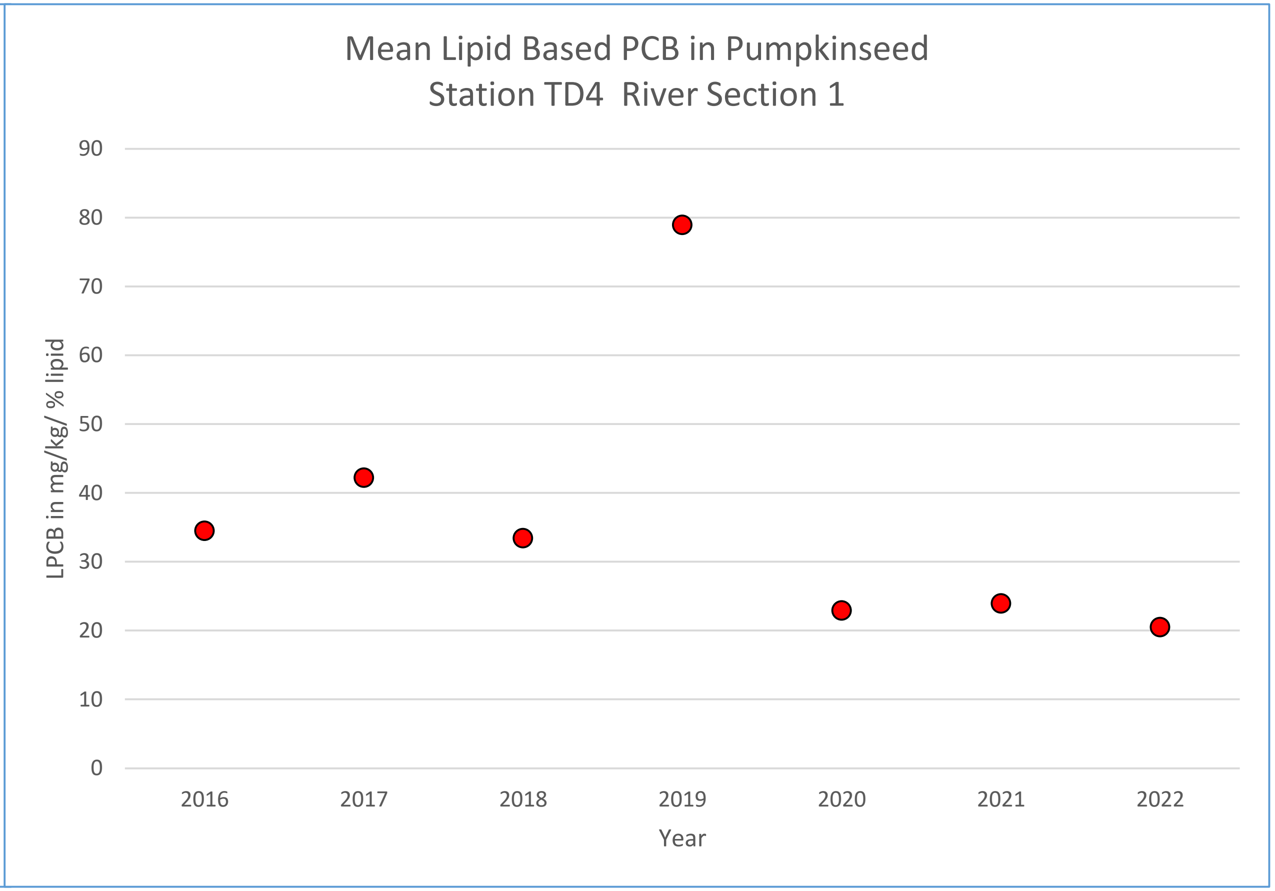
TD4 Pumpkinseed Total PCB and Lipid Based PCB





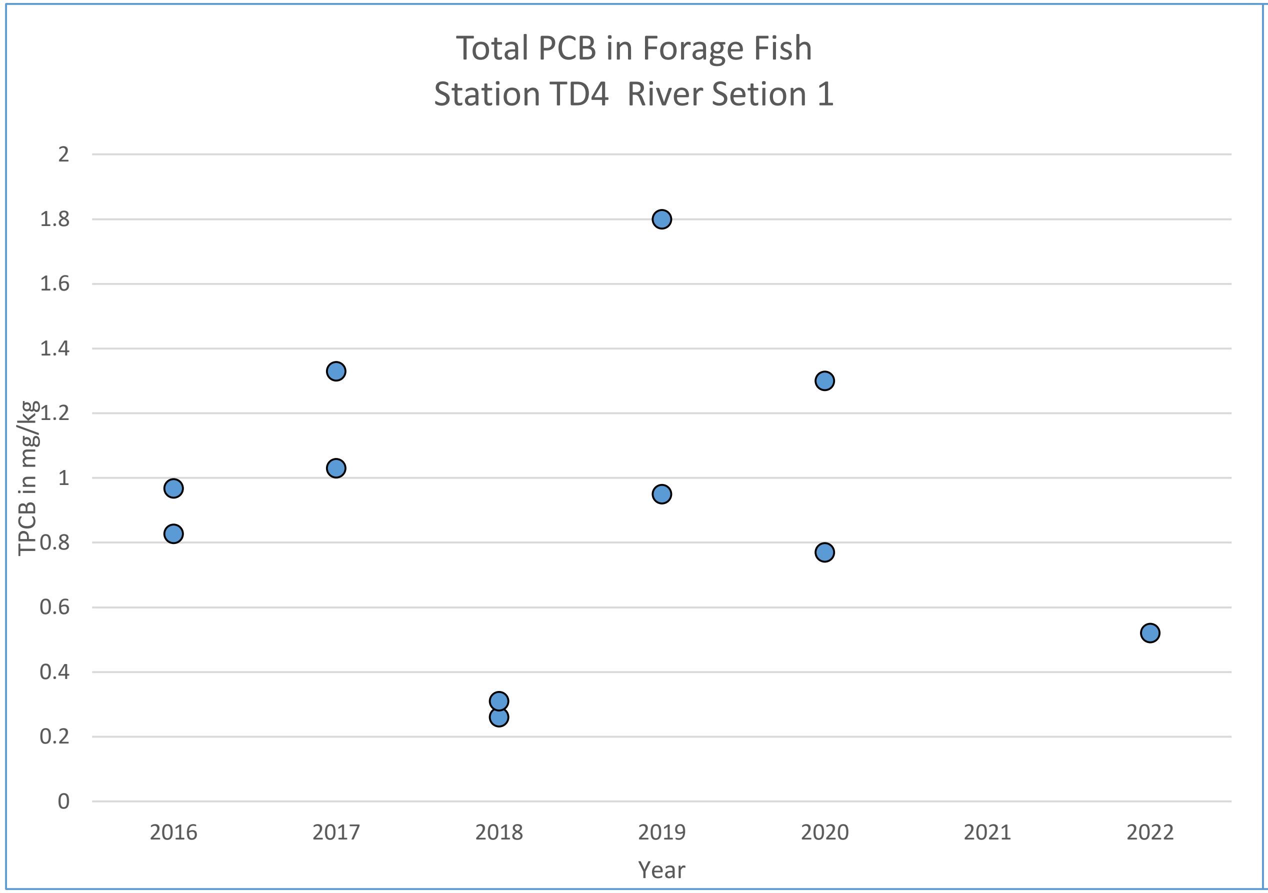
TD4 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

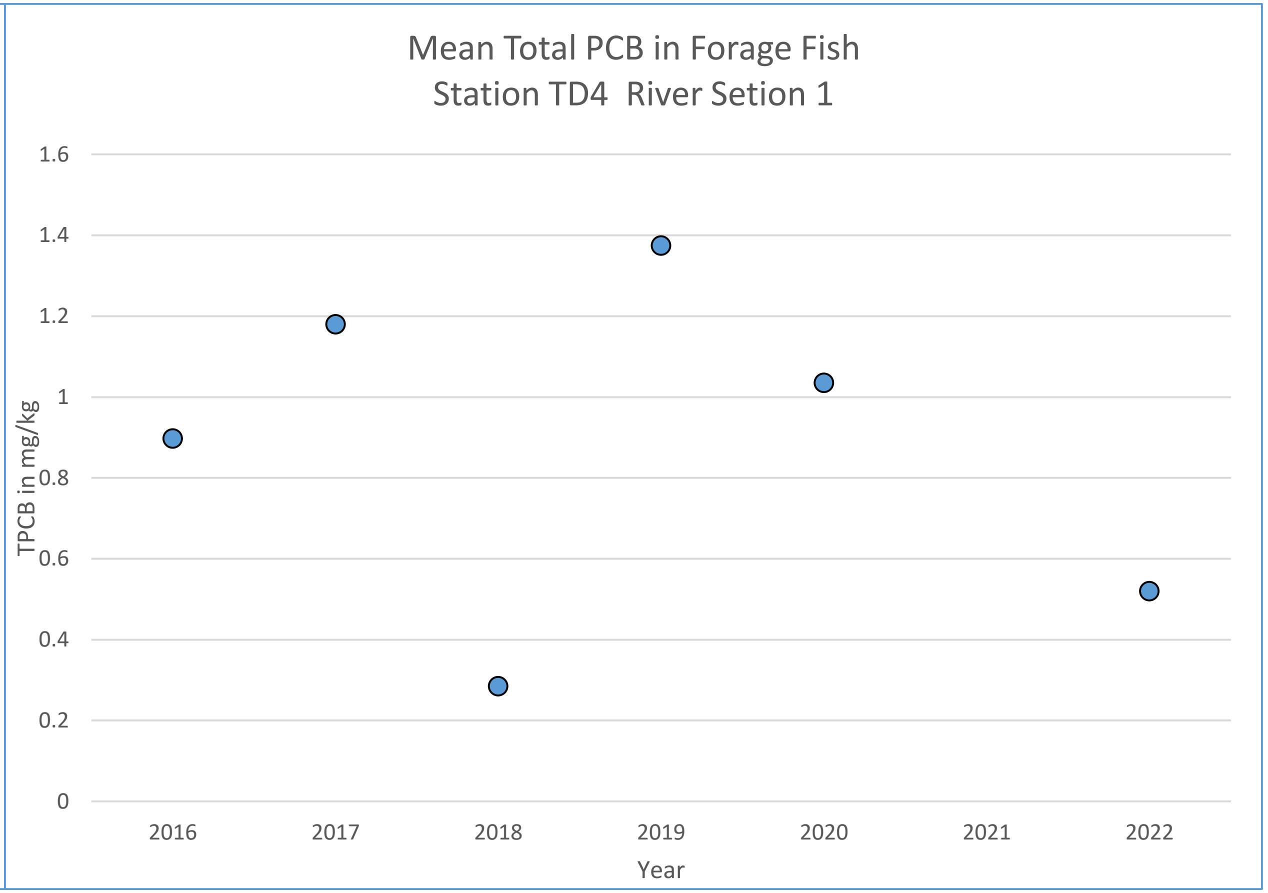




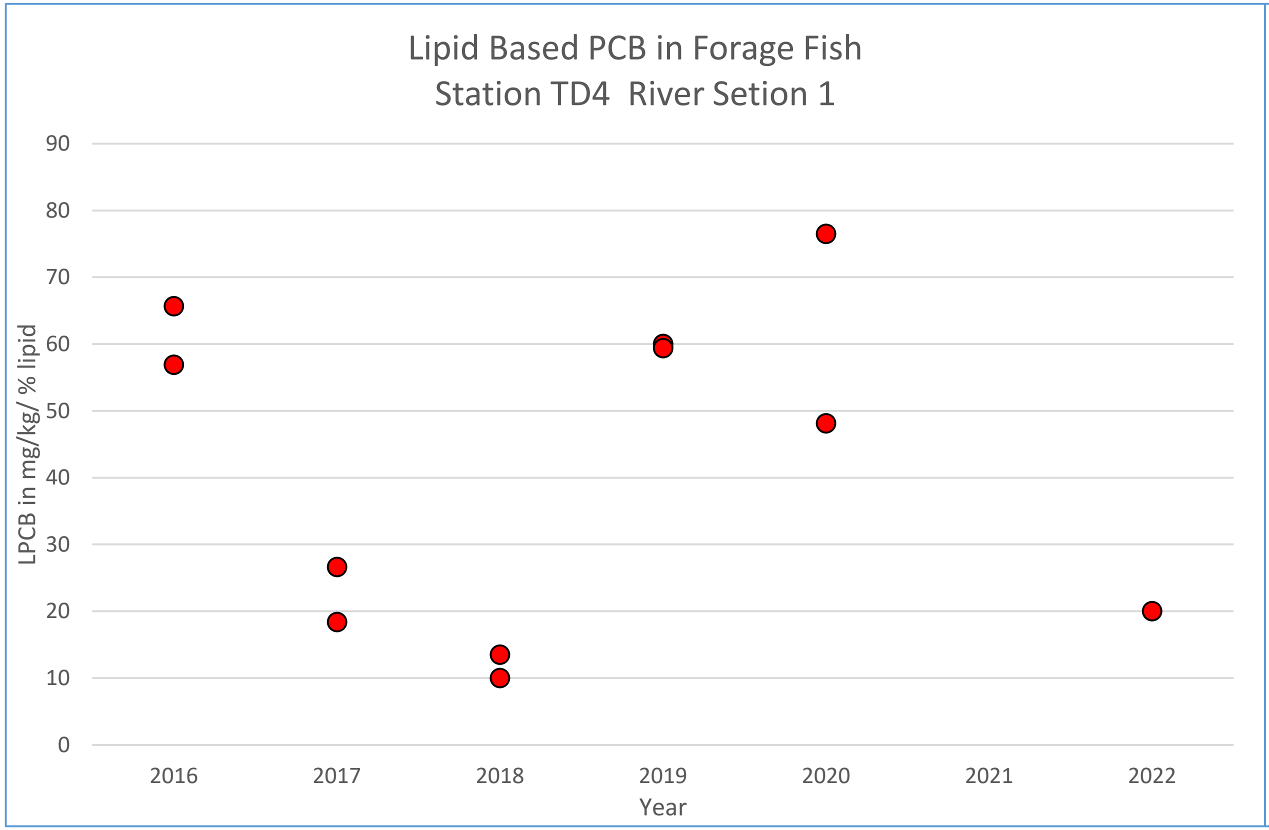
TD4 Forage Fish Data

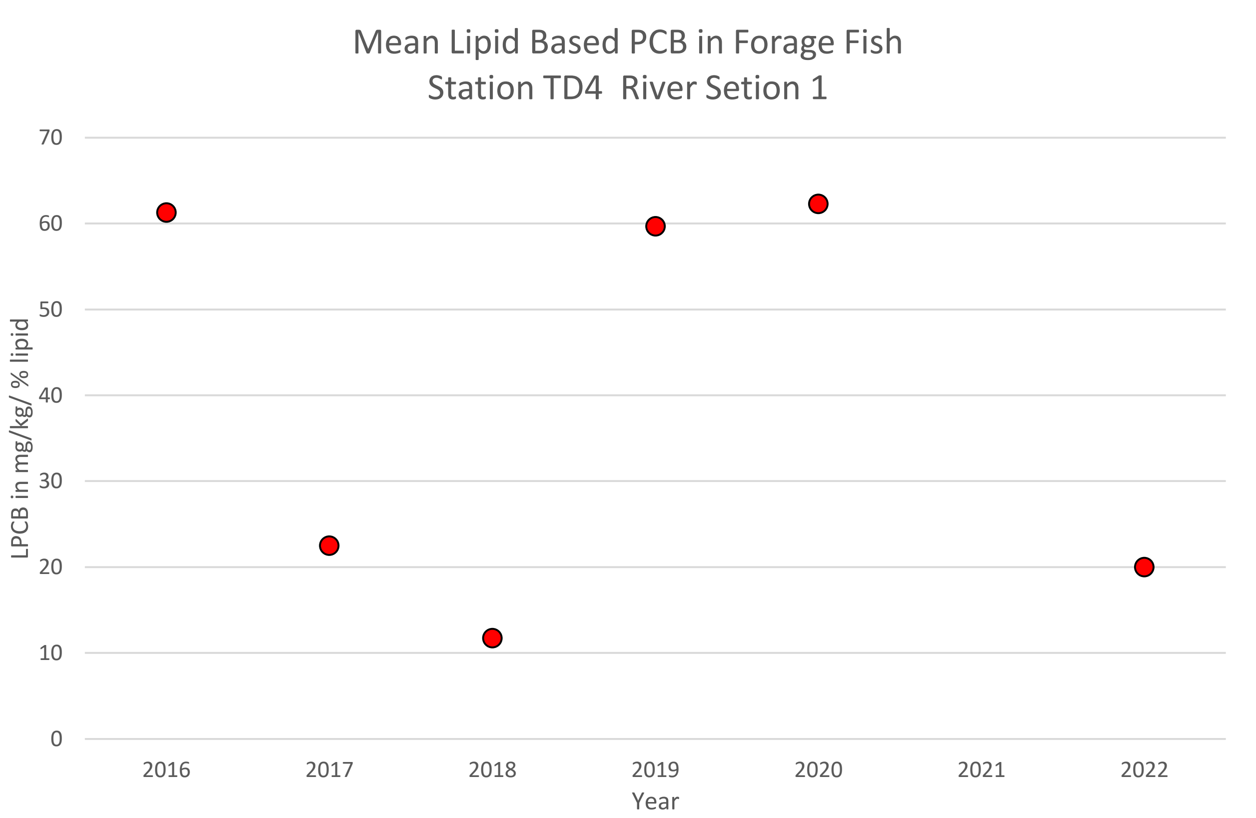
TD4 Forage Fish Total PCB



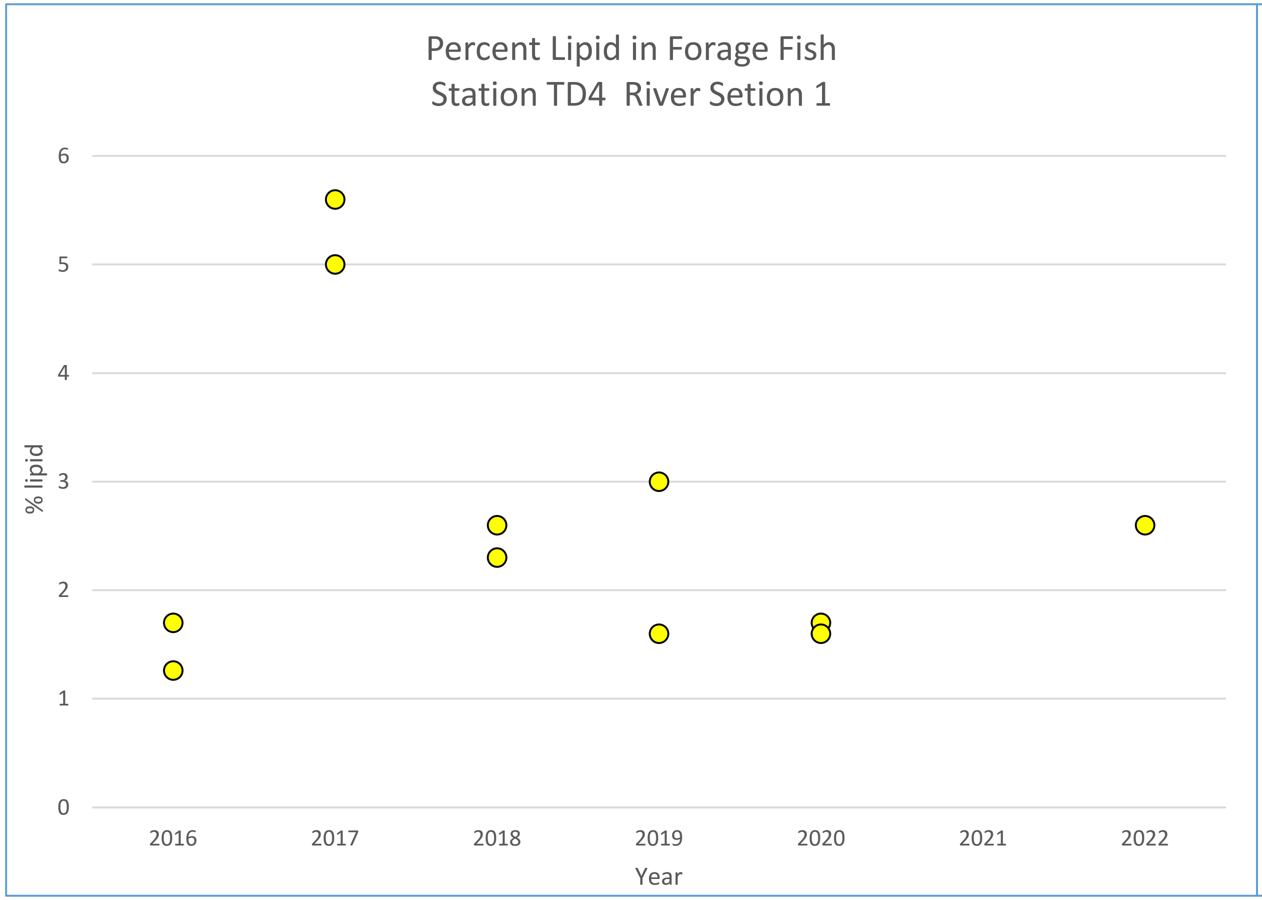


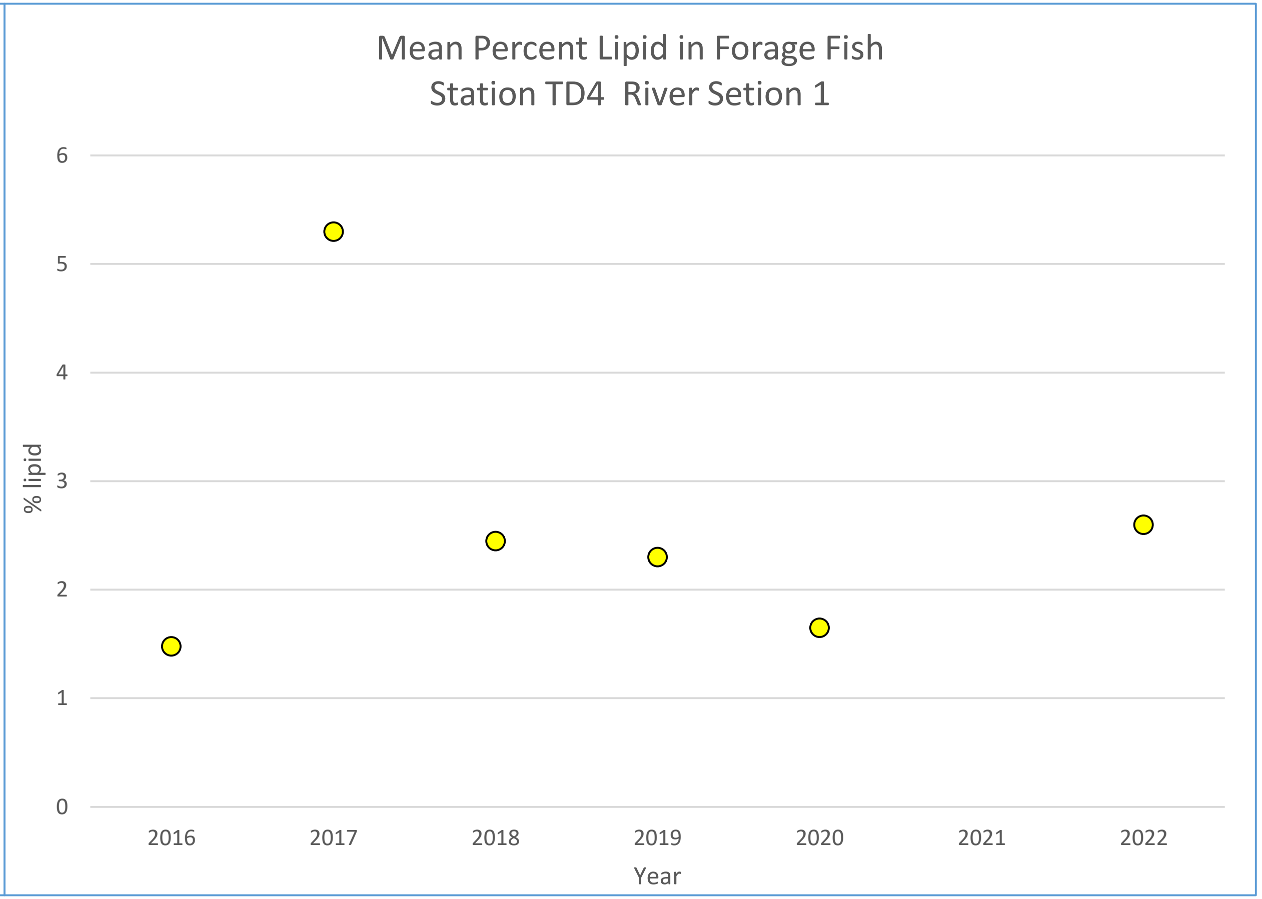
TD4 Forage Fish Lipid Based PCB



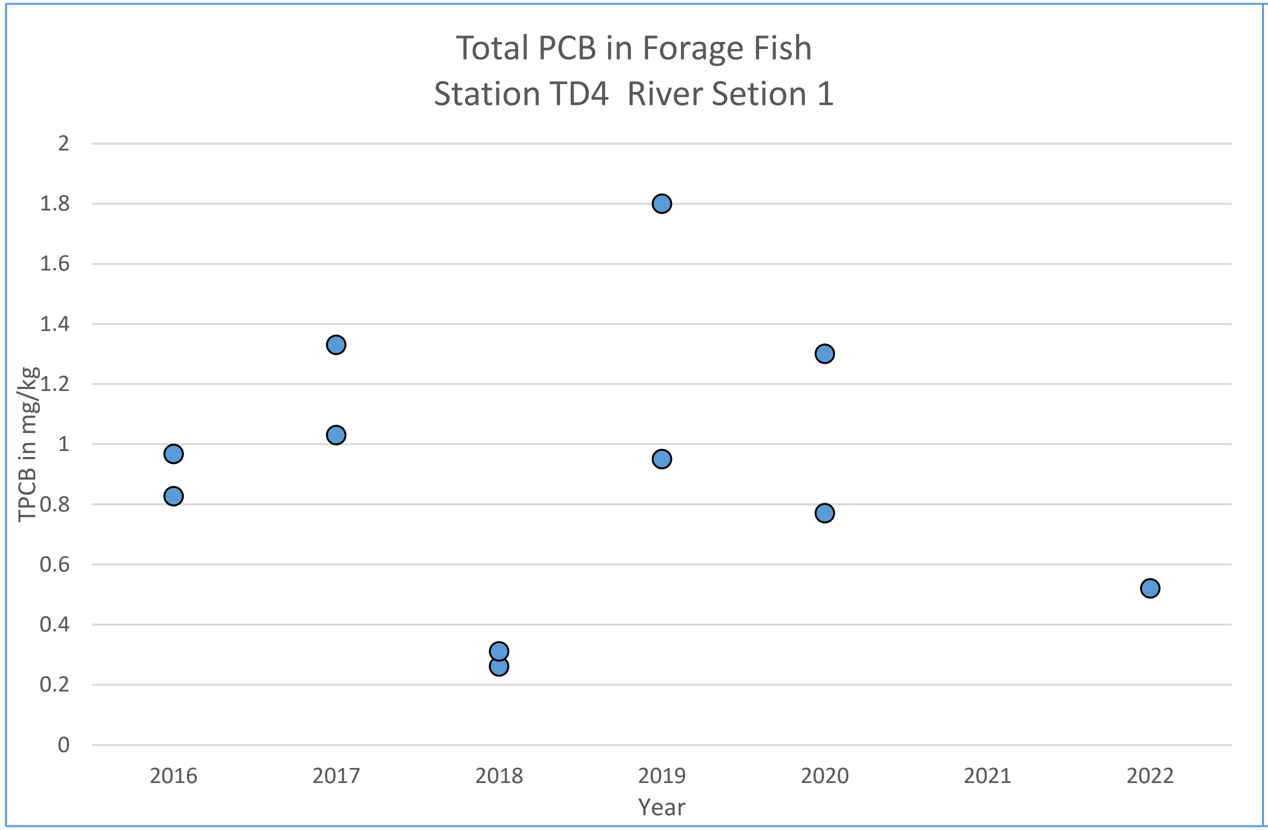


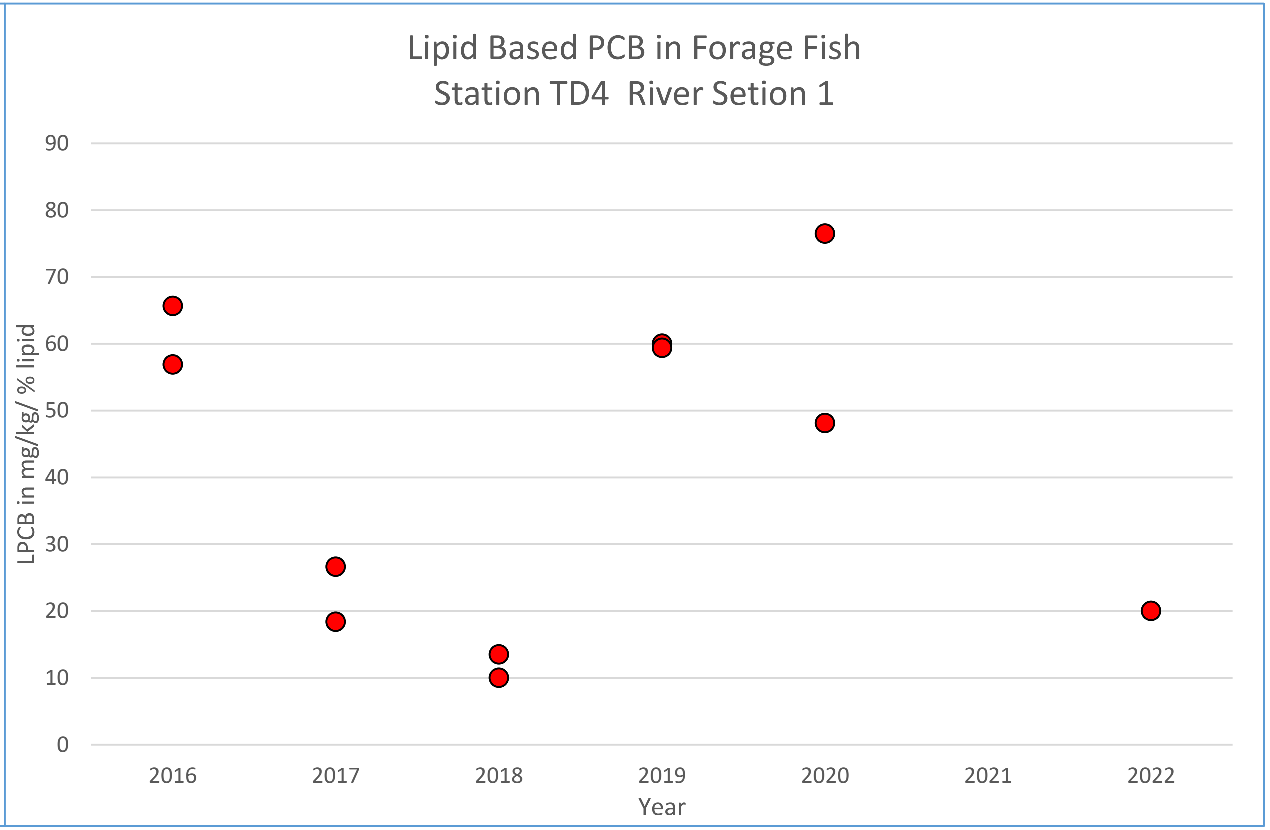
TD4 Forage Fish Percent Lipid



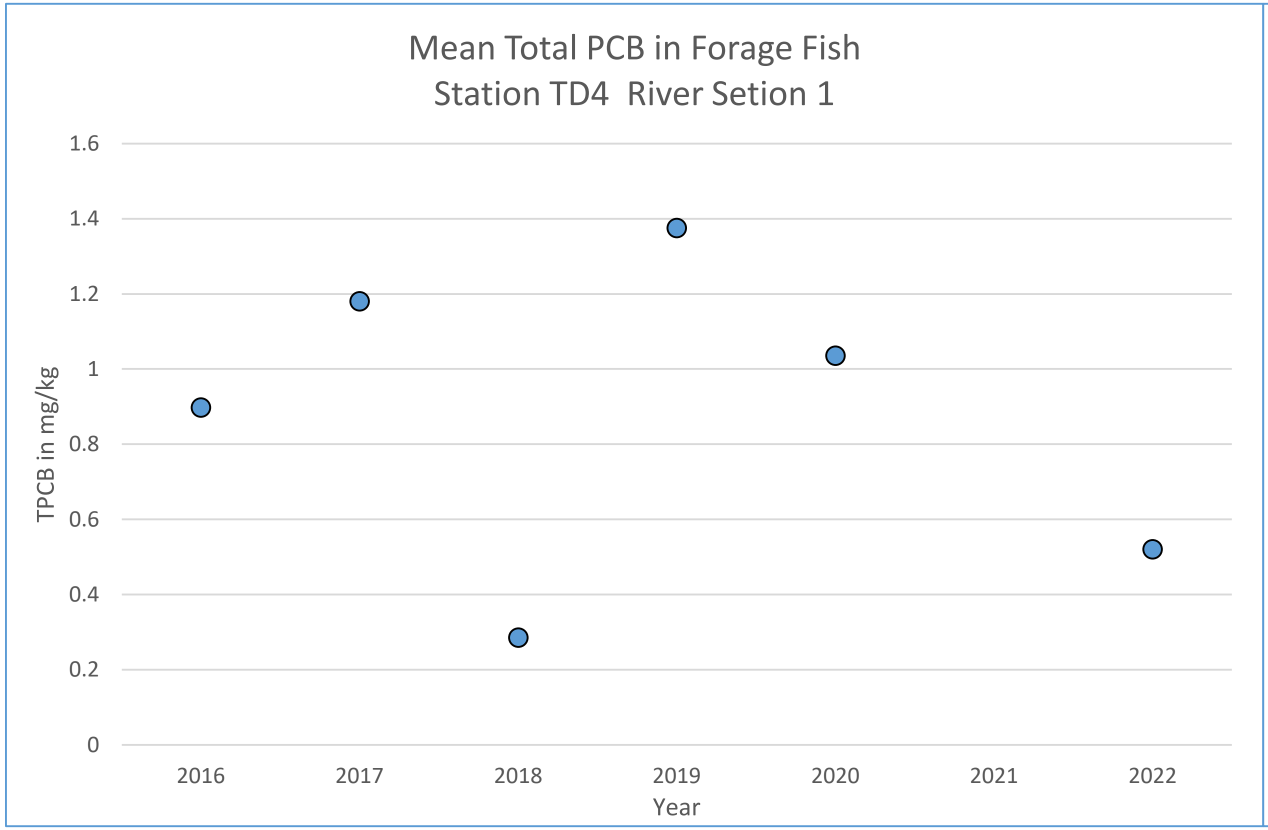


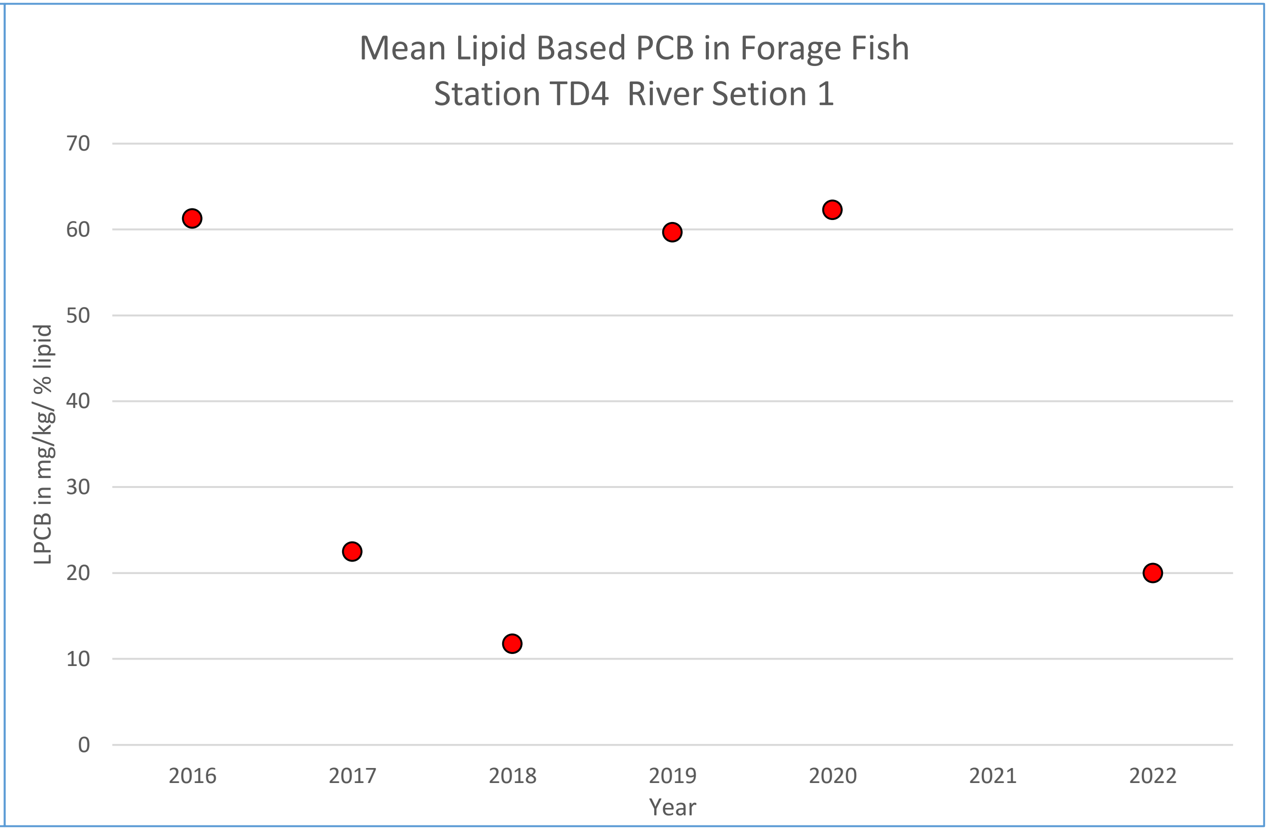
TD4 Forage Fish Total PCB and Lipid Based PCB





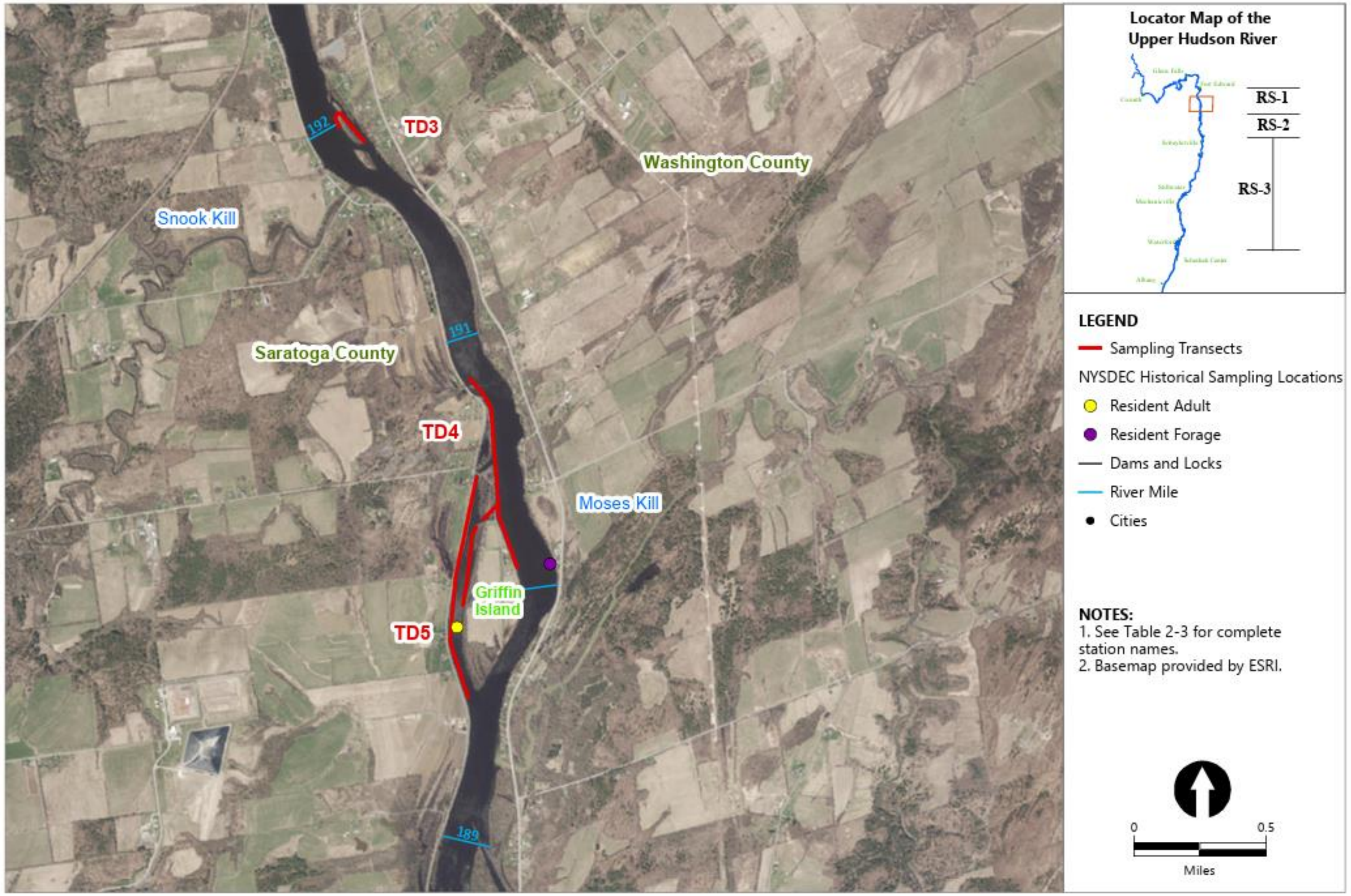
TD4 Forage Fish Mean Total PCB and Mean Lipid Based PCB





Station TD5

Stations TD3, TD4 and TD5



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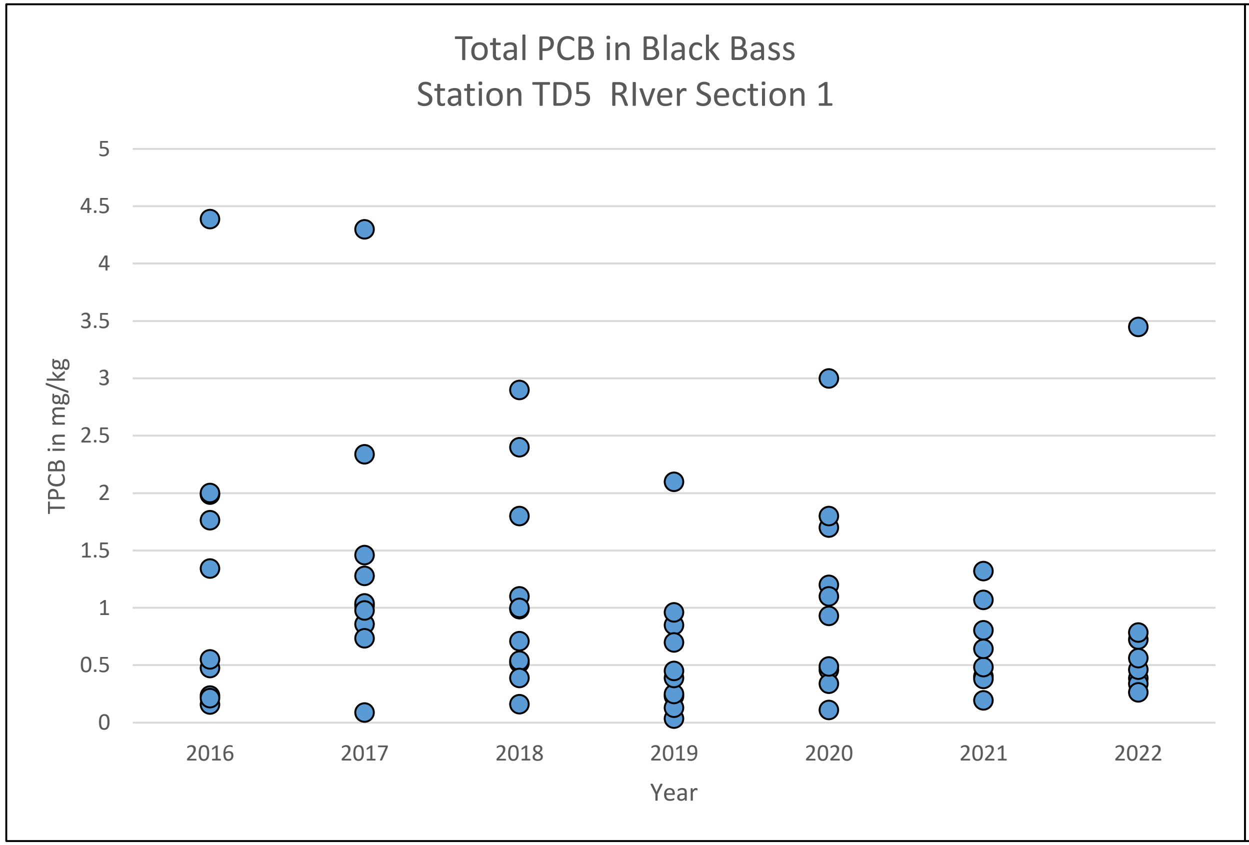
Filepath: H:\E_drive\Projects\GE_Hudson\RAMP\Working\RAMP_Fish\GIS\Projects\RAMP_Fish_2018_Spring_Locations_Upper_Hudson.mxd

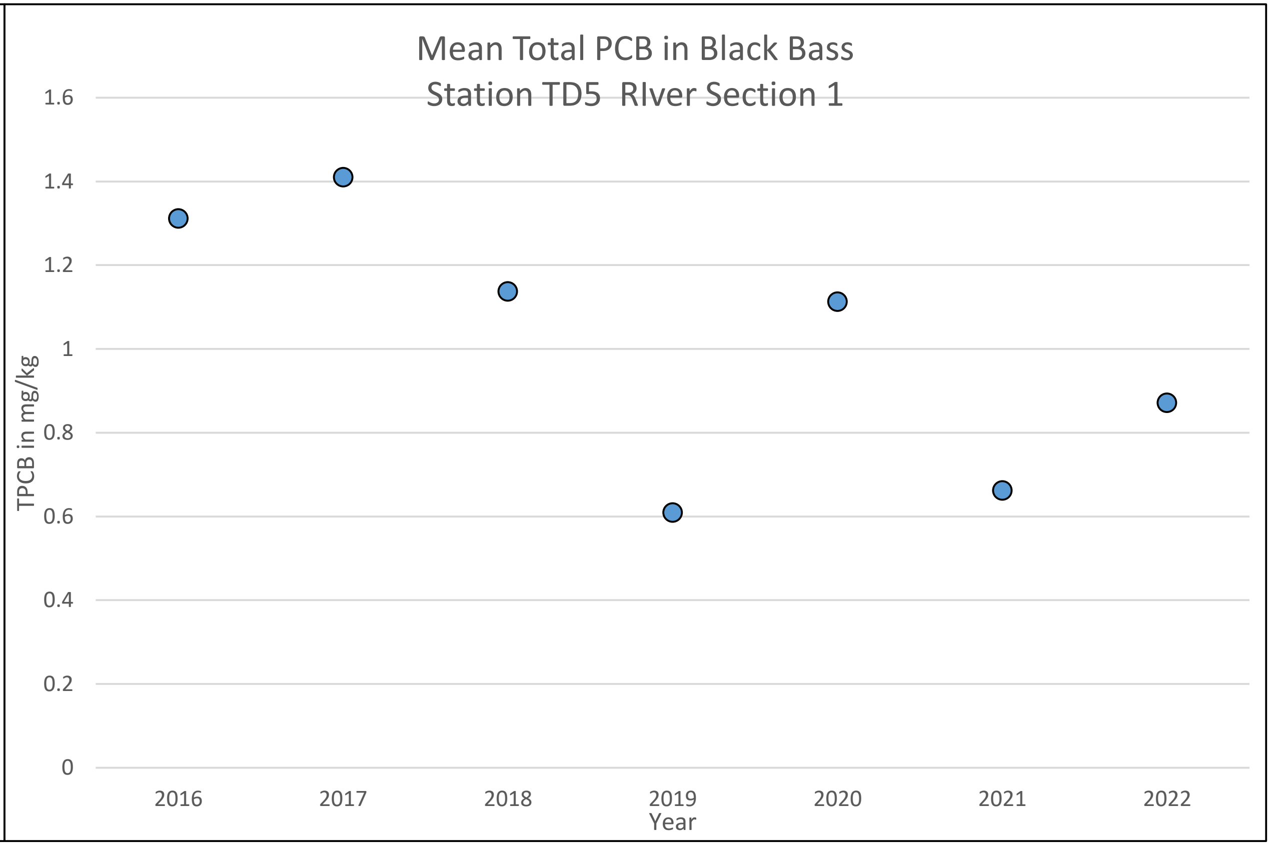
ANCHOR QEA

Figure 2-2c
Spring 2018 Fish Sampling Locations
2018 Water and Fish Data Summary Report
Prepared for the General Electric Company

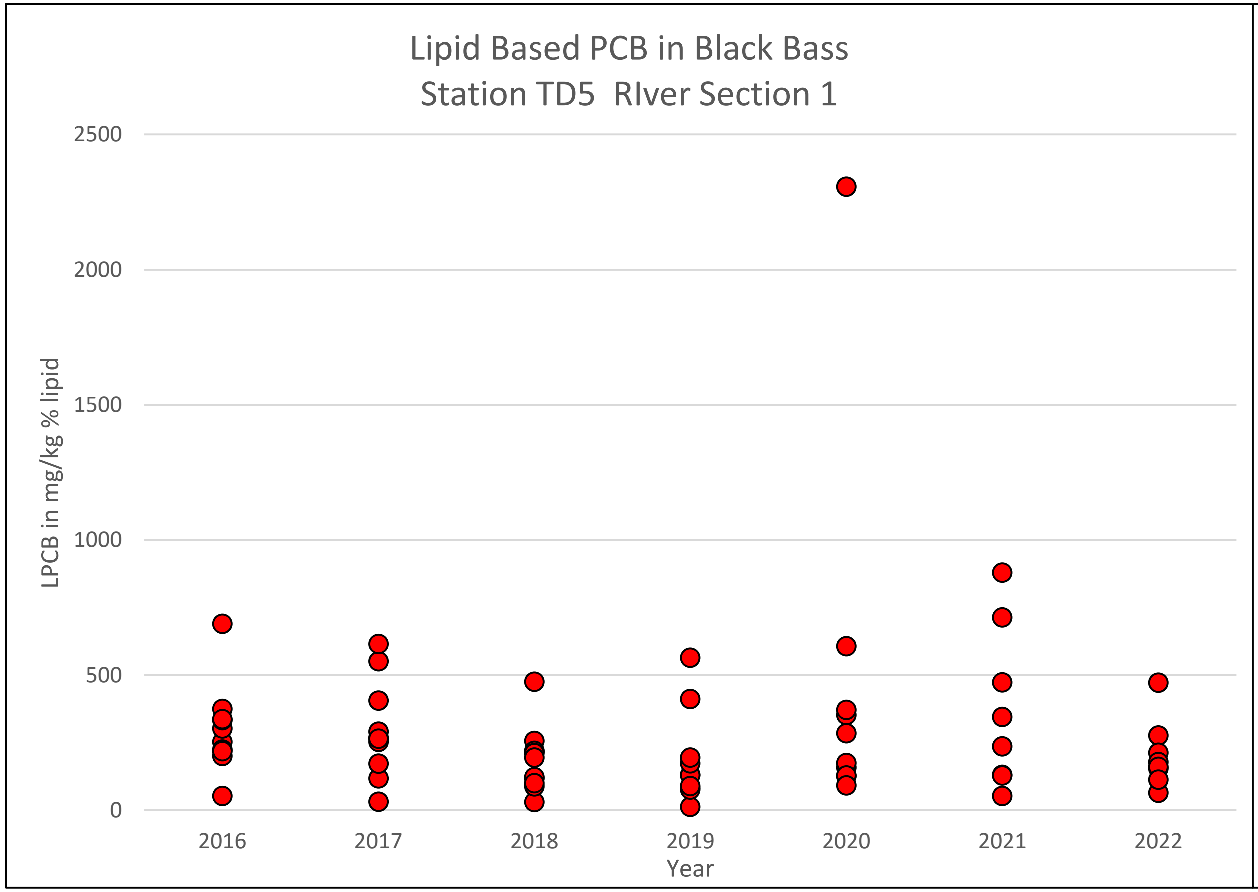
TD5 Black Bass Data

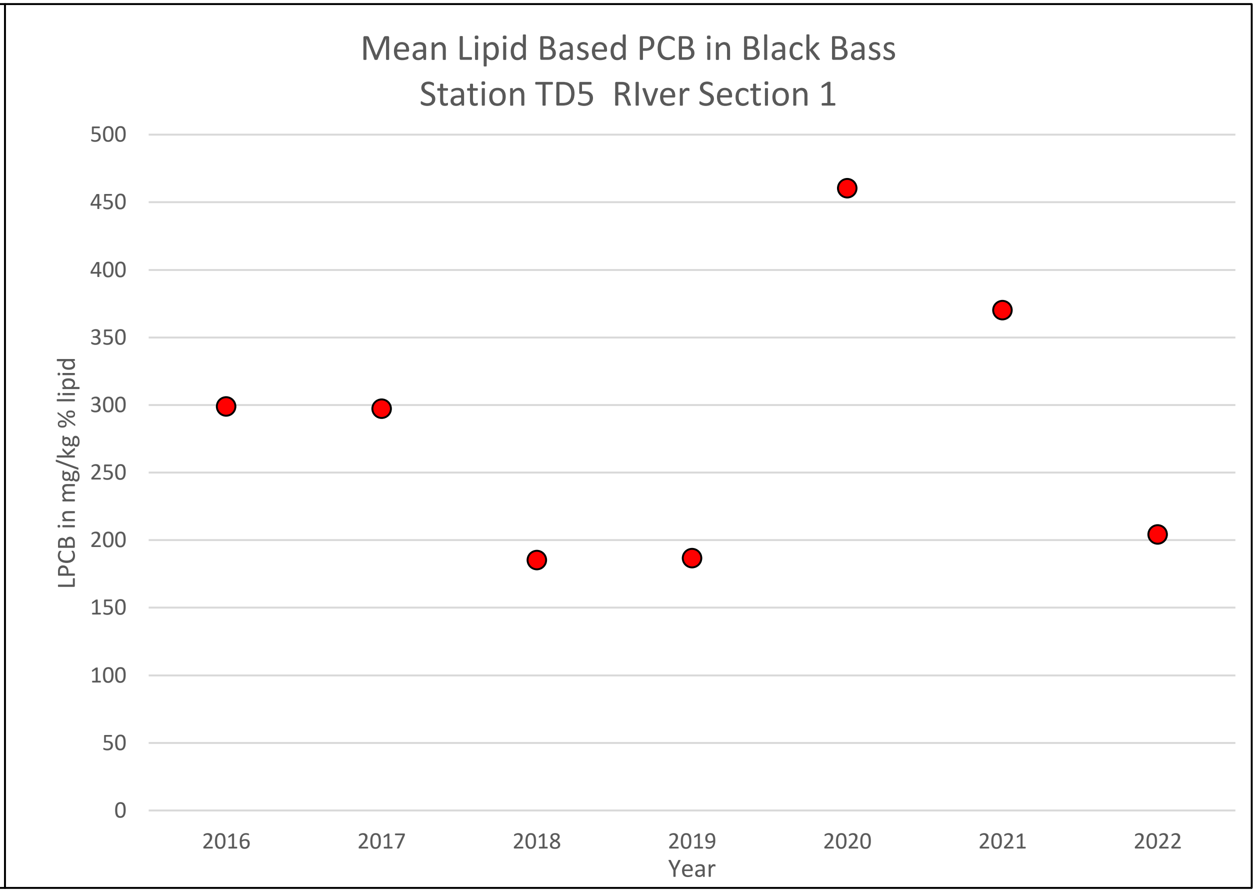
TD5 Black Bass Total PCB



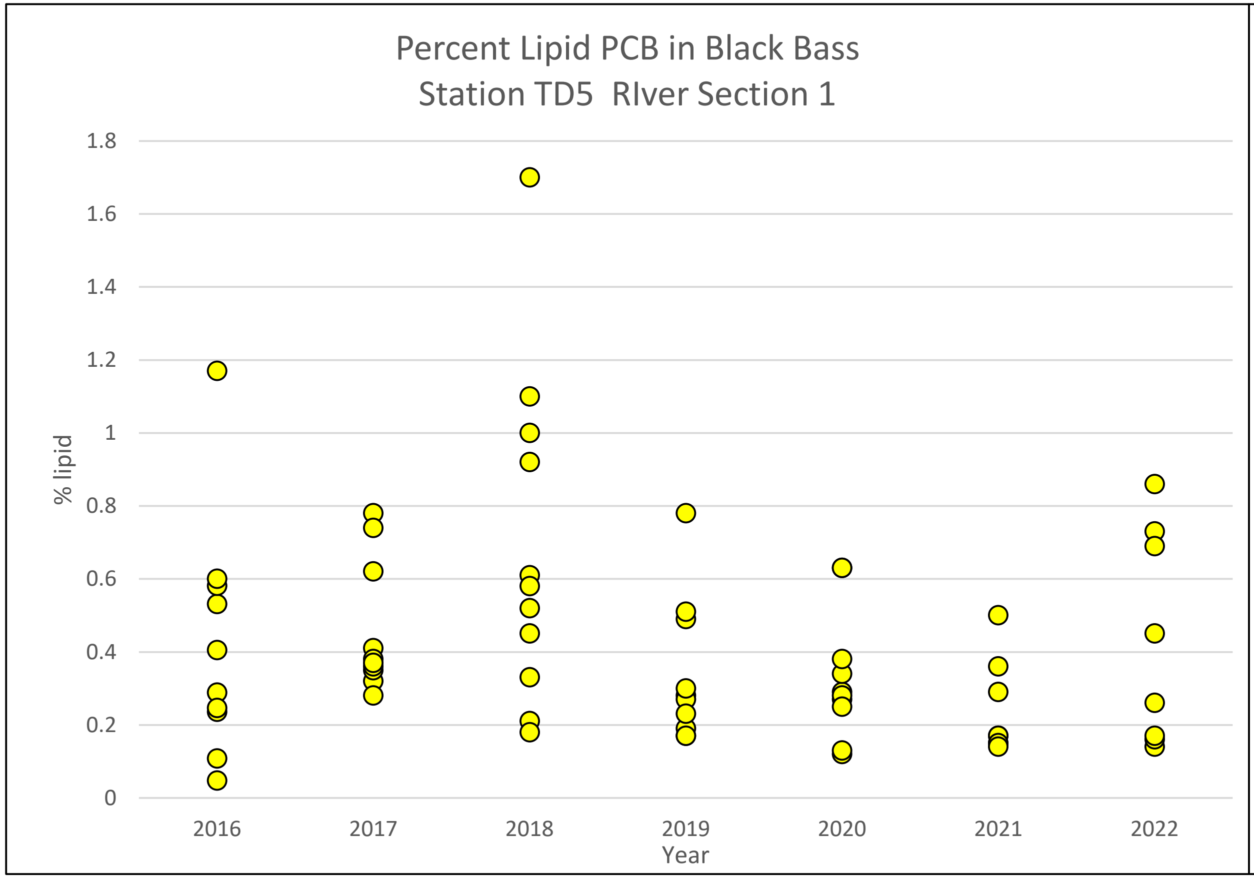


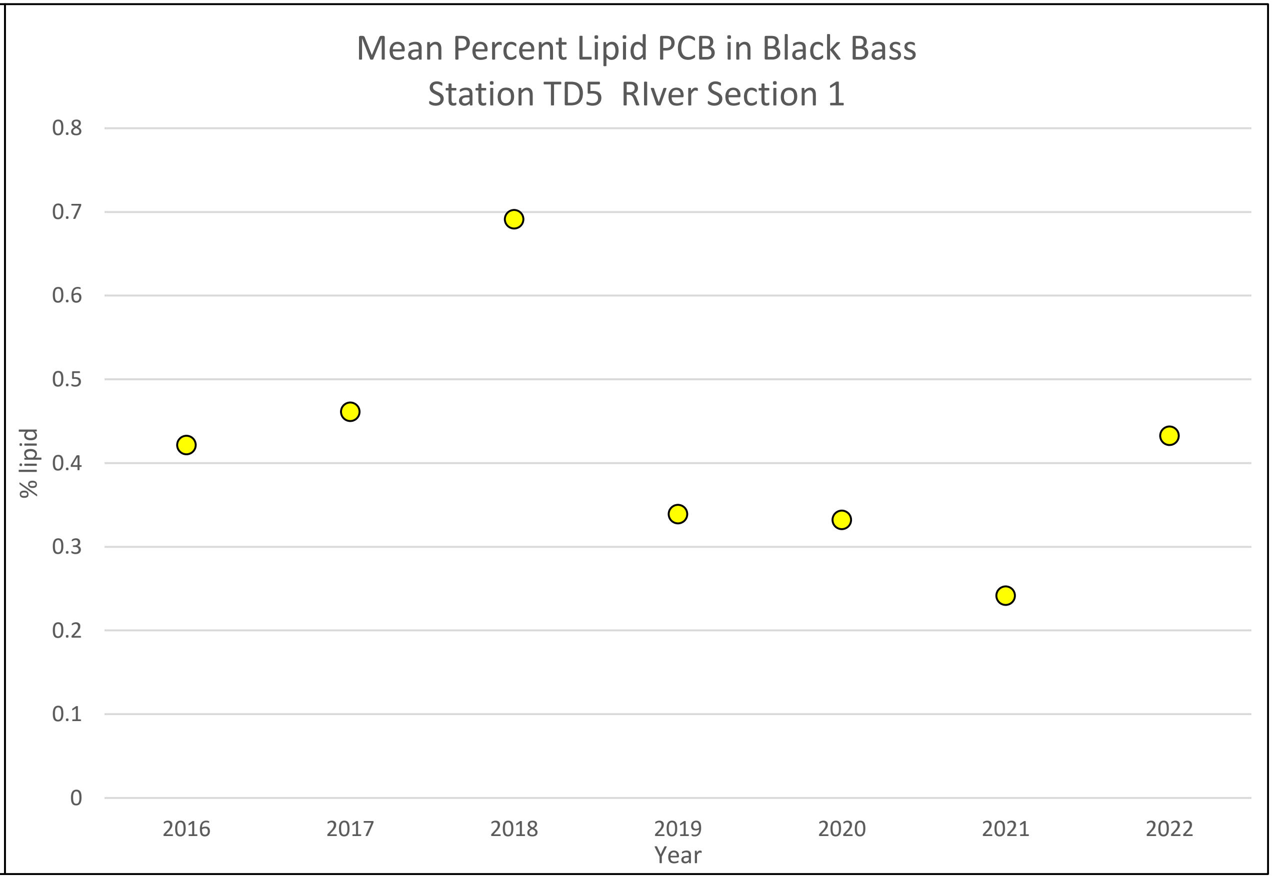
TD5 Black Bass Lipid Based PCB



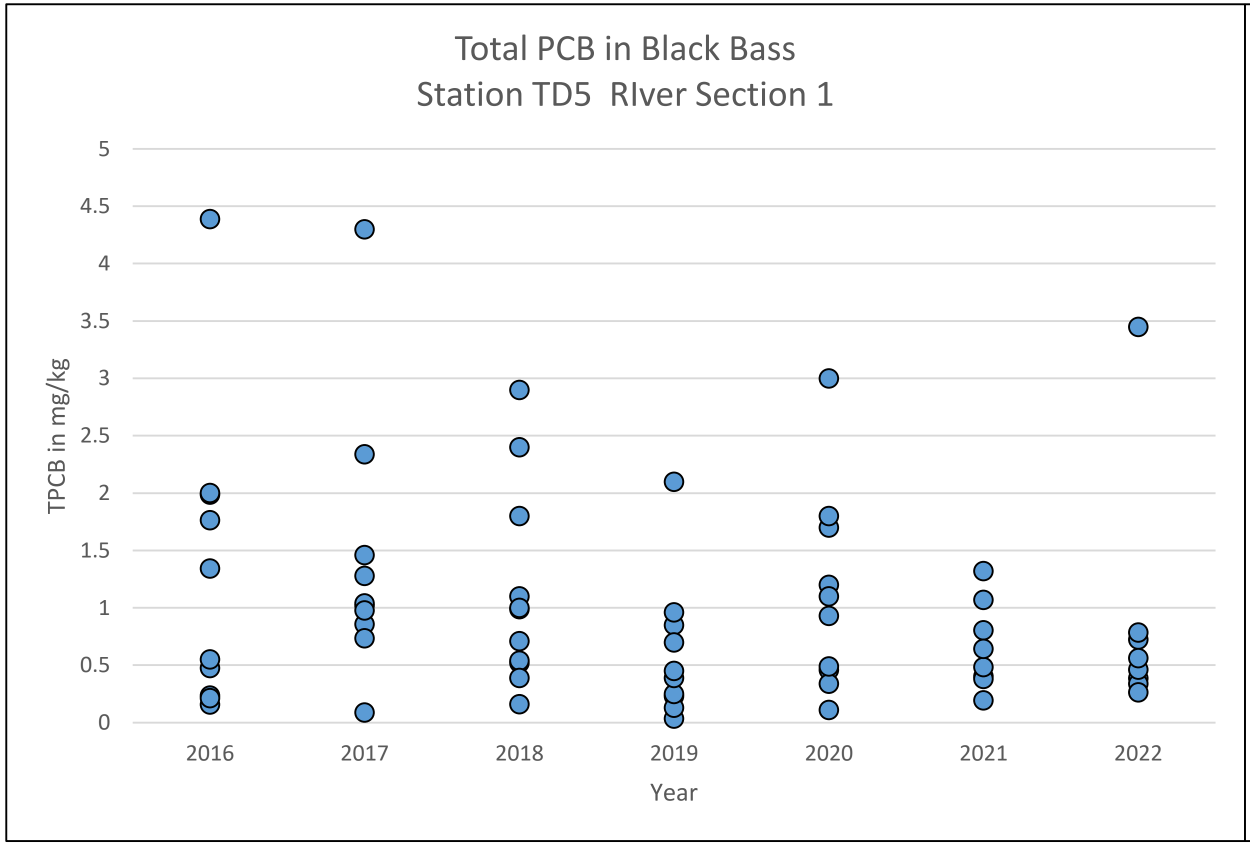


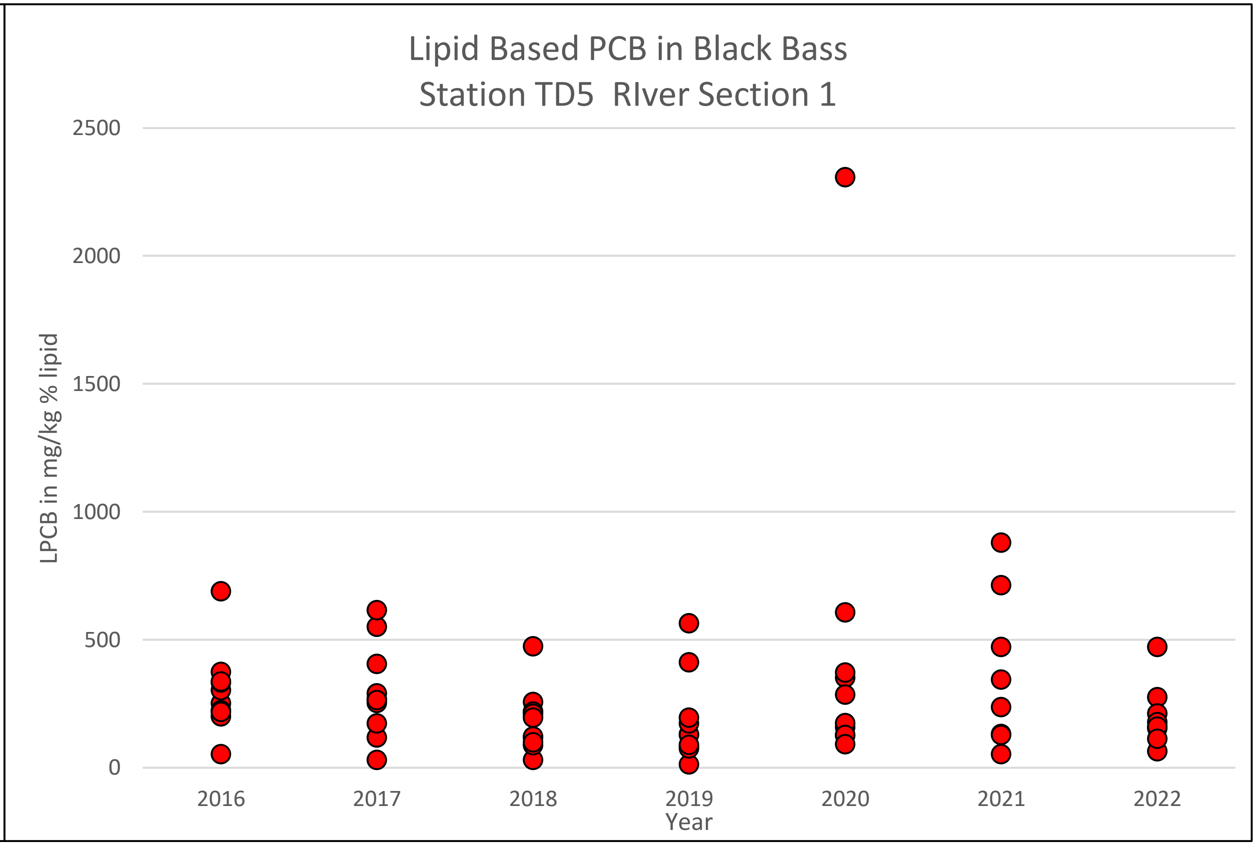
TD5 Black Bass Percent Lipid



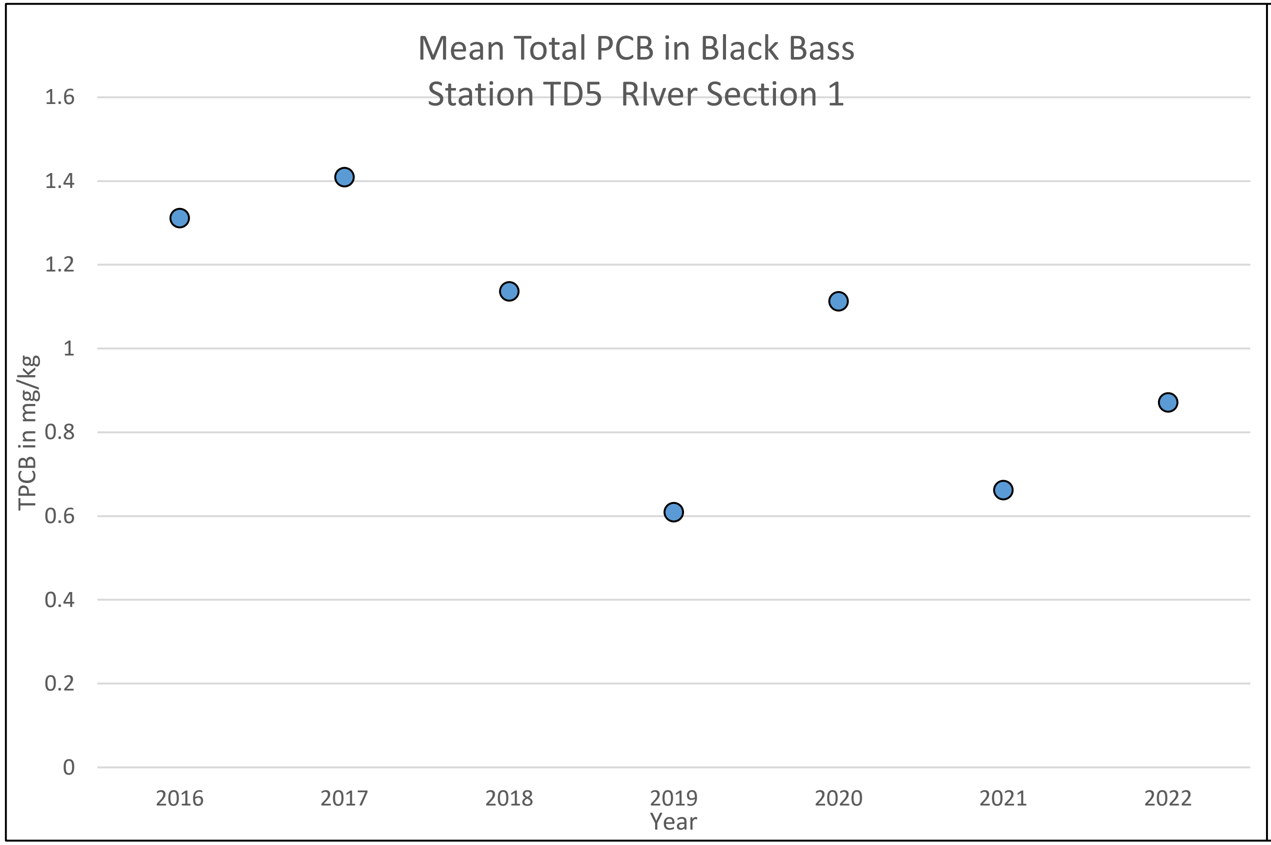


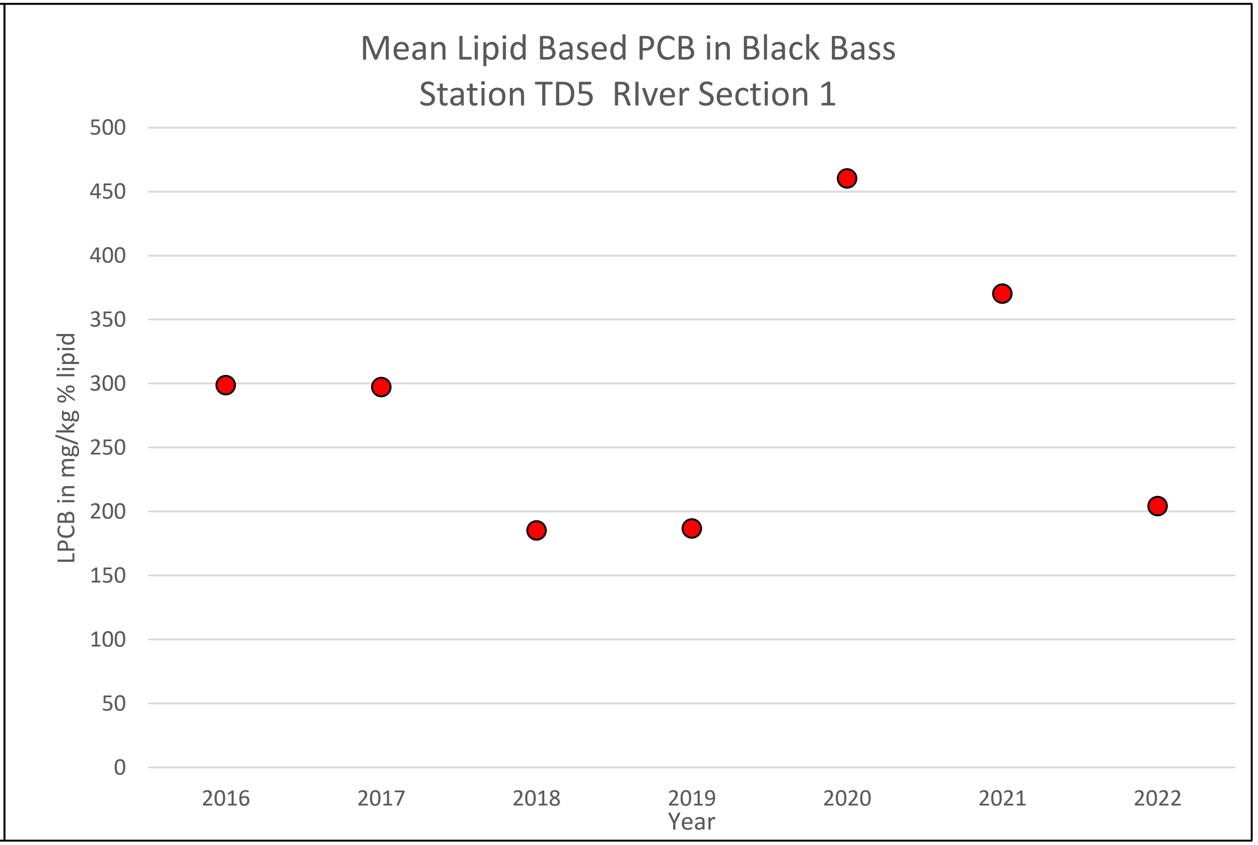
TD5 Black Bass Total PCB and Lipid Based PCB





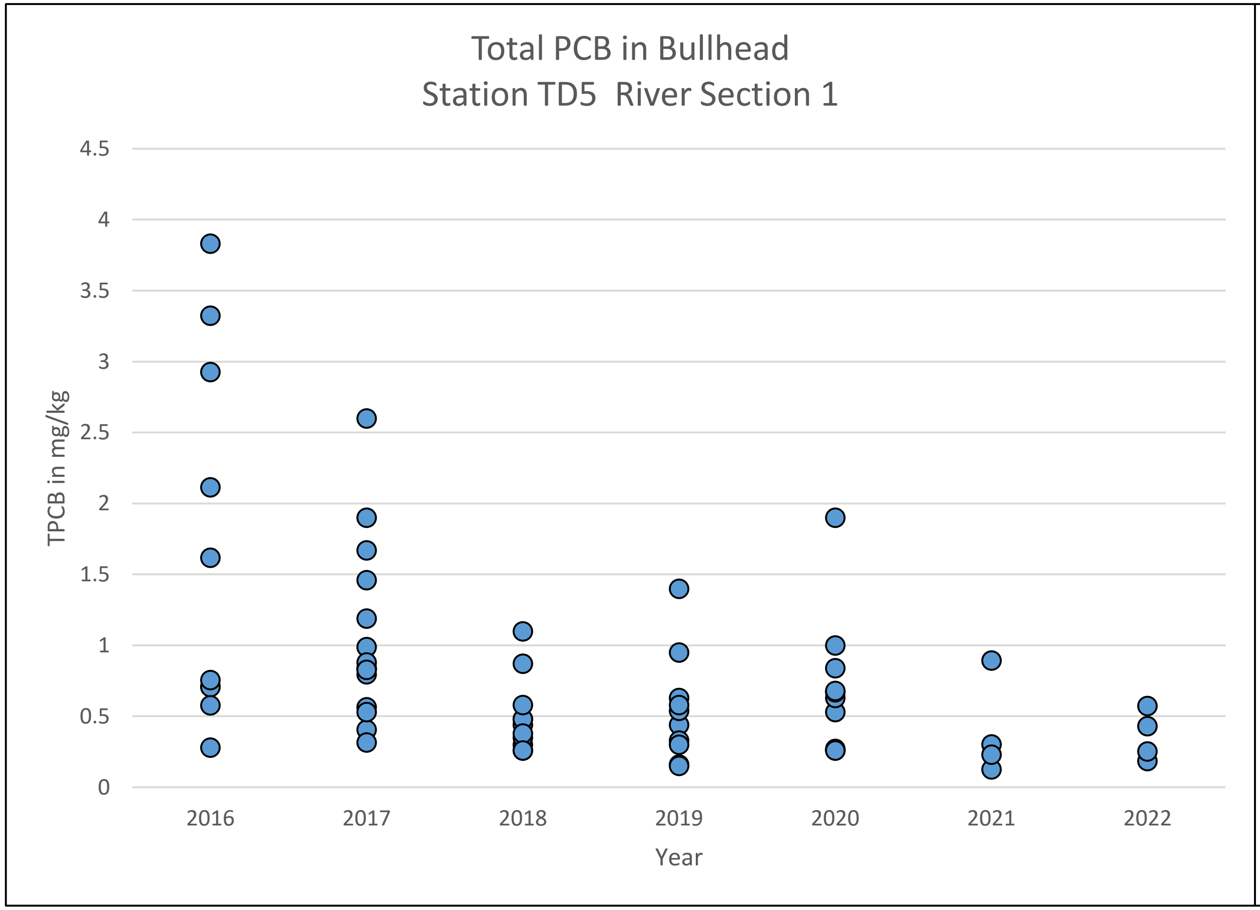
TD5 Black Bass Mean Total PCB and Mean Lipid Based PCB

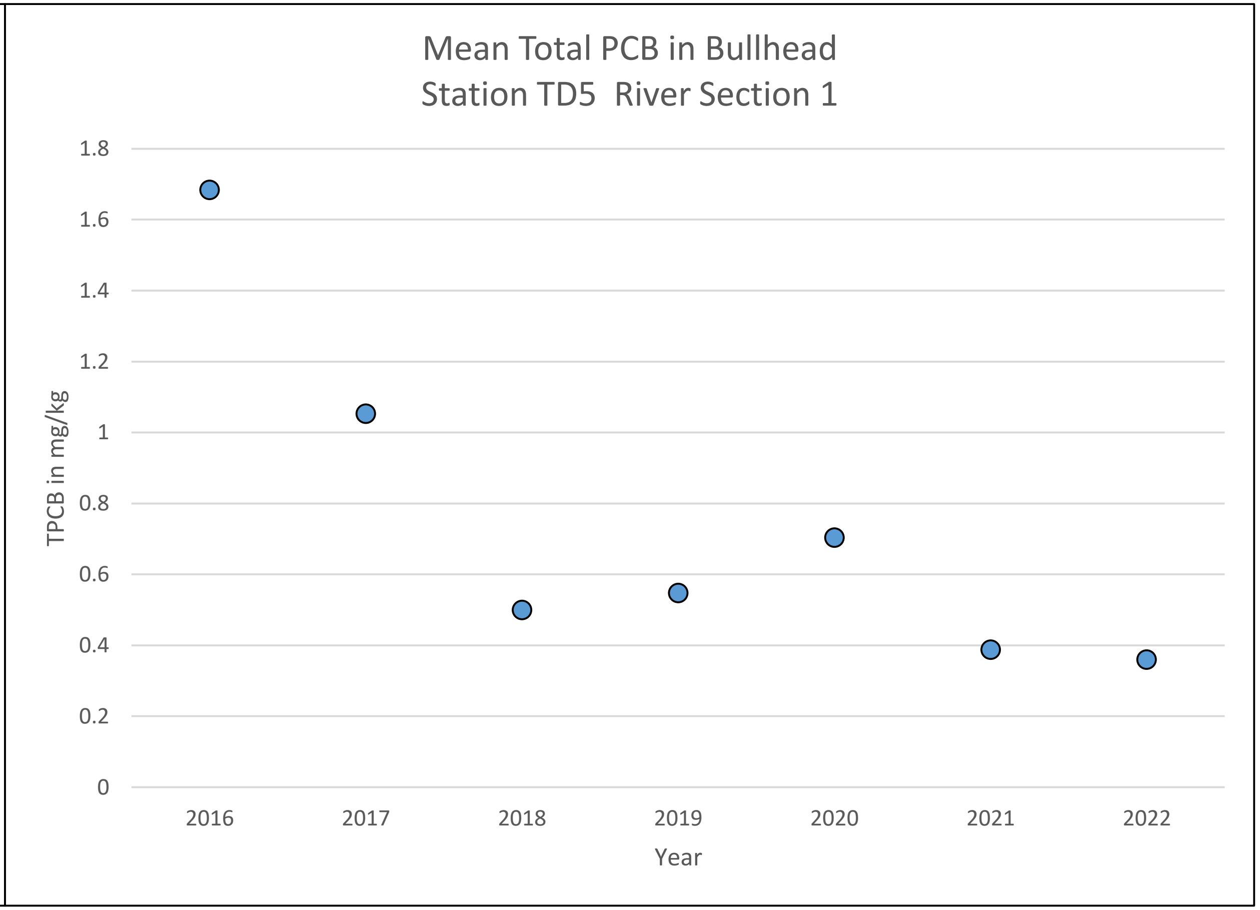




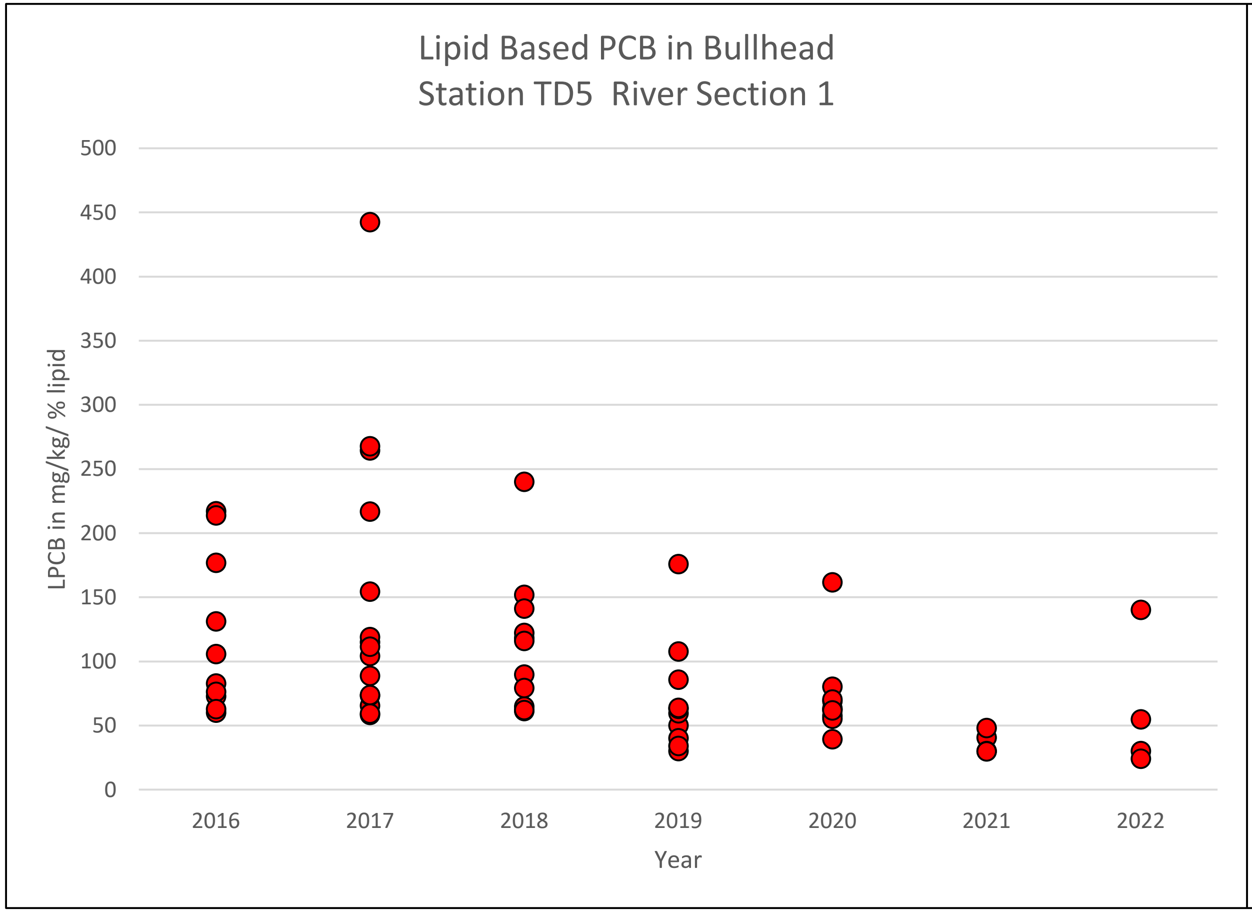
TD5 Bullhead Data

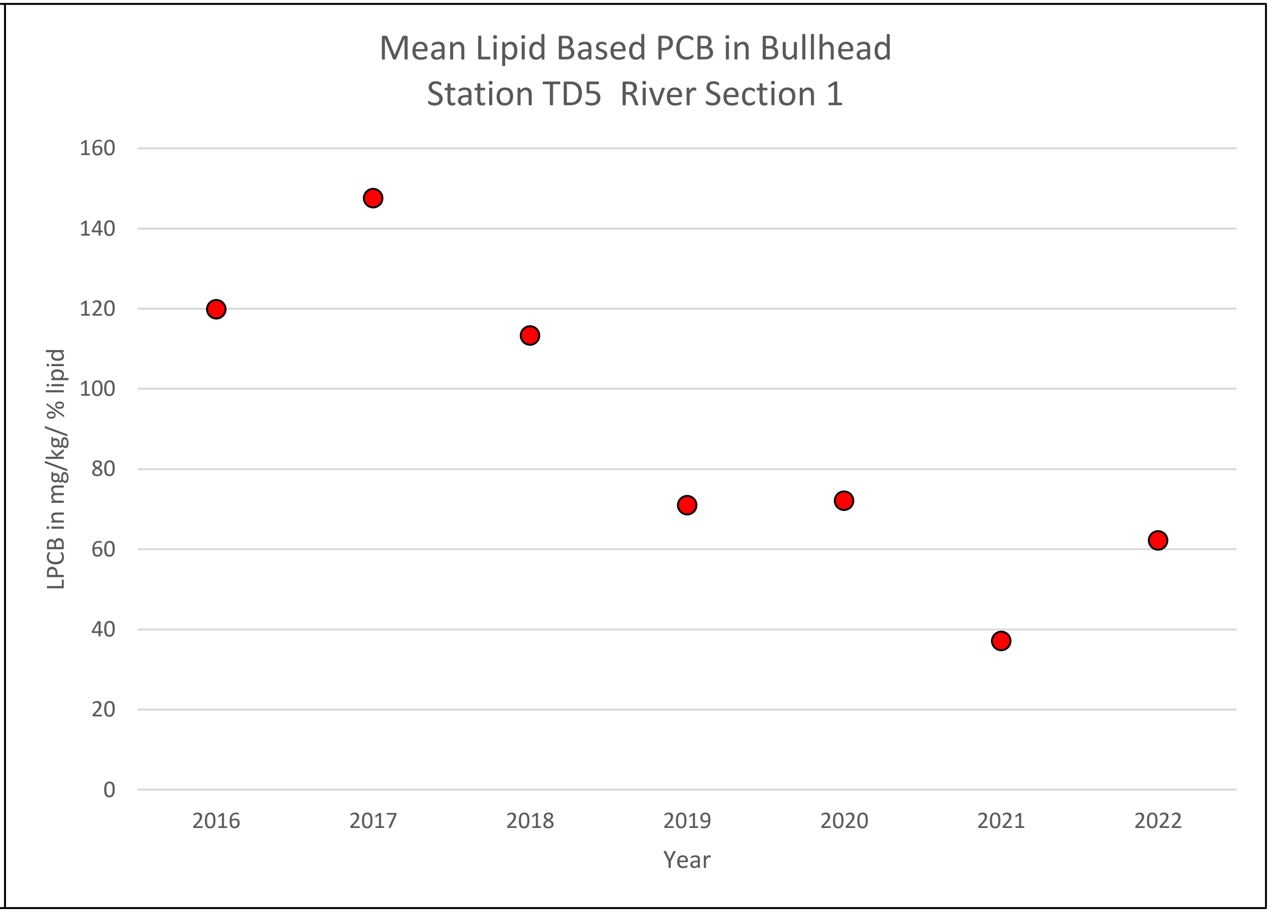
TD5 Bullhead Total PCB



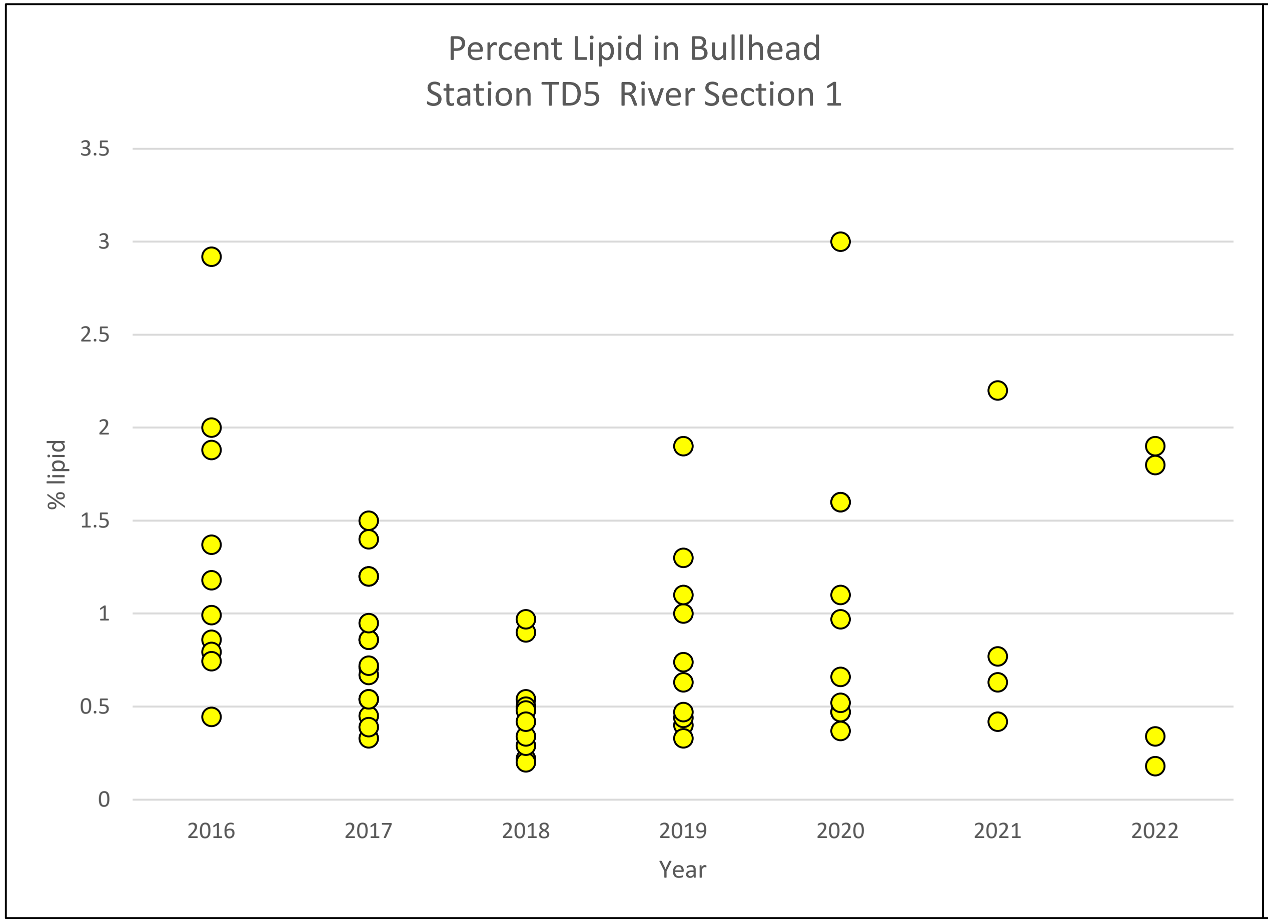


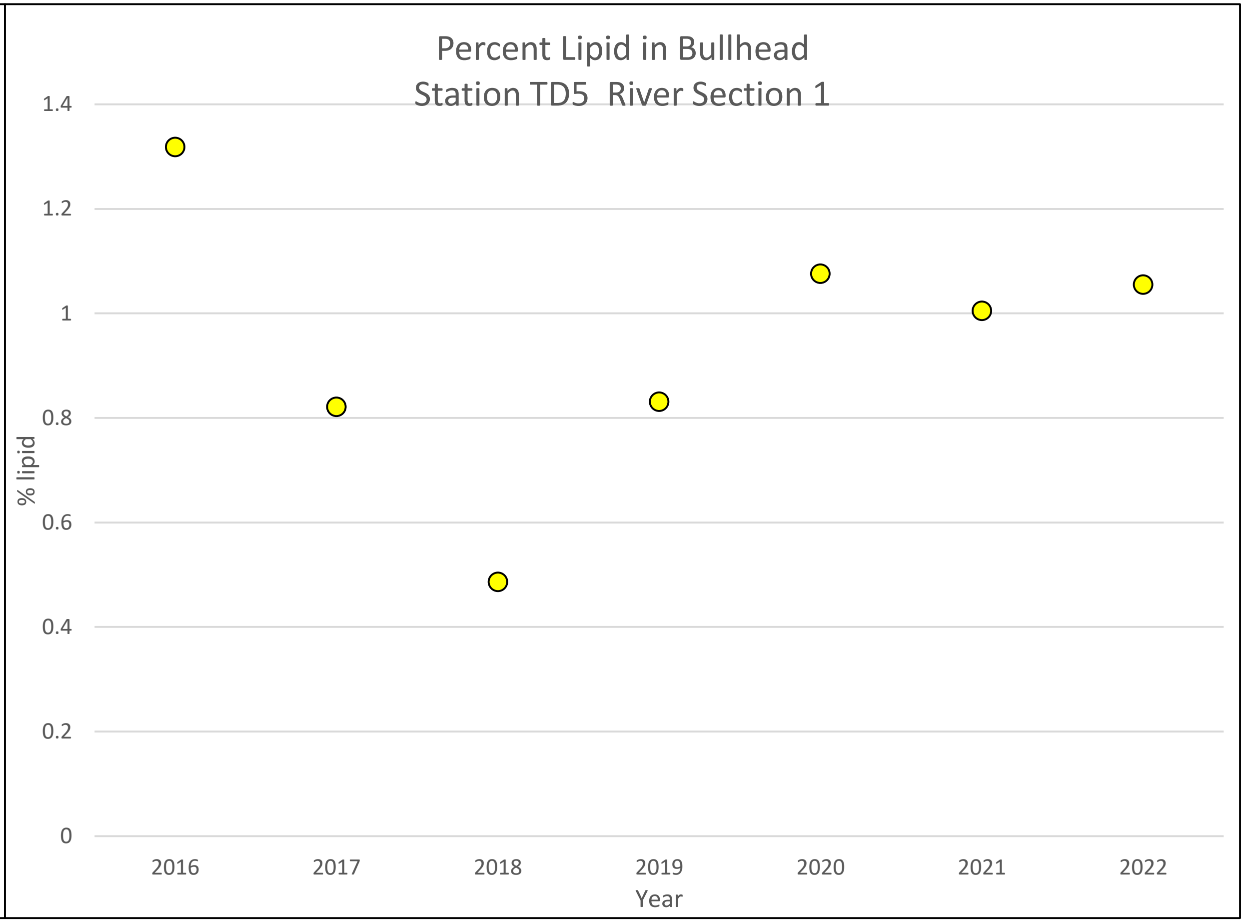
TD5 Bullhead Lipid Based PCB



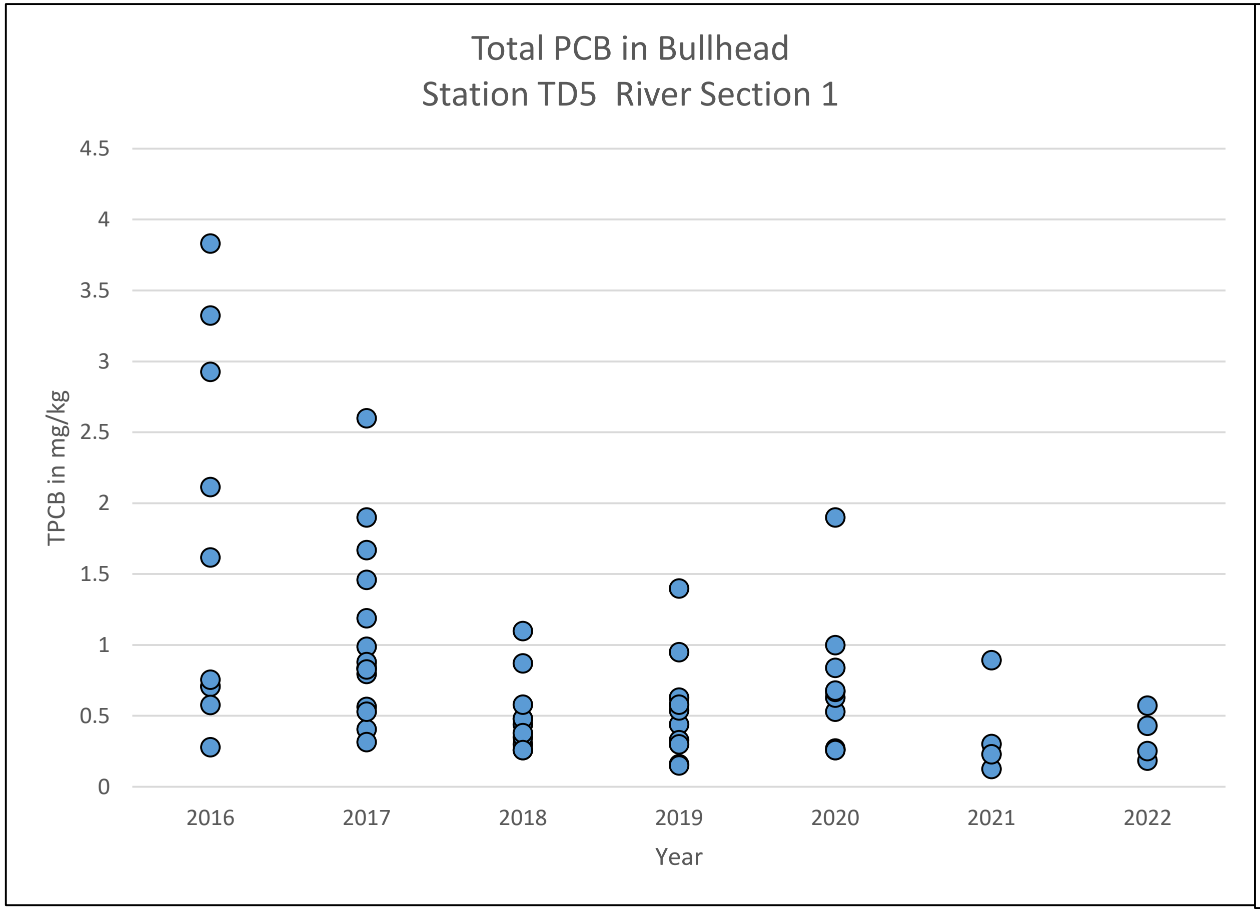


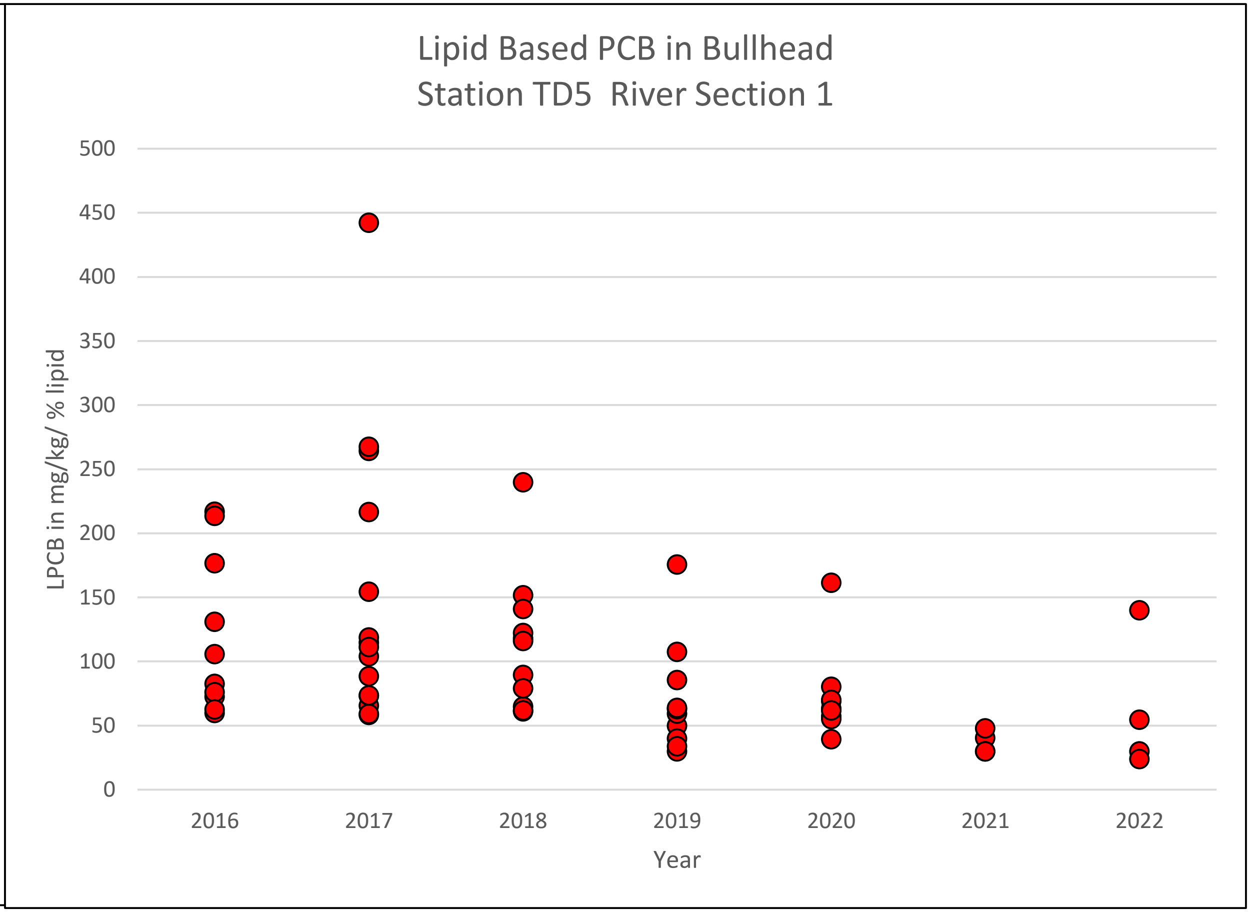
TD5 Bullhead Percent Lipid



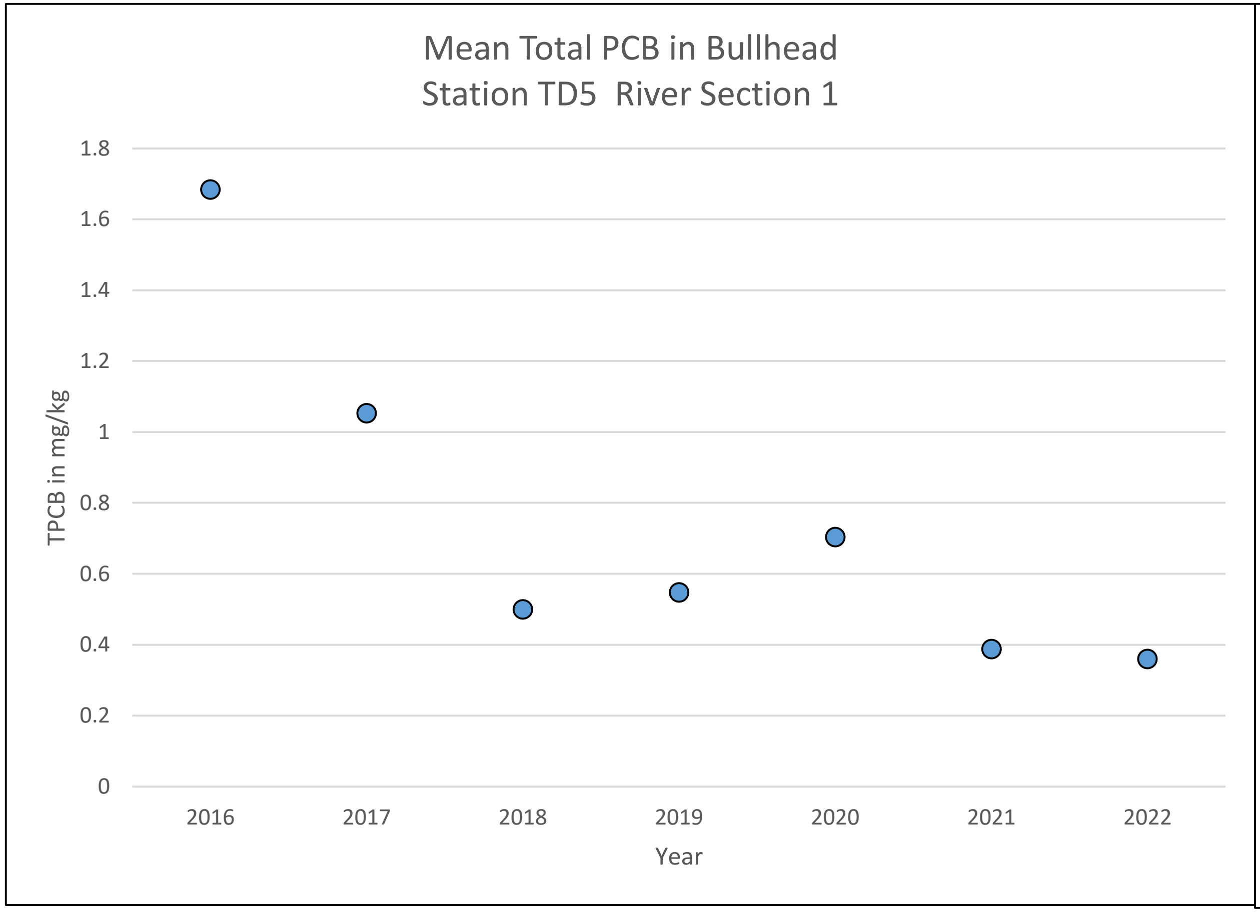


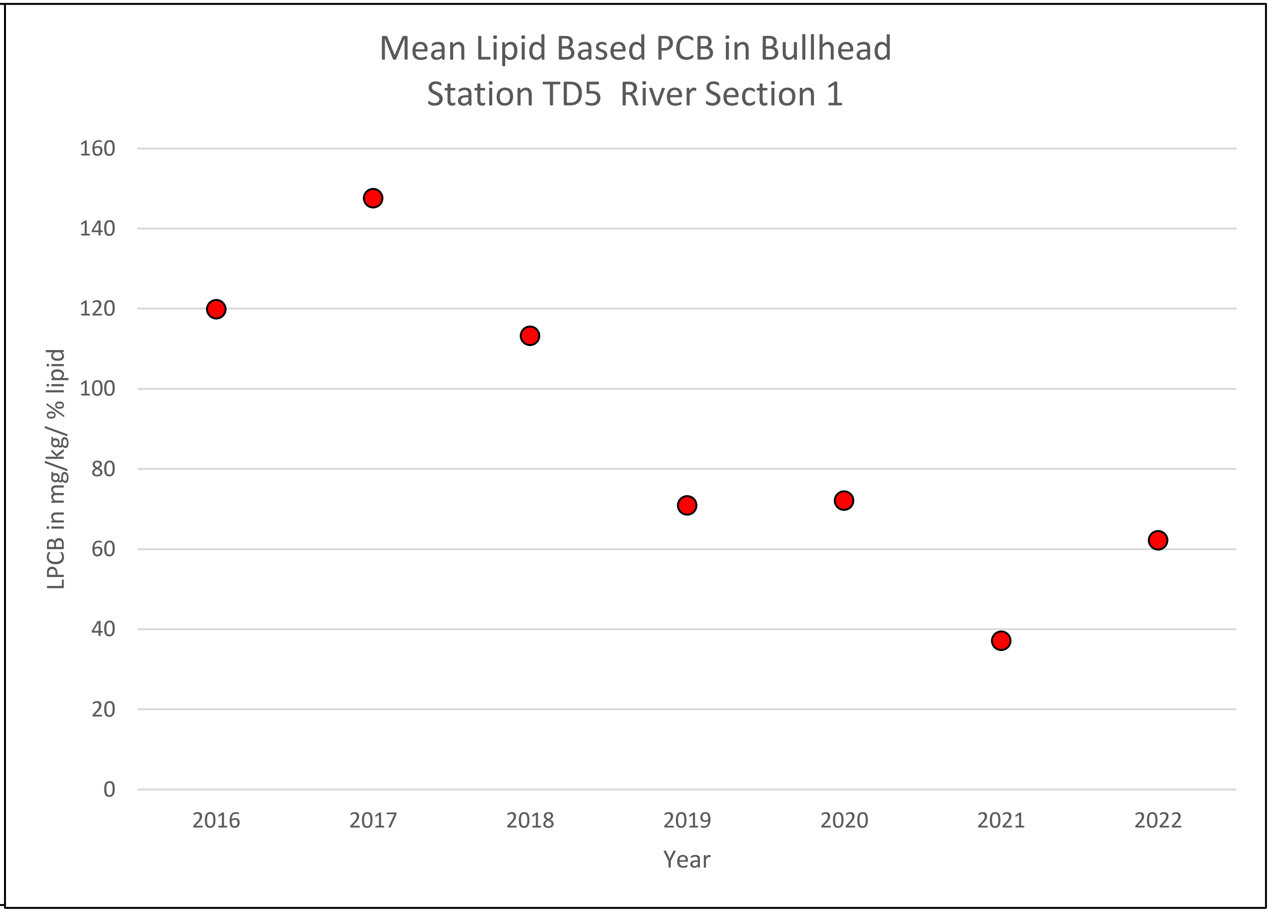
TD5 Bullhead Total PCB and Lipid Based PCB





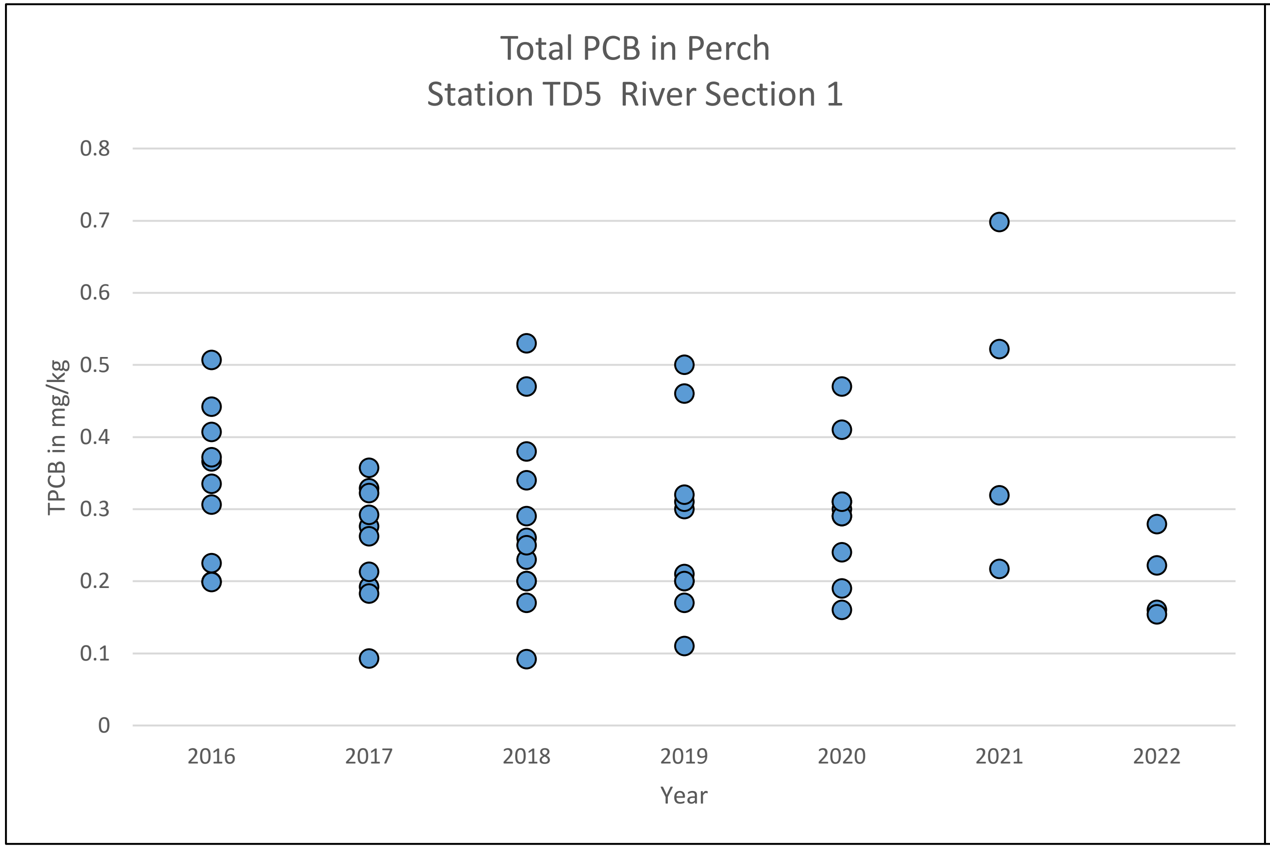
TD5 Bullhead Mean Total PCB and Mean Lipid Based PCB

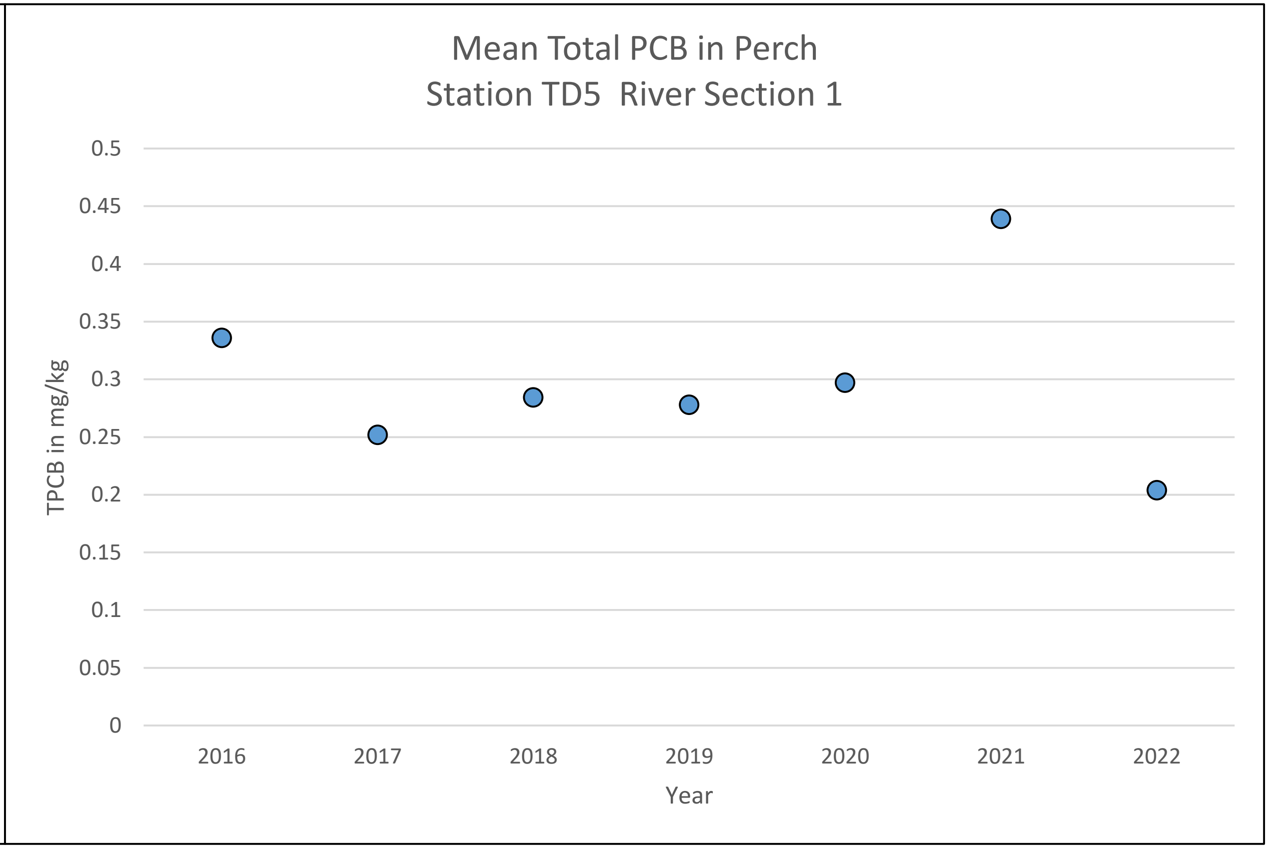




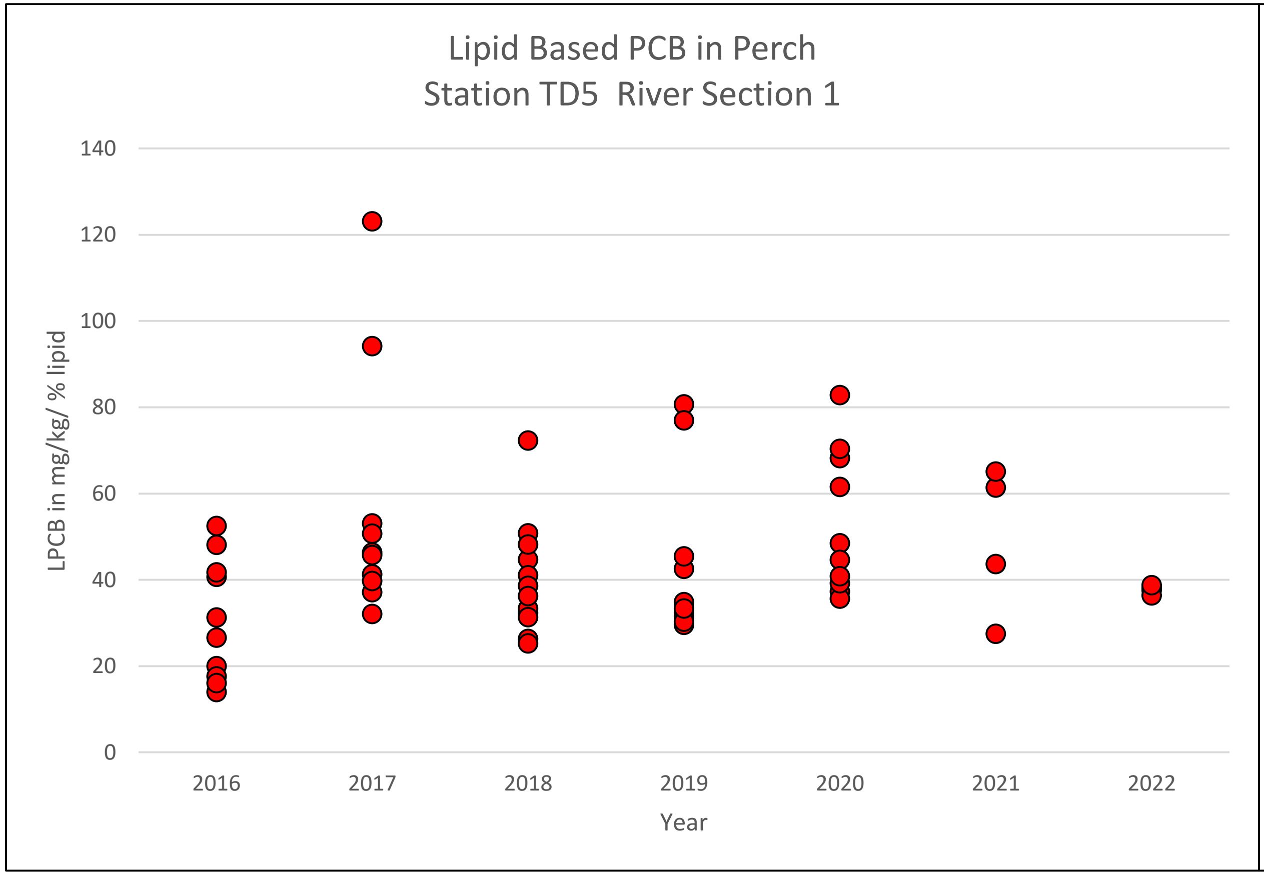
TD5 Yellow Perch Data

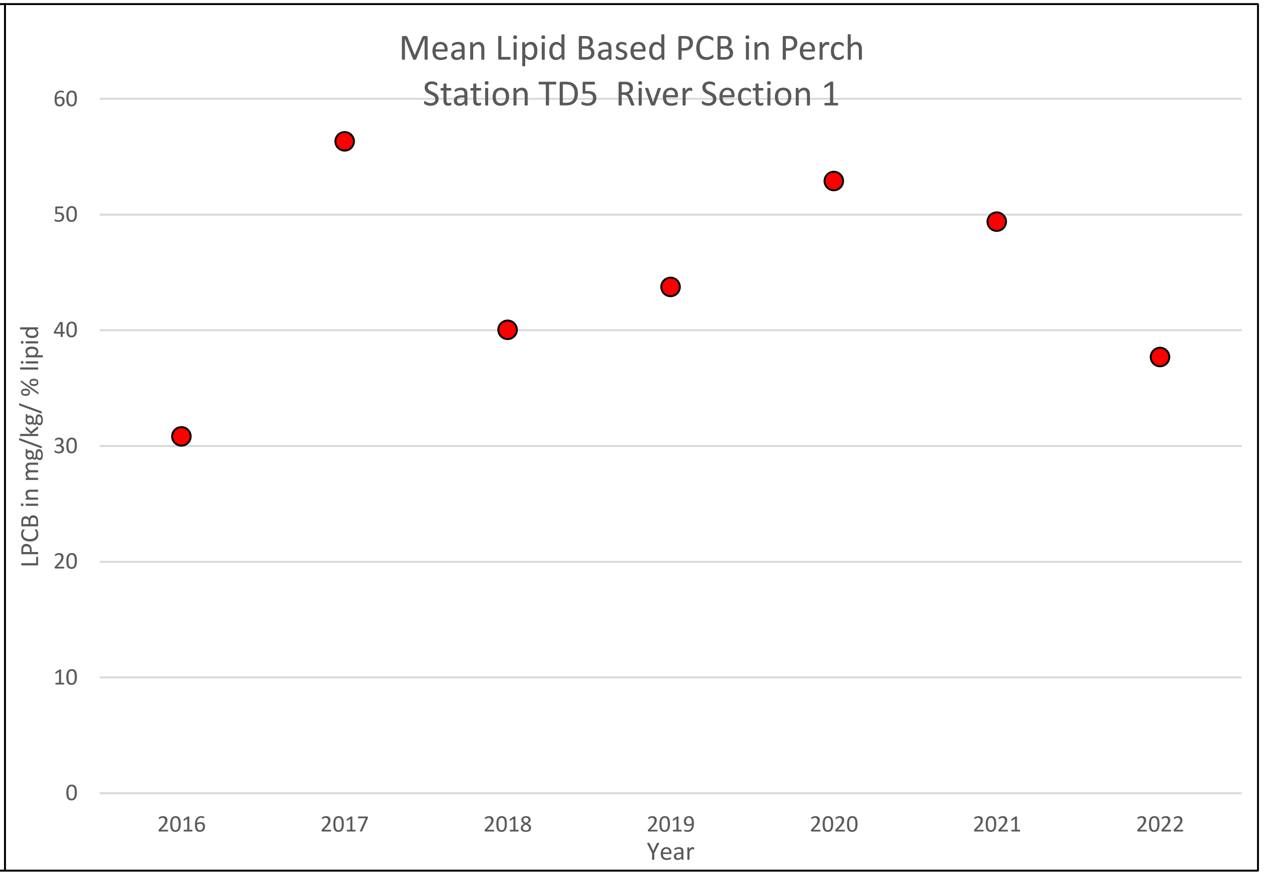
TD5 Yellow Perch Total PCB



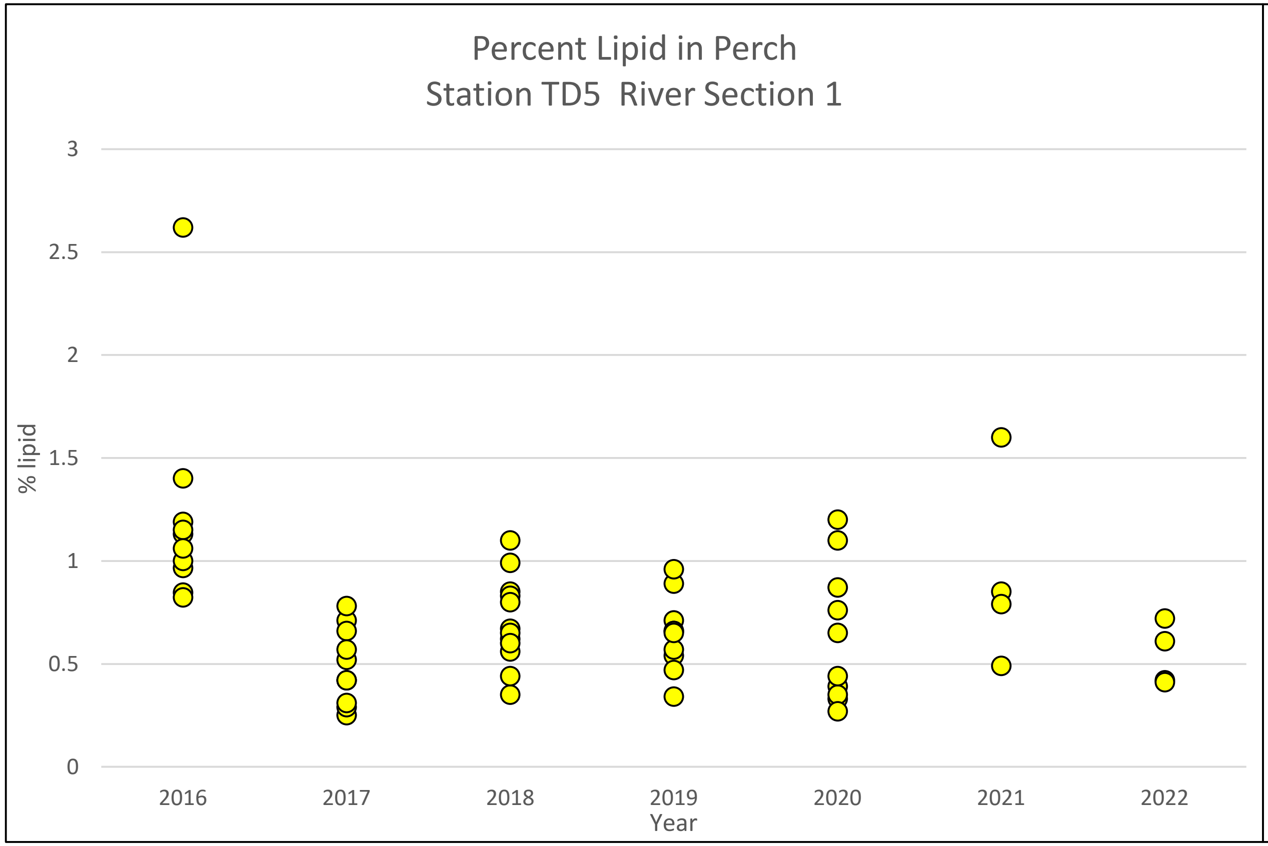


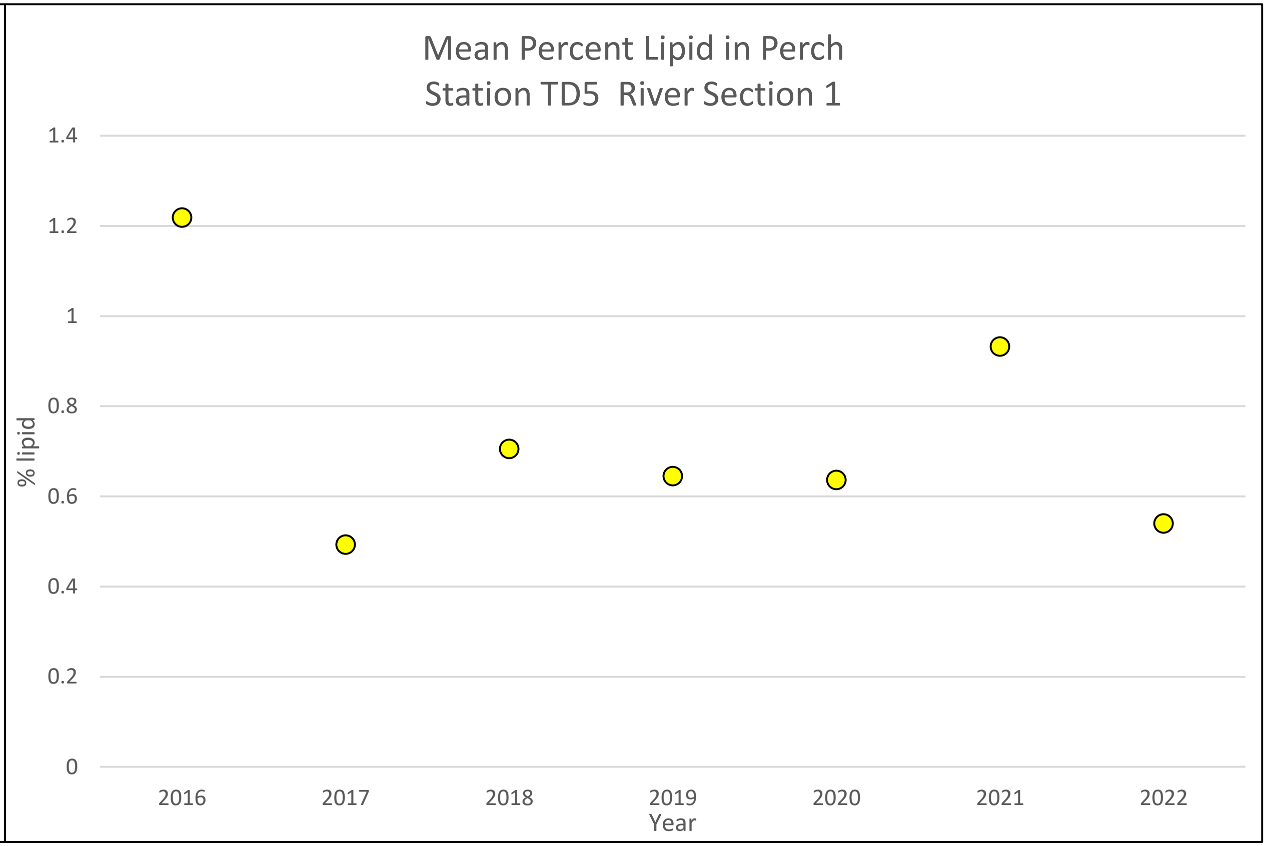
TD5 Yellow Perch Lipid Based PCB



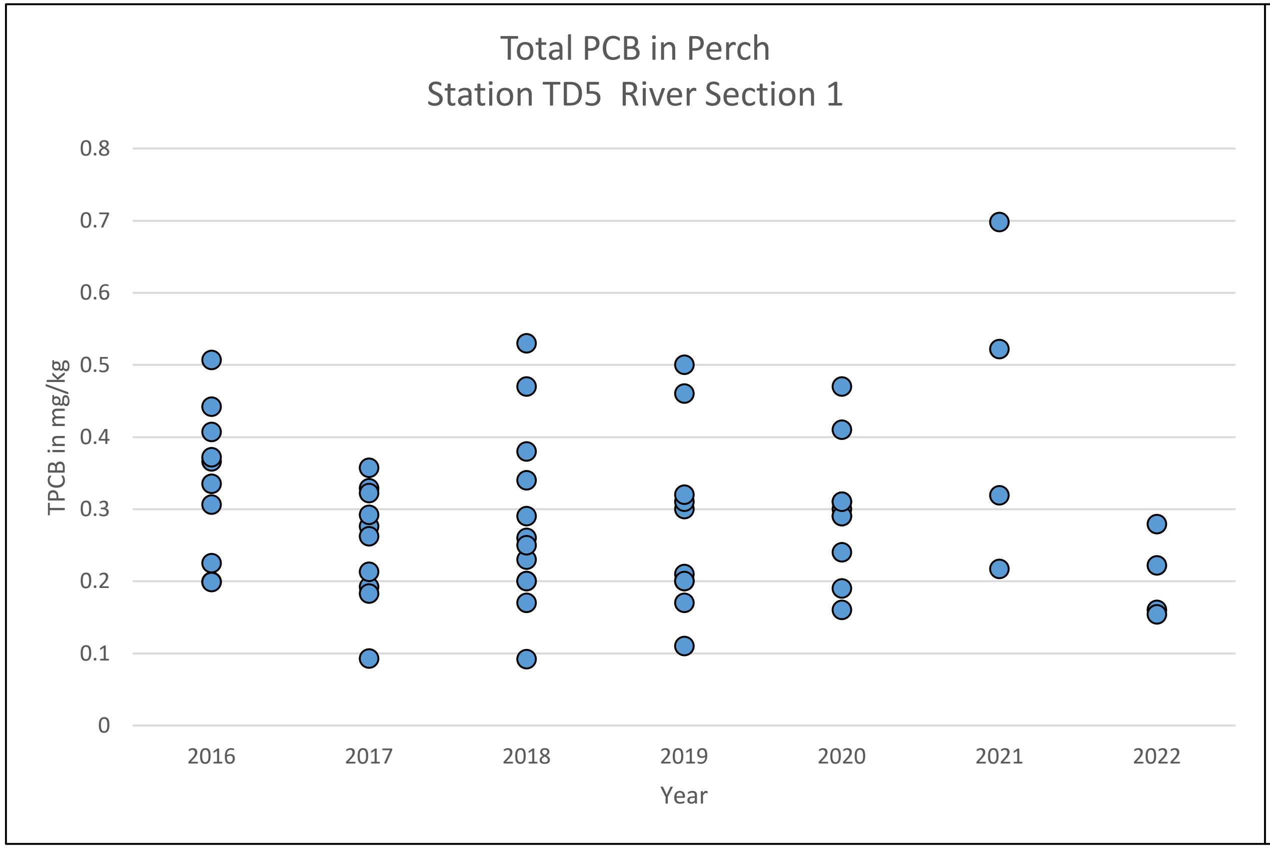


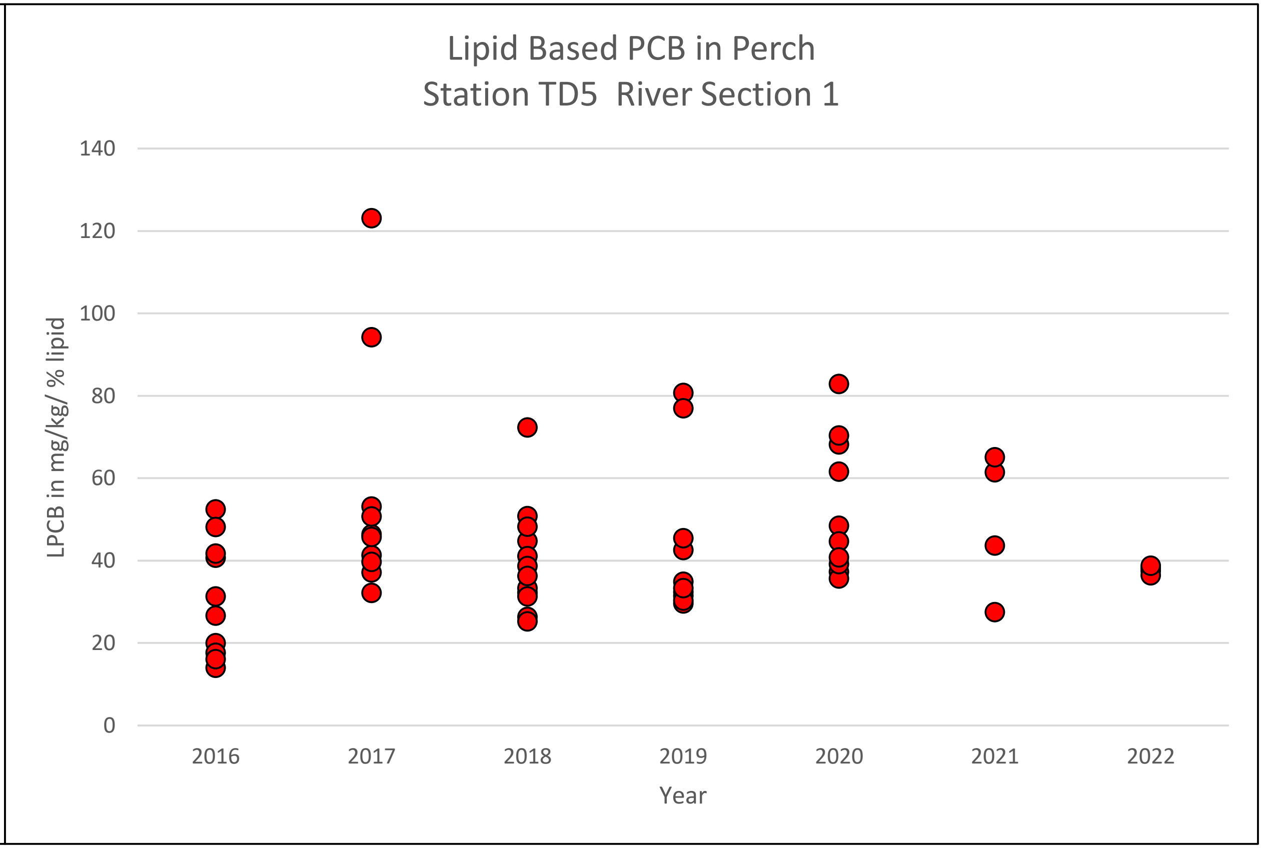
TD5 Yellow Perch Percent Lipid



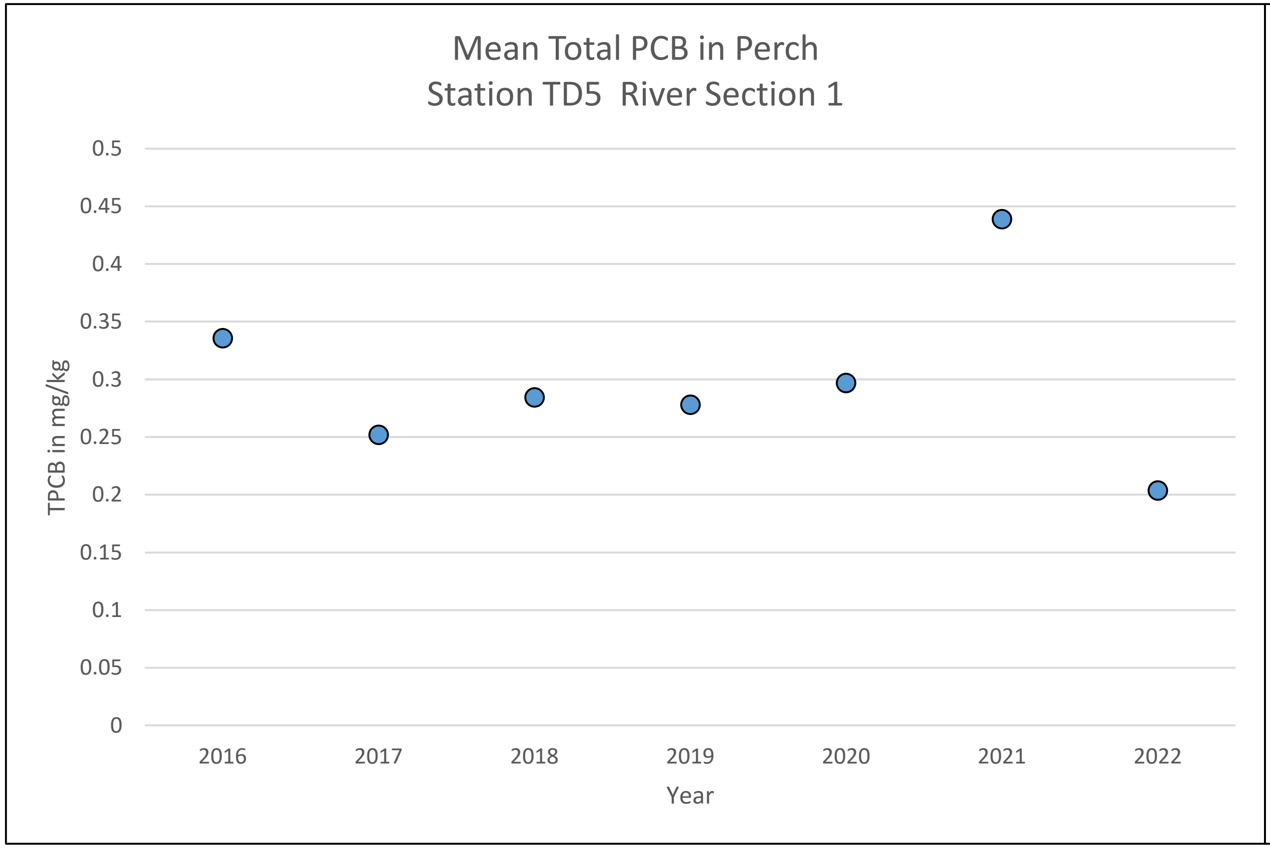


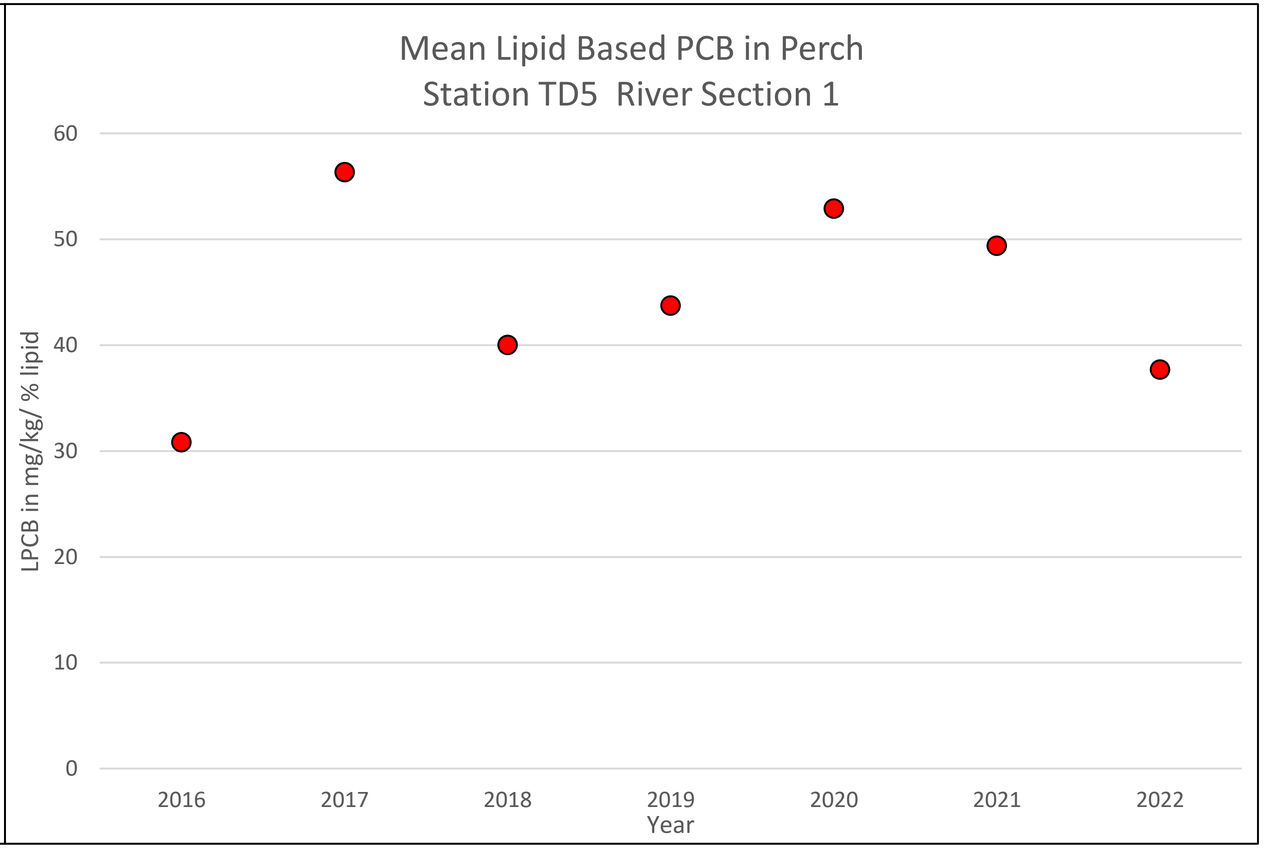
TD5 Yellow Perch Total PCB and Lipid Based PCB





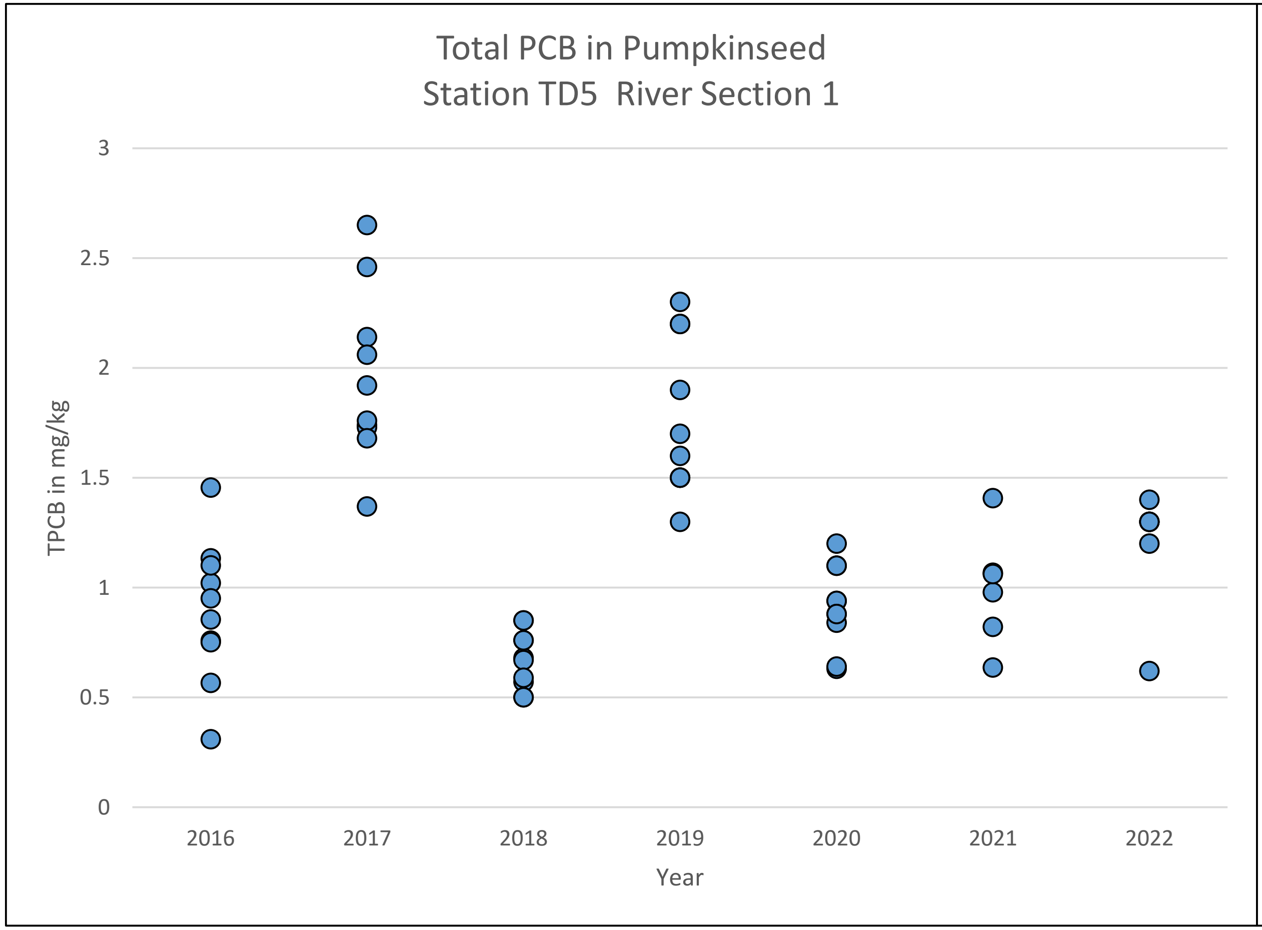
TD5 Yellow Perch Mean Total PCB and Mean Lipid Based PCB

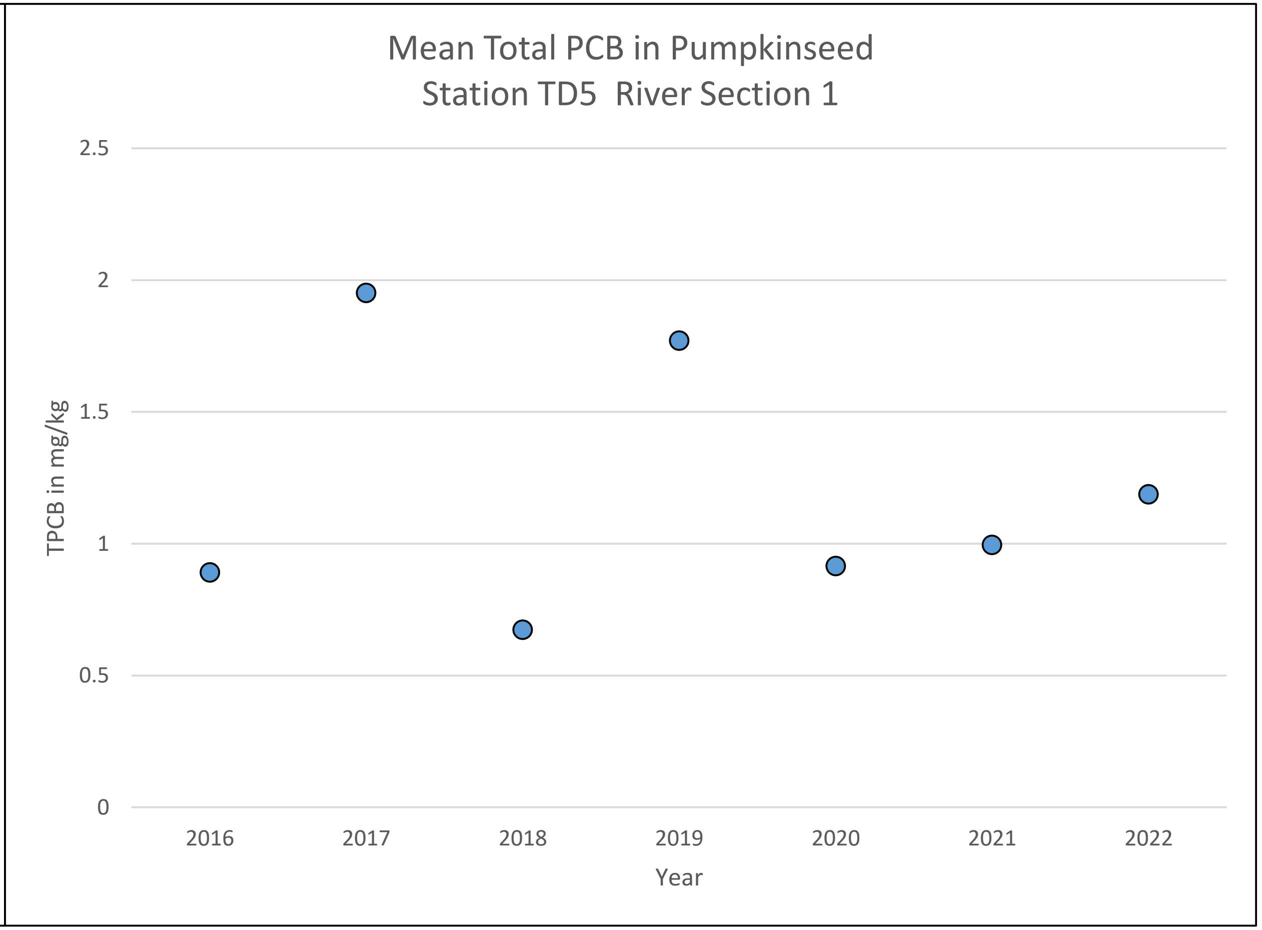




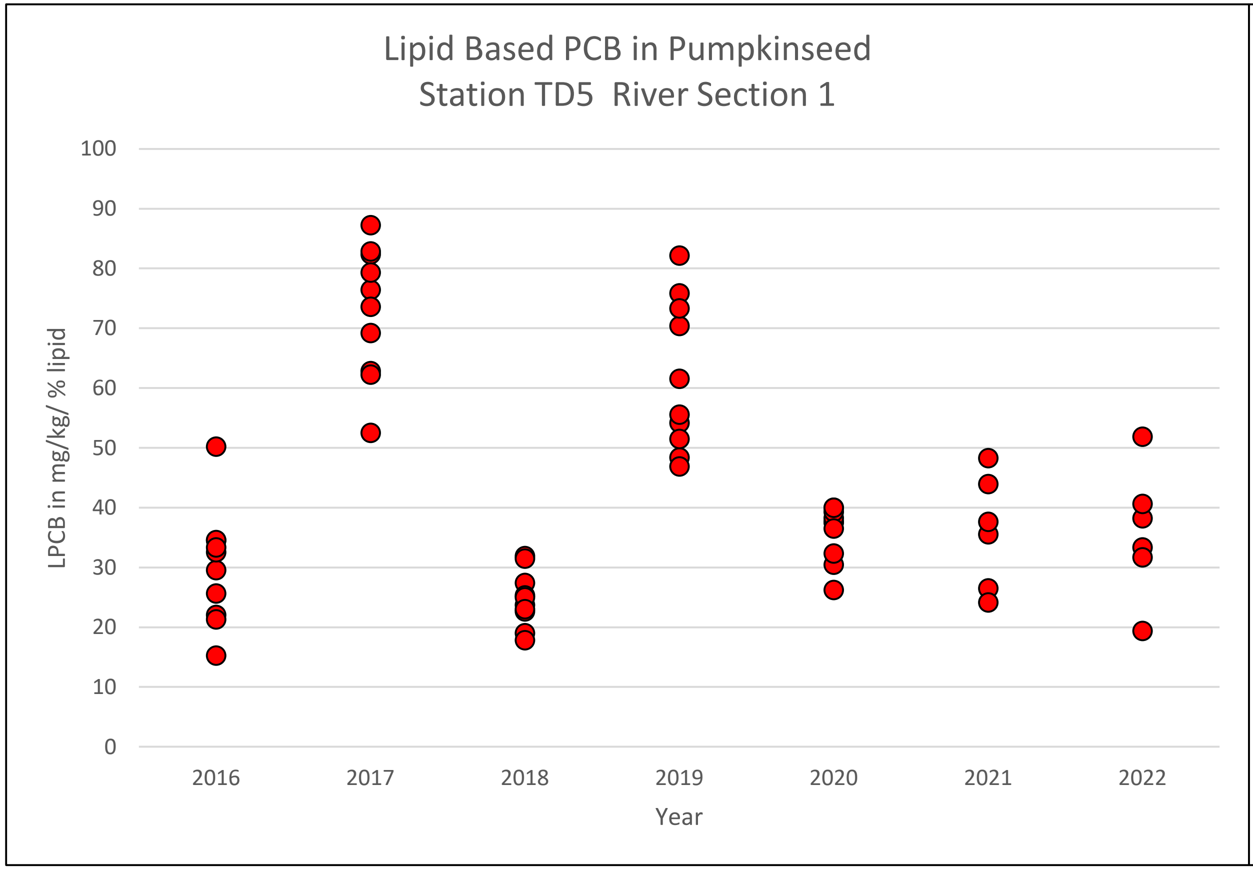
TD5 Pumpkinseed Data

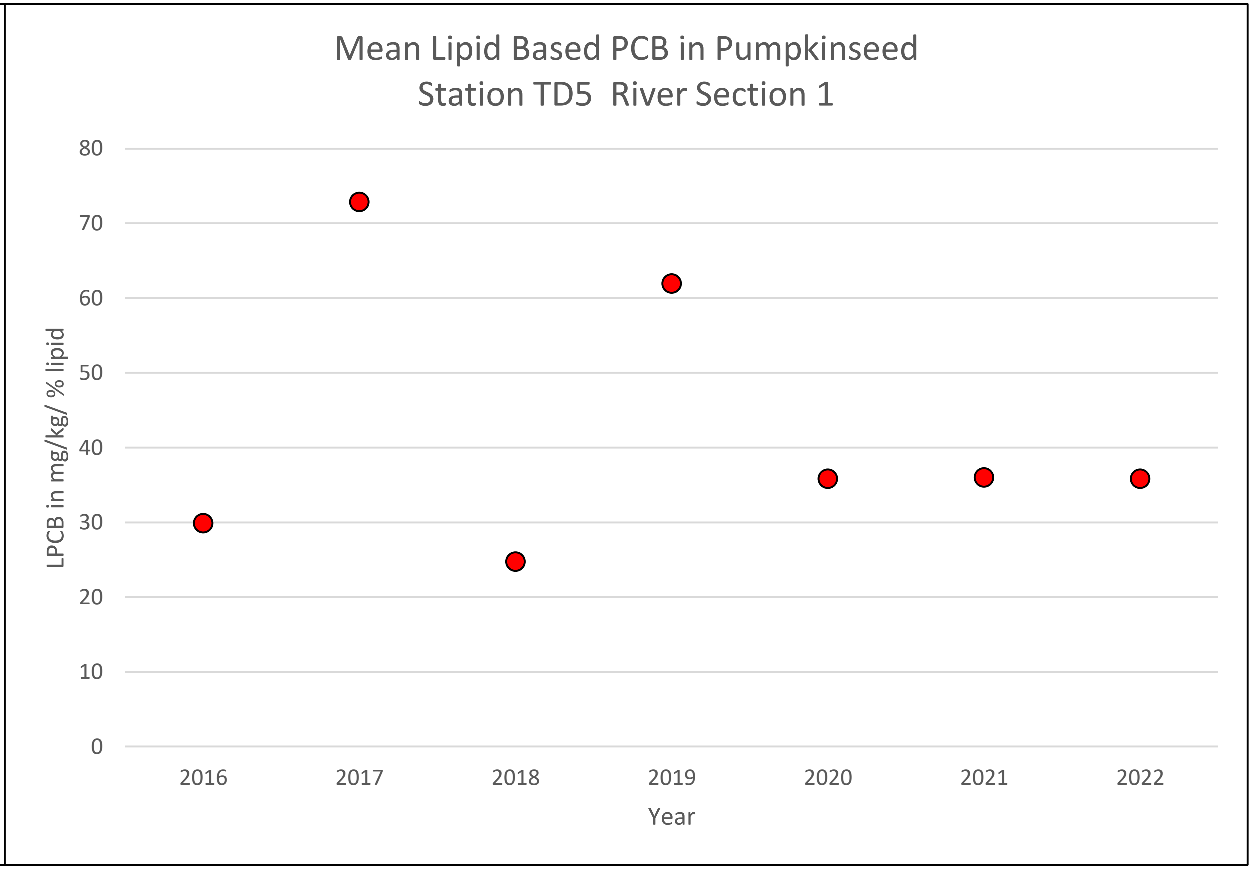
TD5 Pumpkinseed PCB



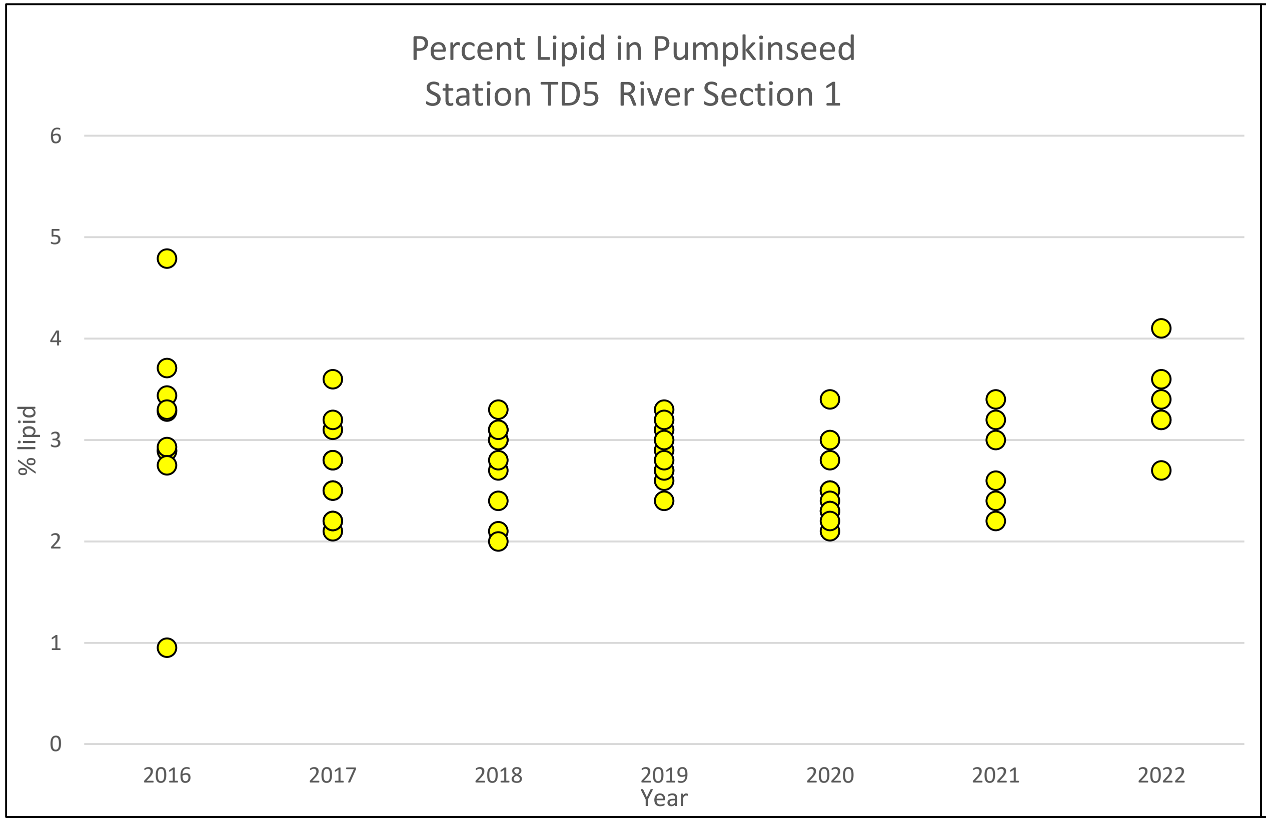


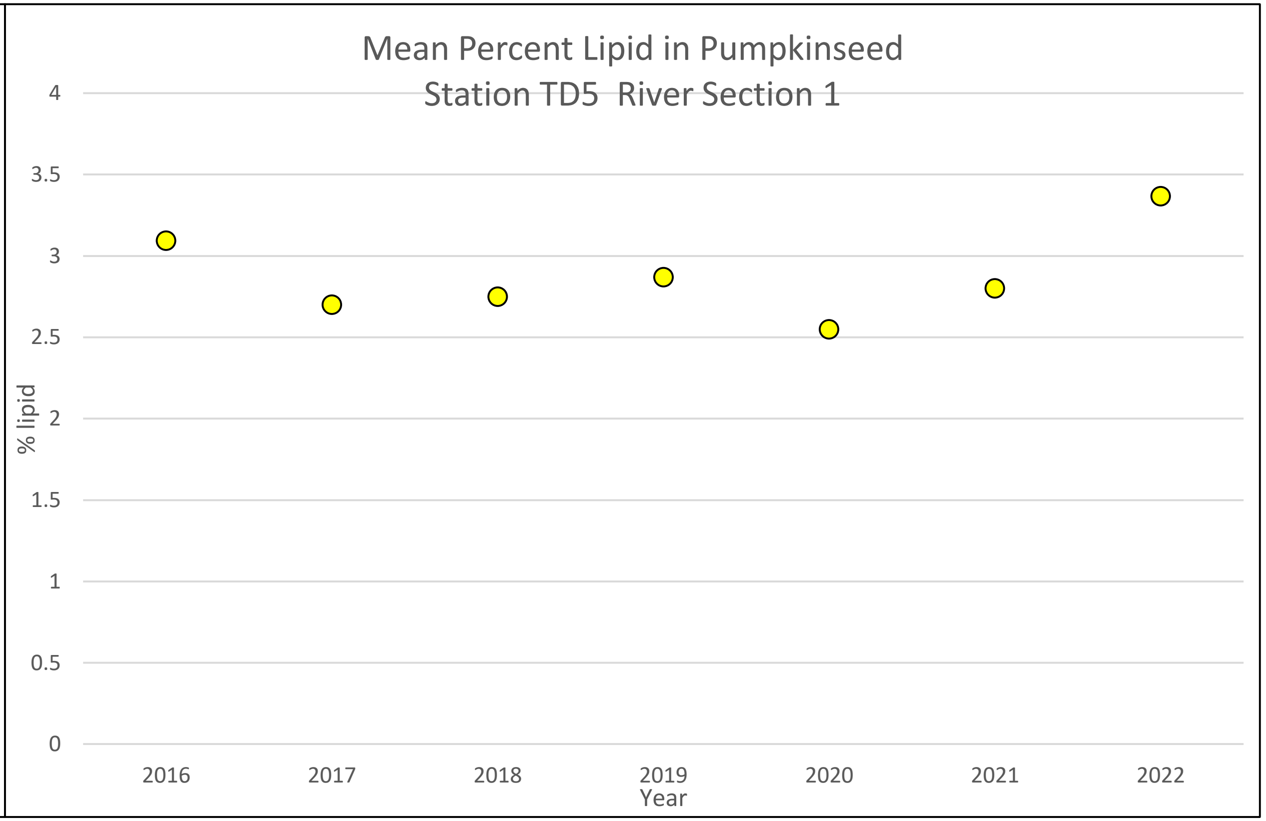
TD5 Pumpkinseed Lipid Based PCB



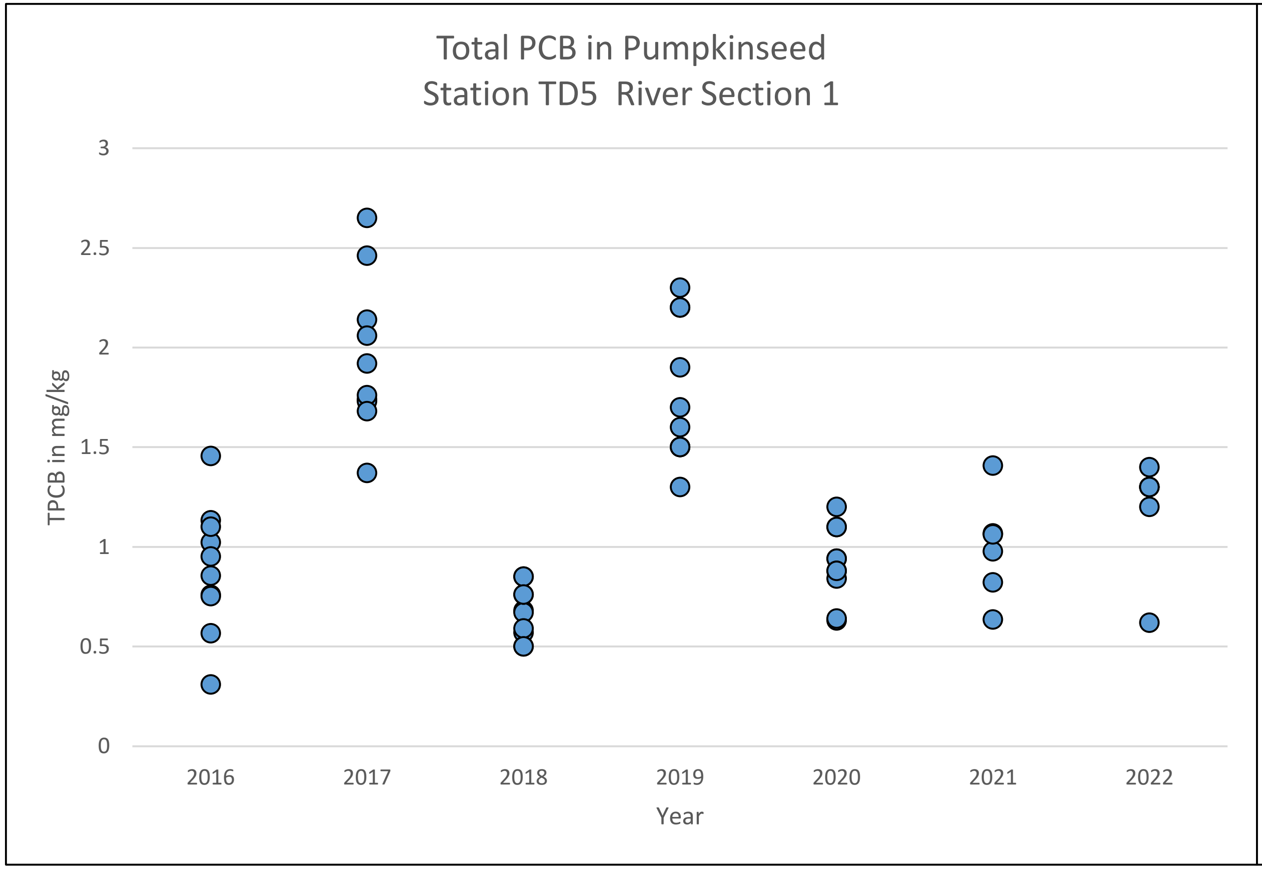


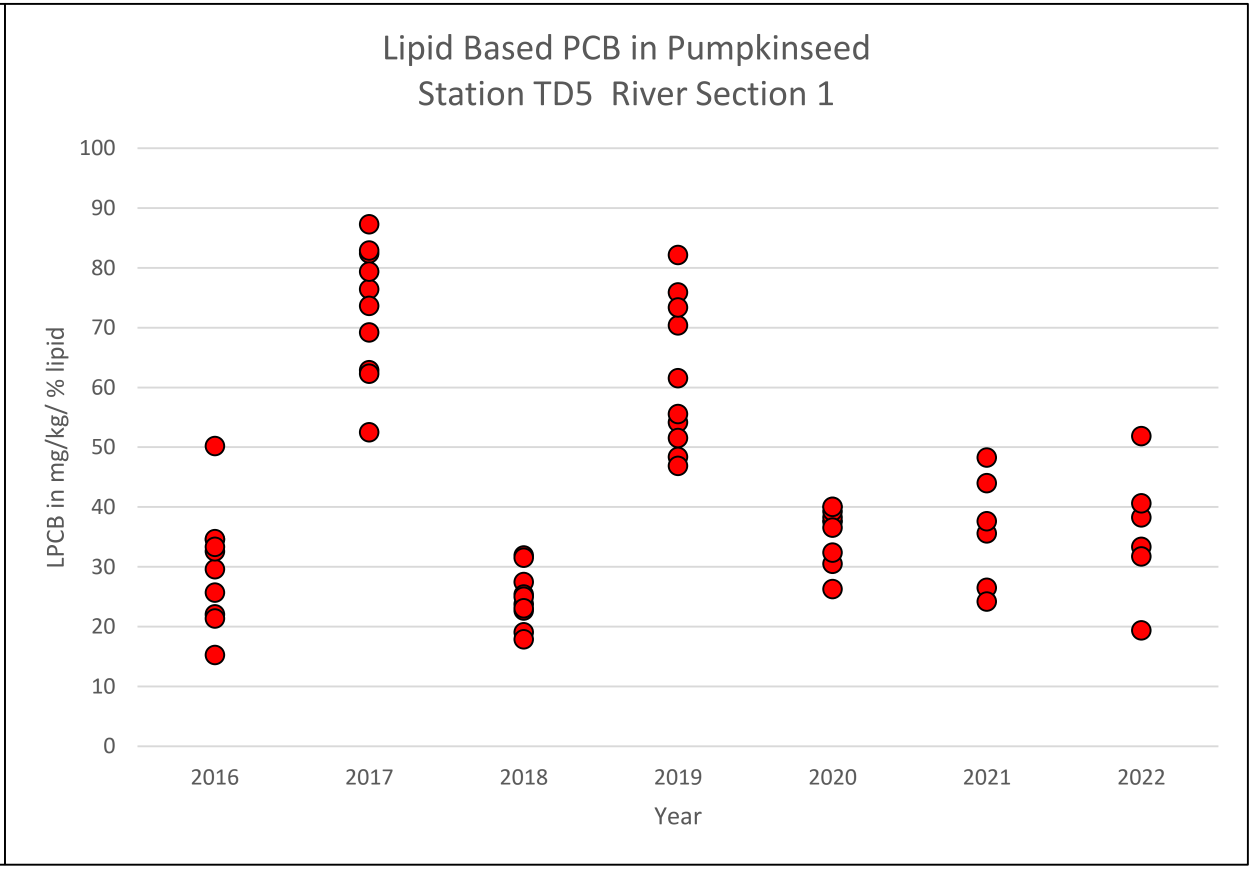
TD5 Pumpkinseed Percent Lipid



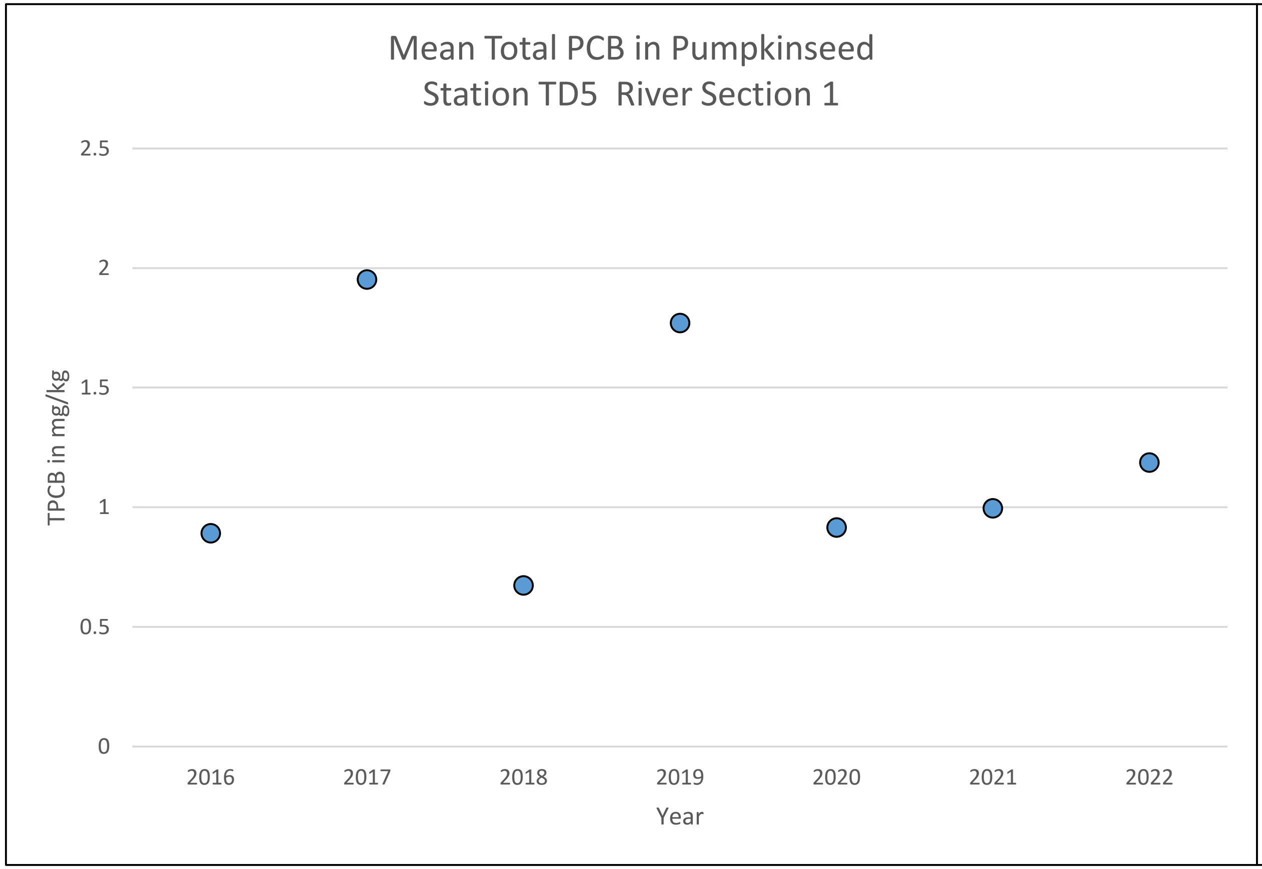


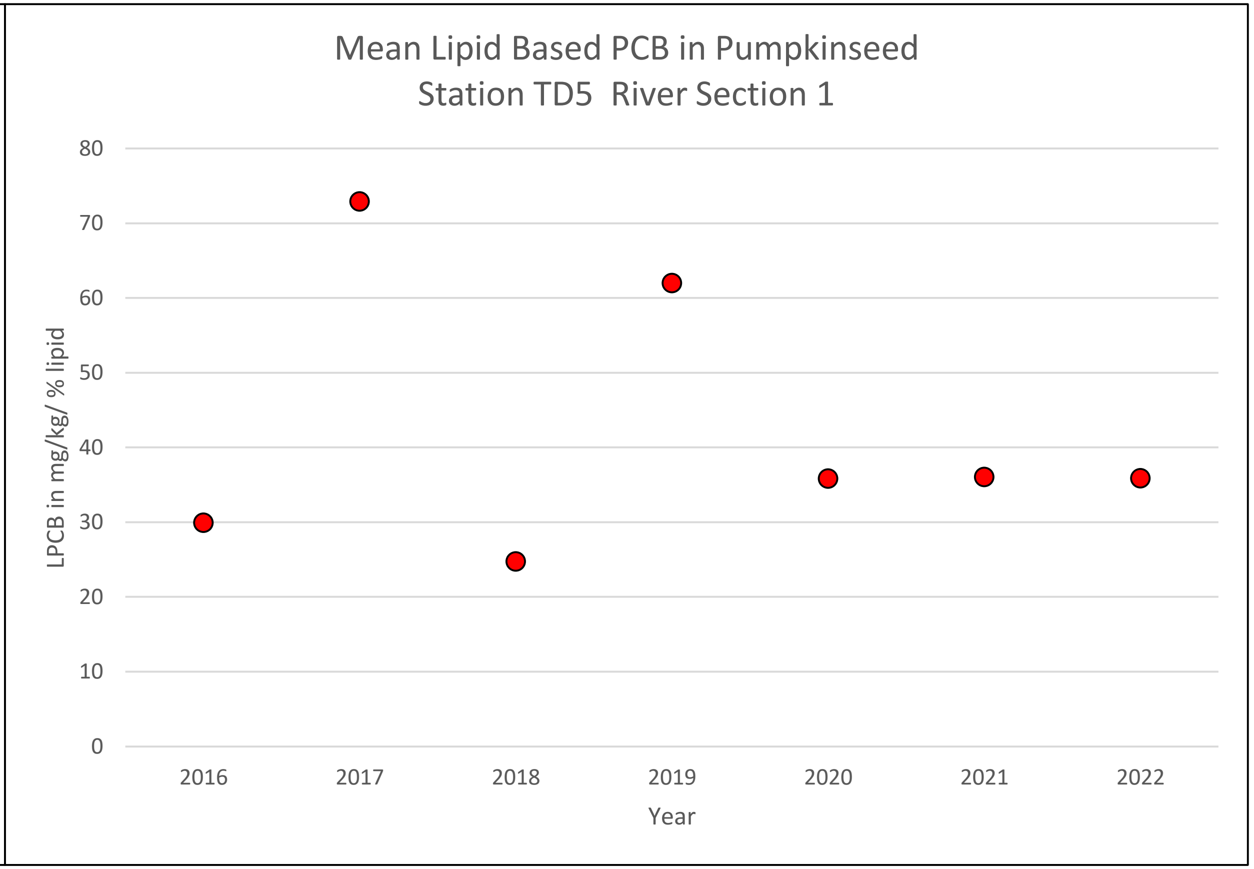
TD5 Pumpkinseed Total PCB and Lipid Based PCB





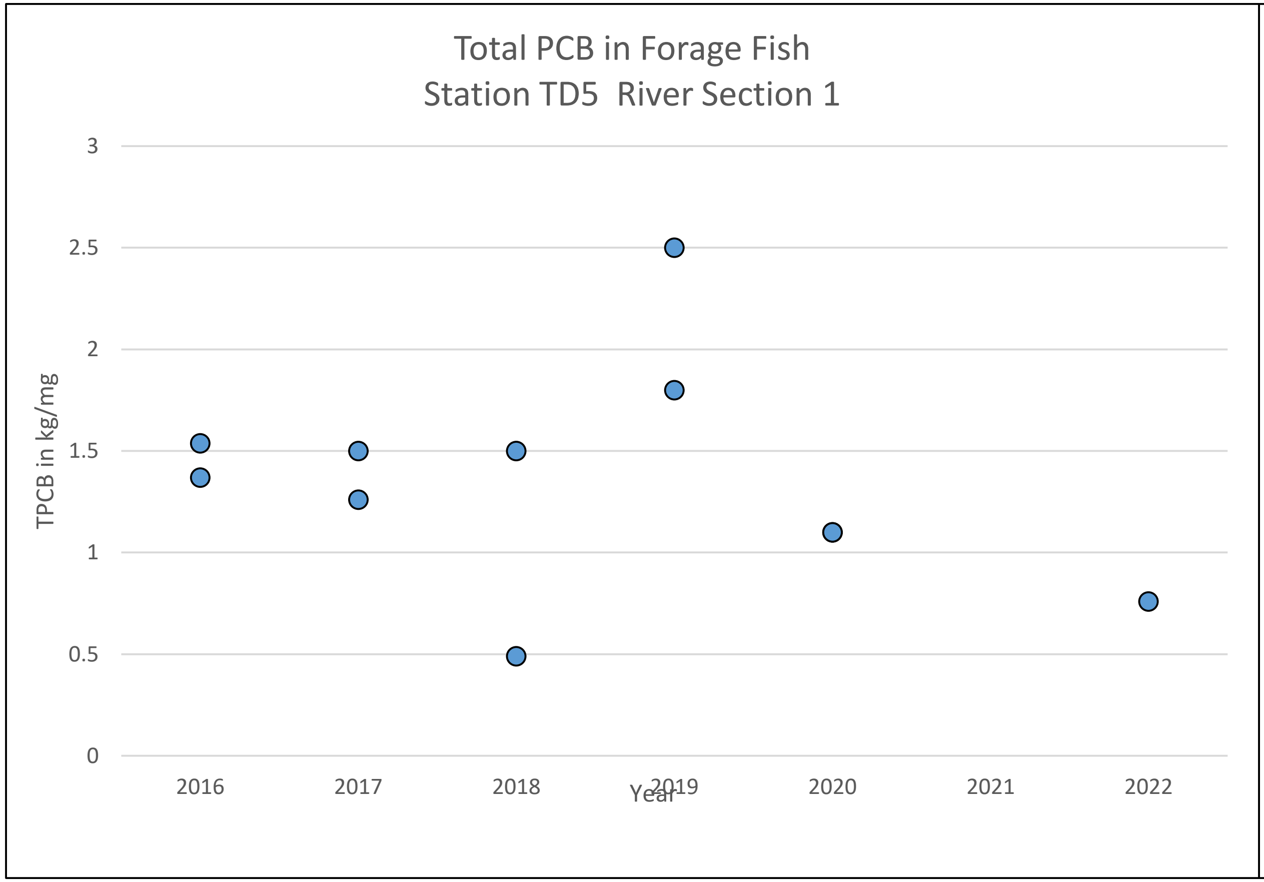
TD5 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

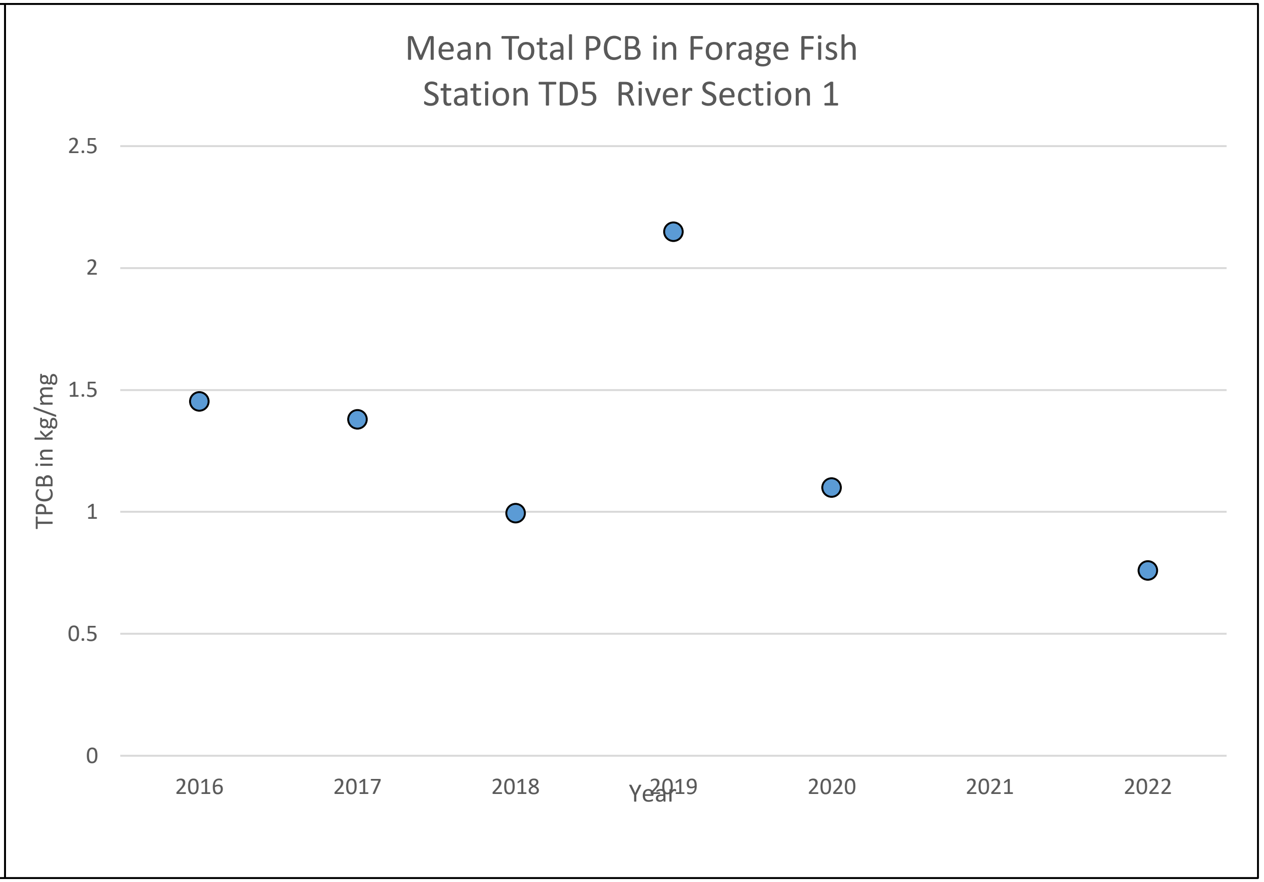




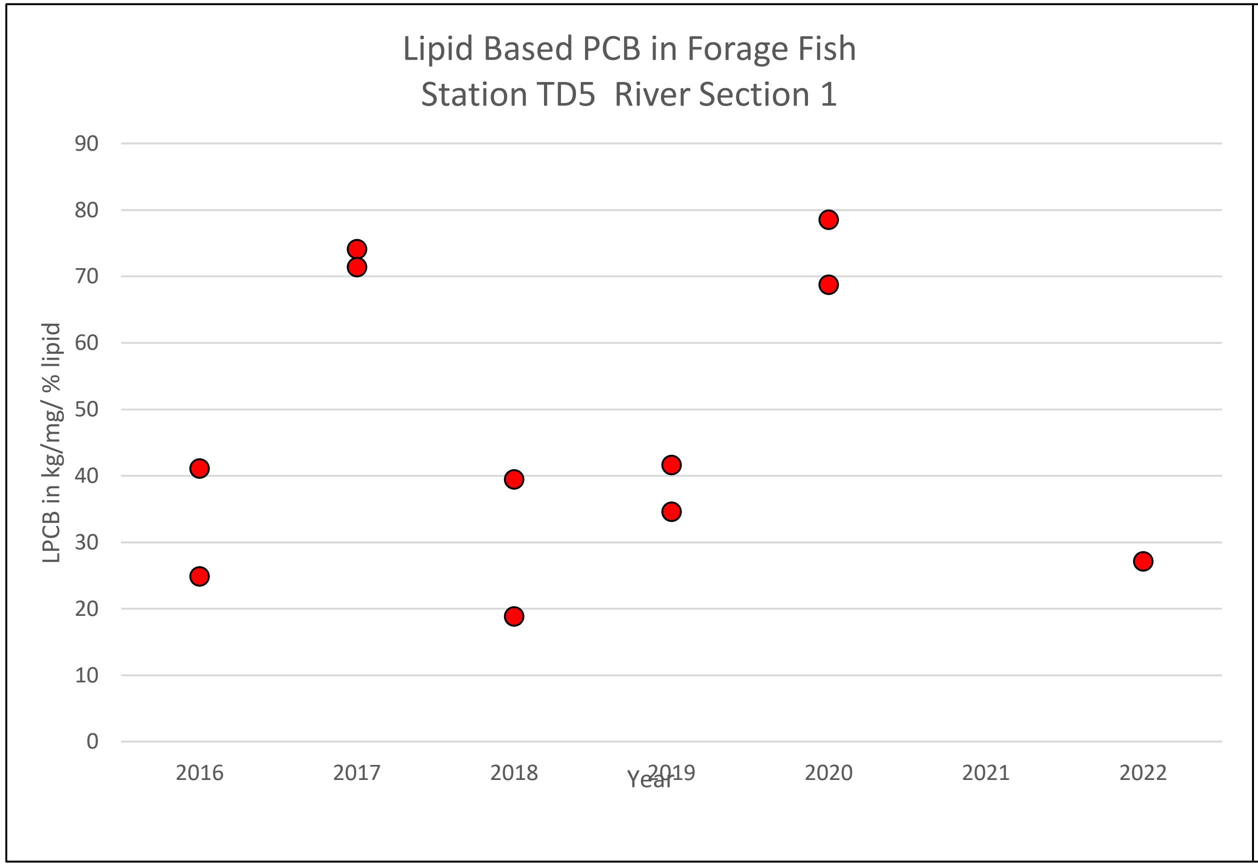
TD5 Forage Fish Data

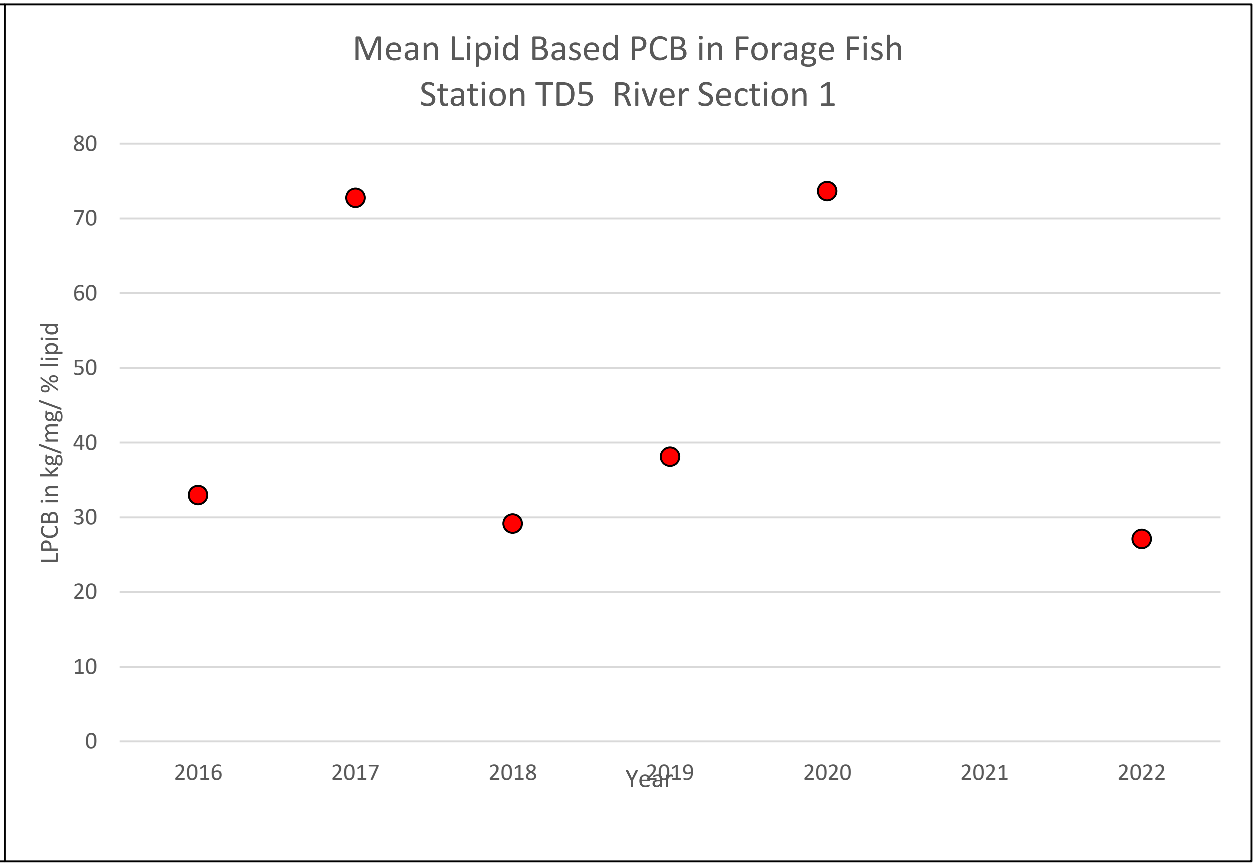
TD5 Forage Fish PCB



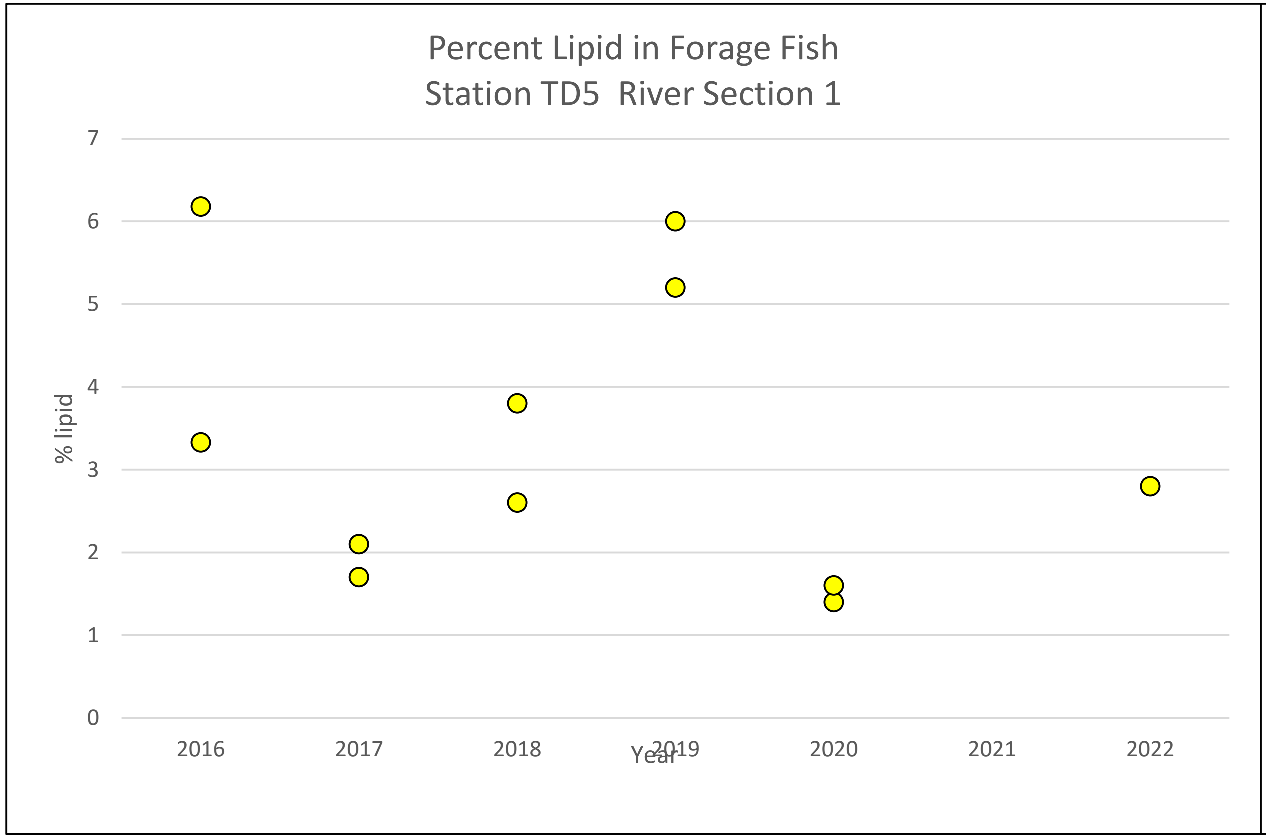


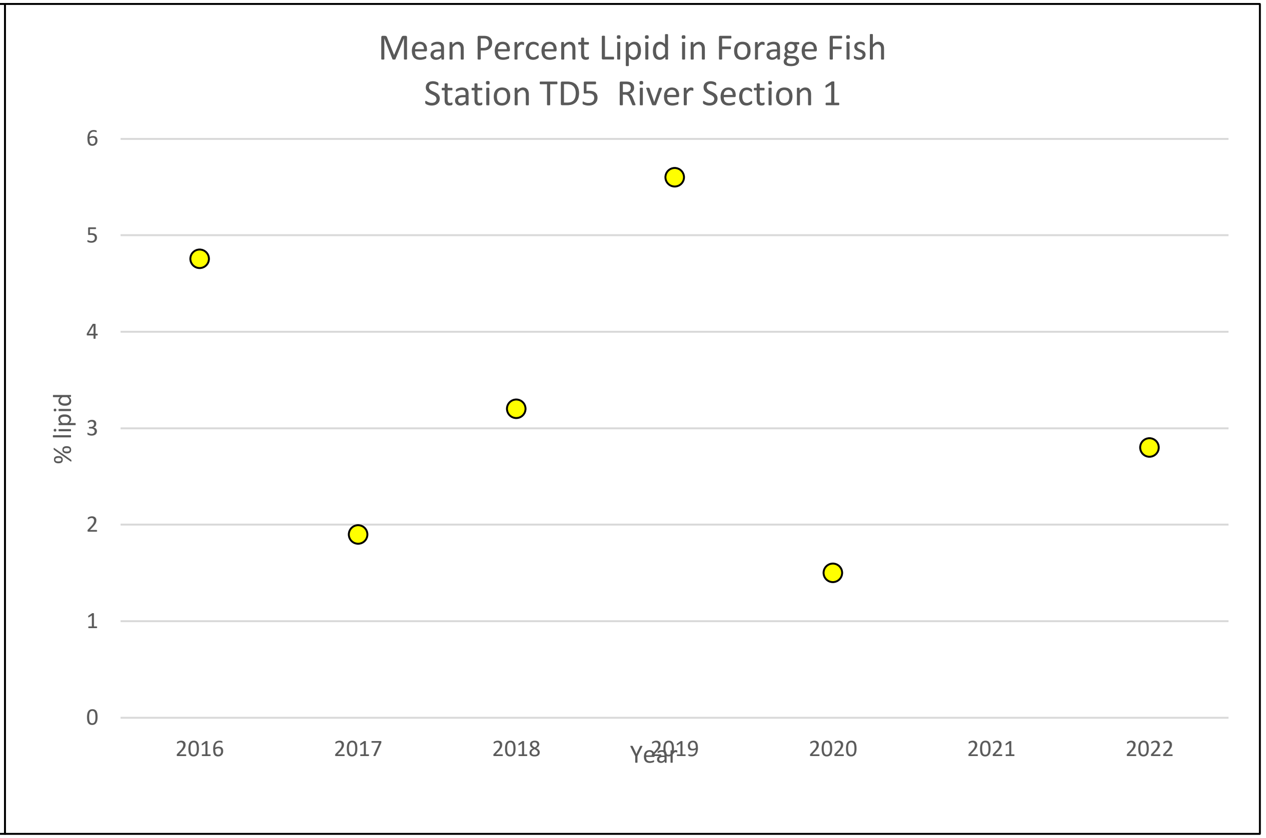
TD5 Forage Fish Lipid Based PCB



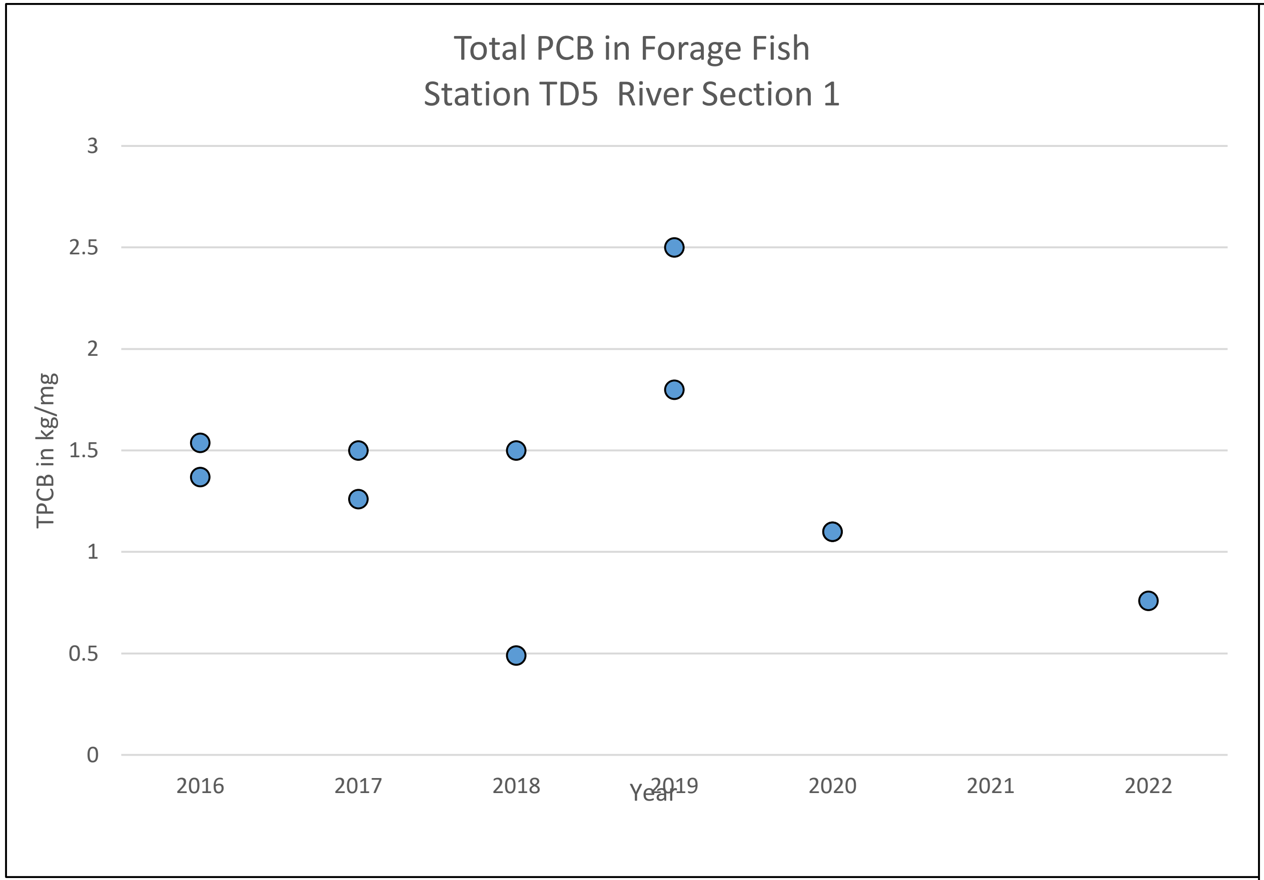


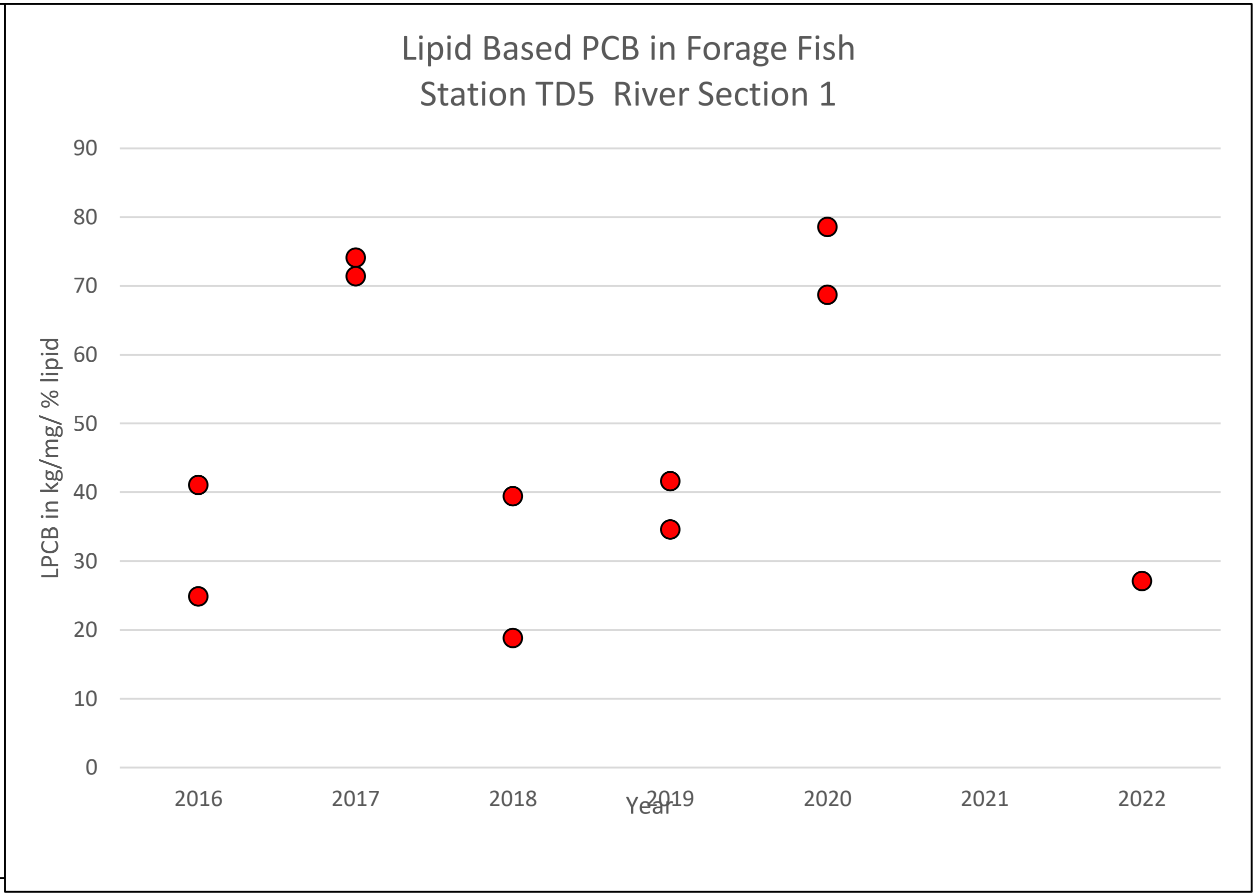
TD5 Forage Fish Percent Lipid



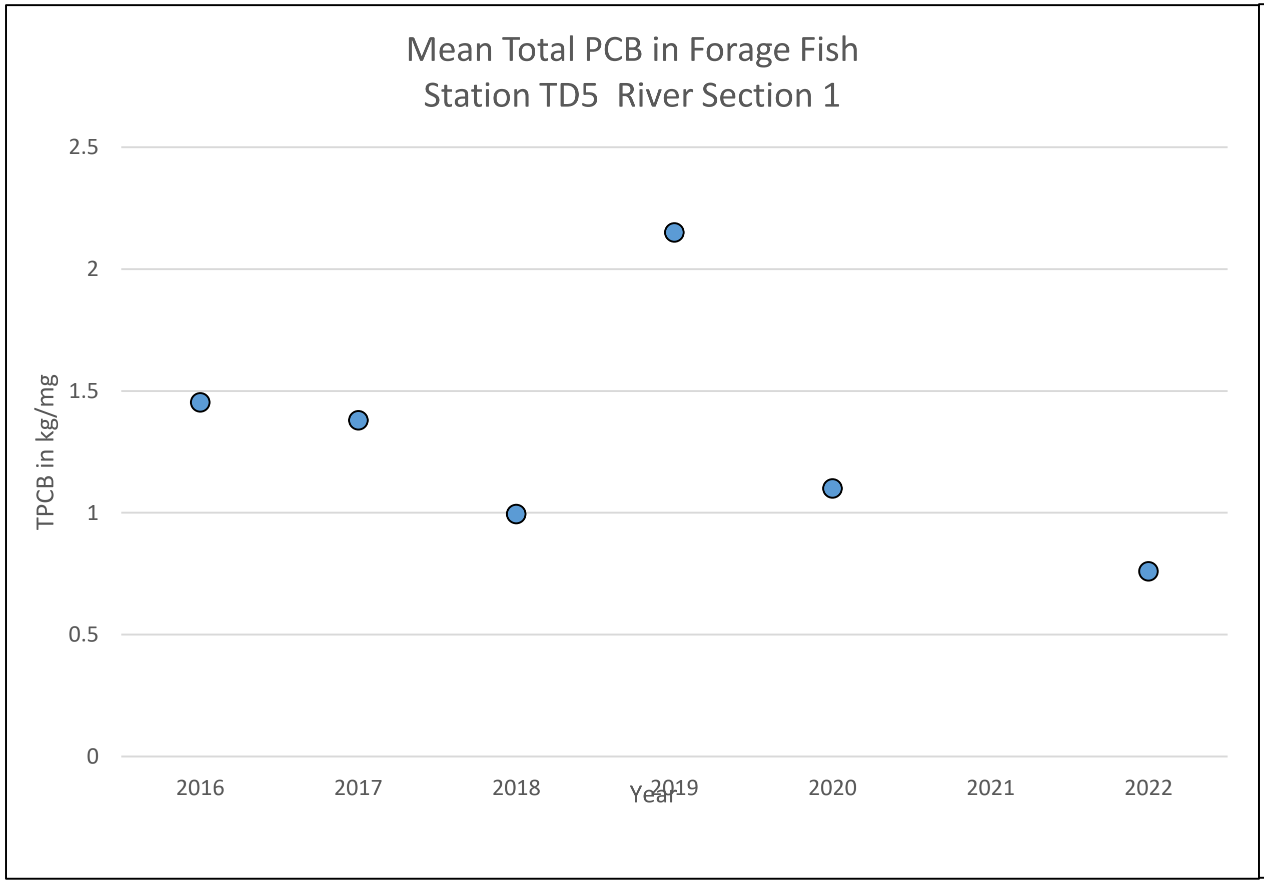


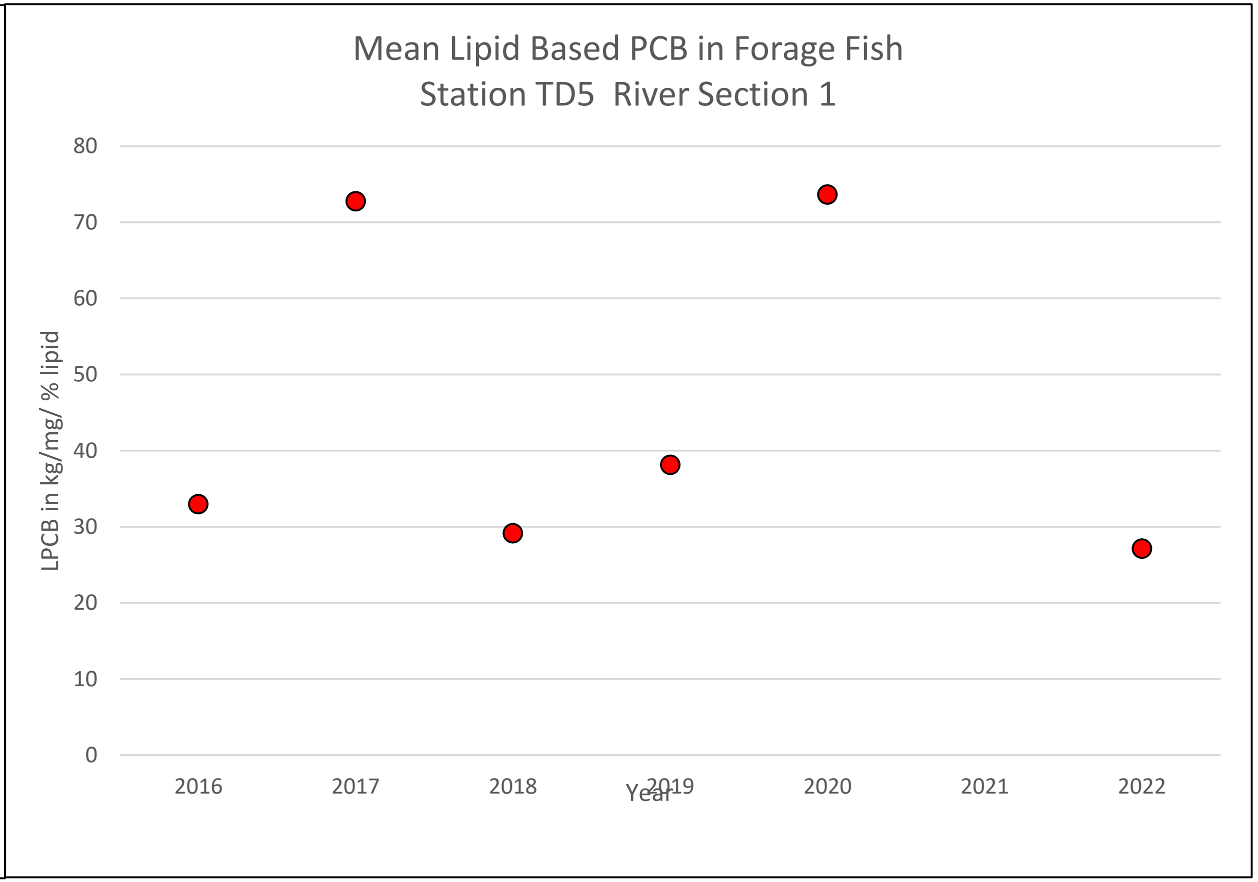
TD5 Forage Fish Total PCB and Lipid Based PCB





TD5 Forage Fish Mean Total PCB and Mean Lipid Based PCB





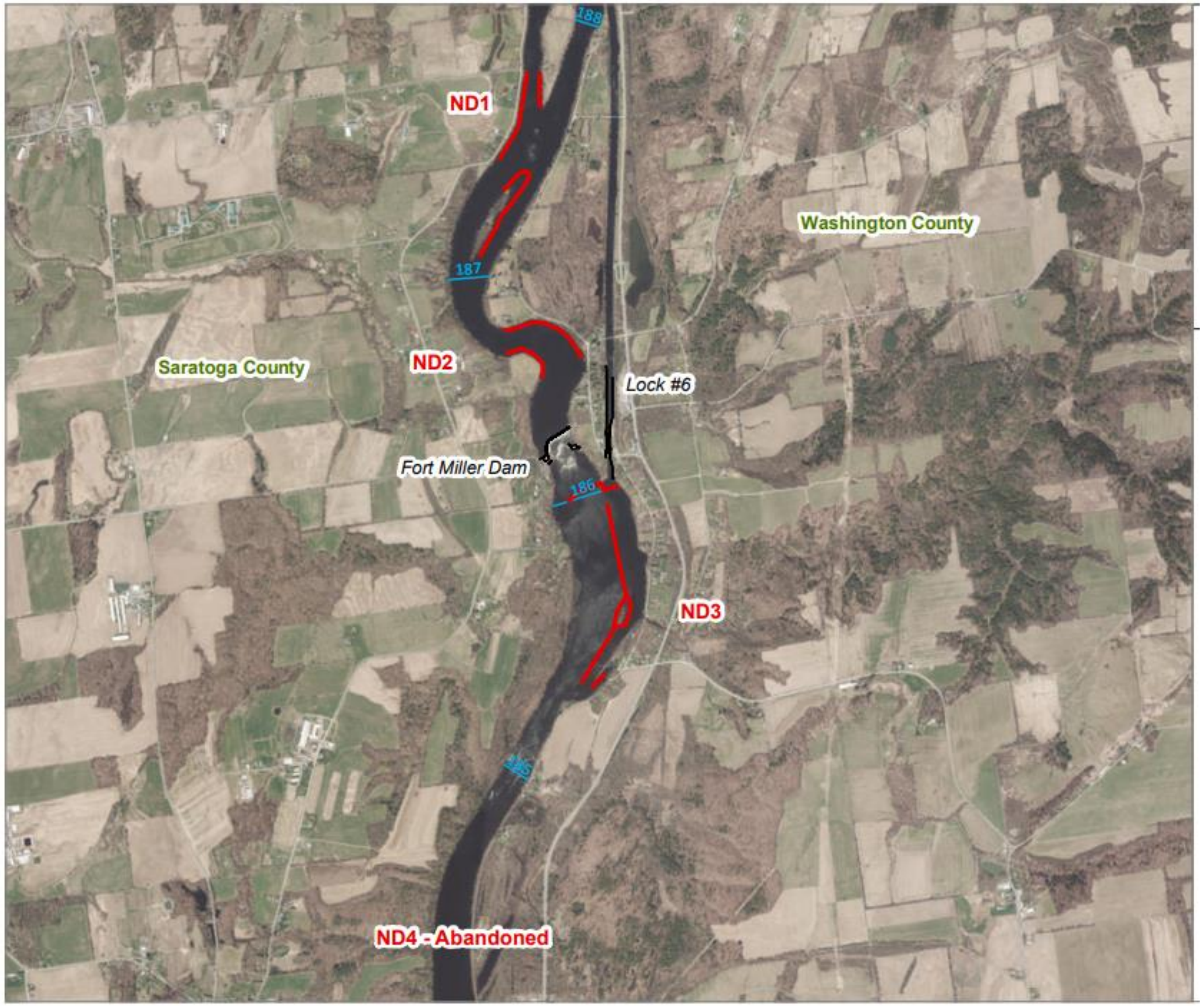
River Section 2 (Reaches 7 and 8)
Fort Miller and Northumberland Pools

Reach 7 (Fort Miller Pool)
River Section 2

- Reach 7 extends from the Thompson Island Dam downstream to the Fort Miller Dam, about 3 miles downstream.
- Reach 7 is approximately half of River Section 2.
- River Section 2 is the start of the portion of the river where EPA selected the less stringent cleanup level for delineating sediment removal. The criteria for removal were approximately three times hgher than in River Section 1.
- There are two fish monitoring stations in Reach 8, designated ND1 and ND2.

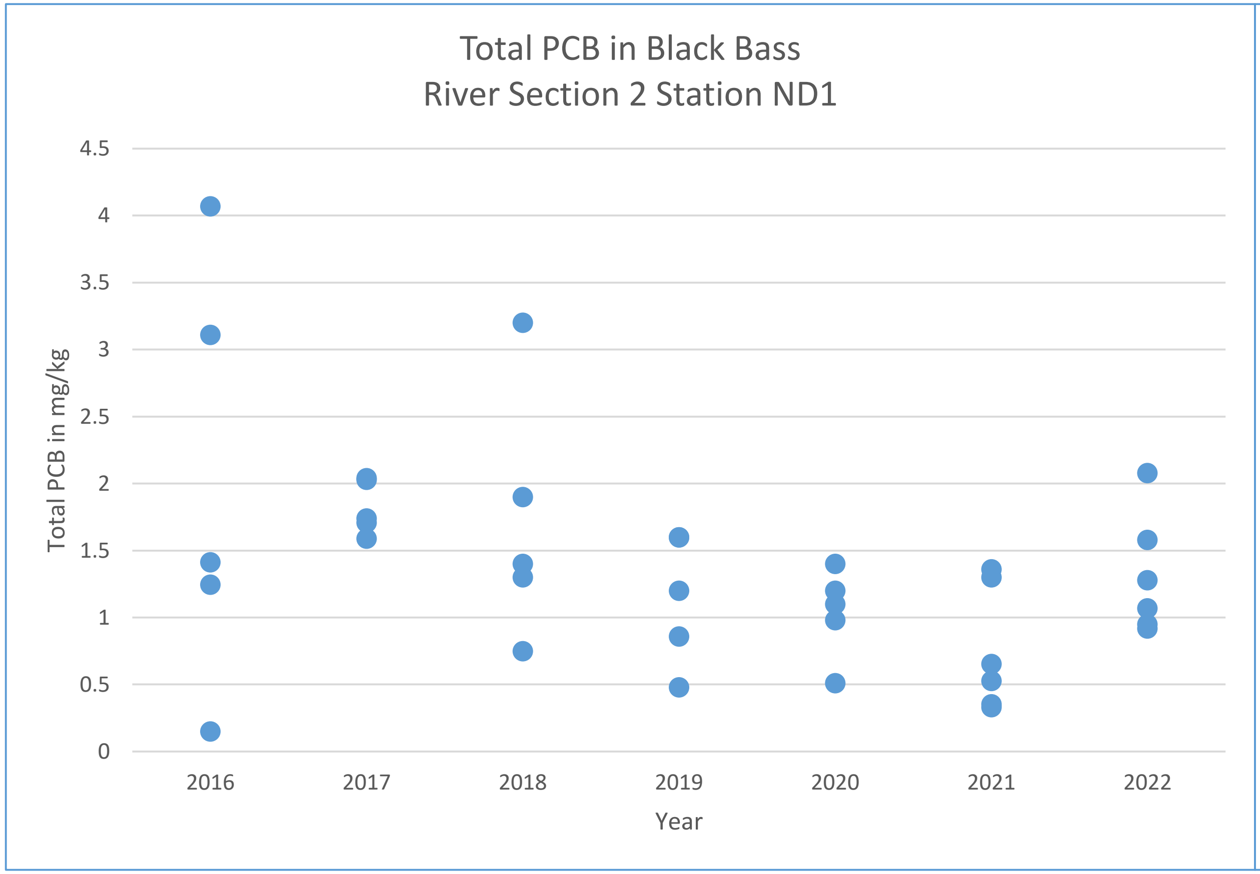
Station ND1

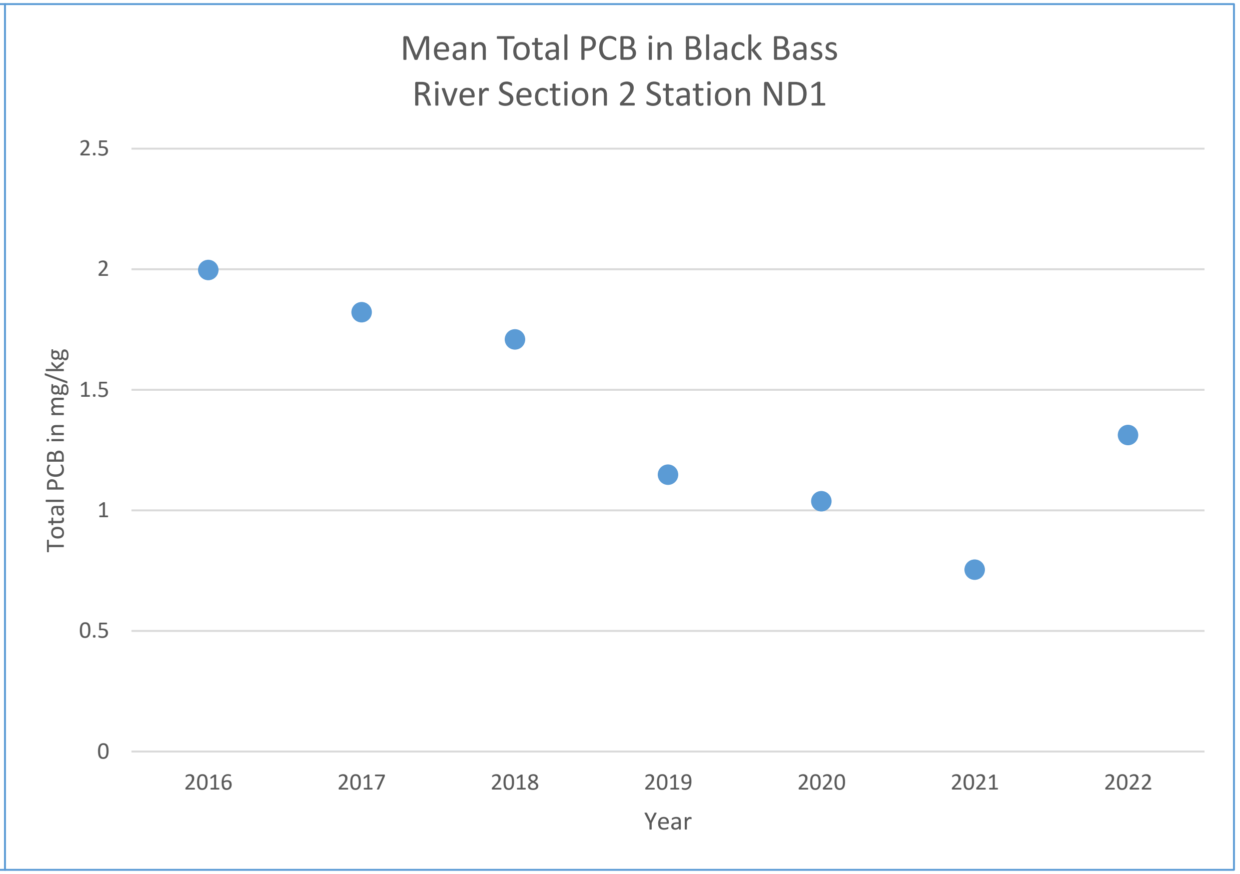
Stations ND1, ND2, and ND3



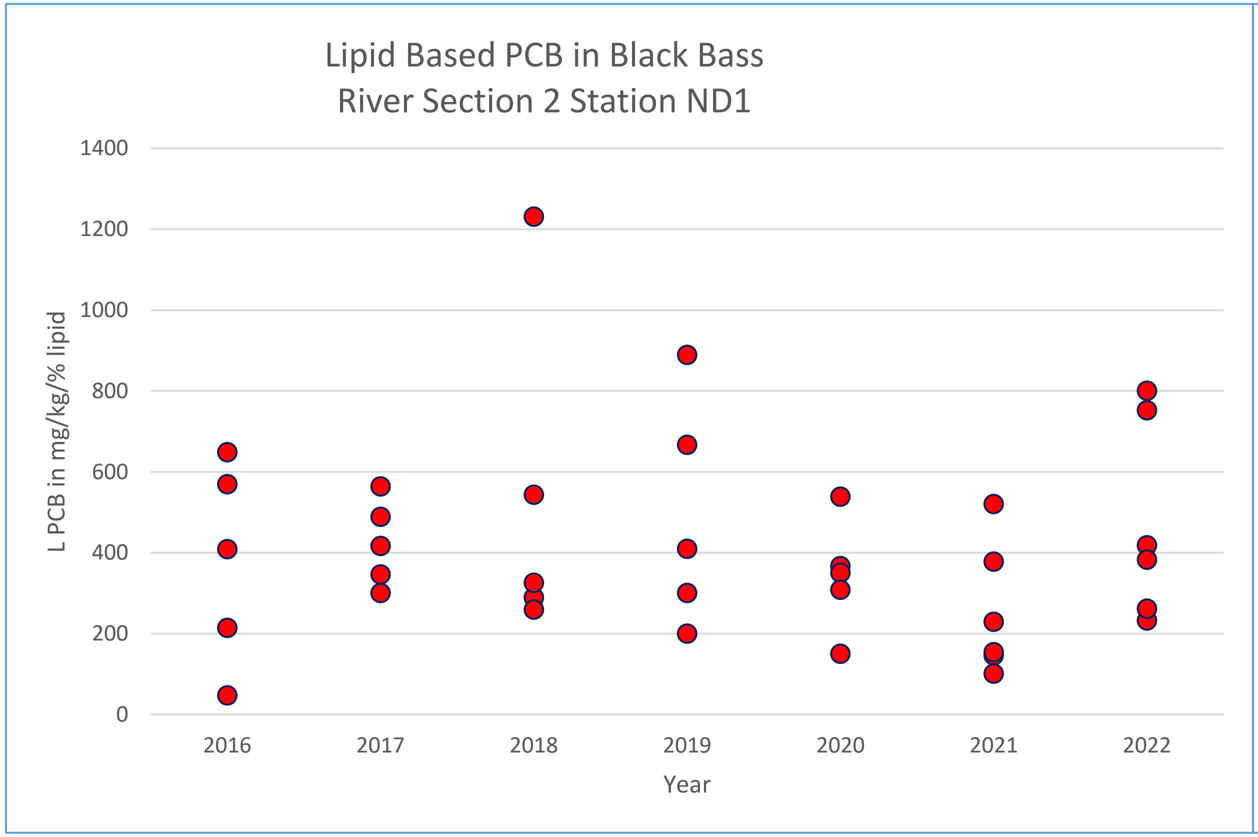
ND1 Black Bass Data

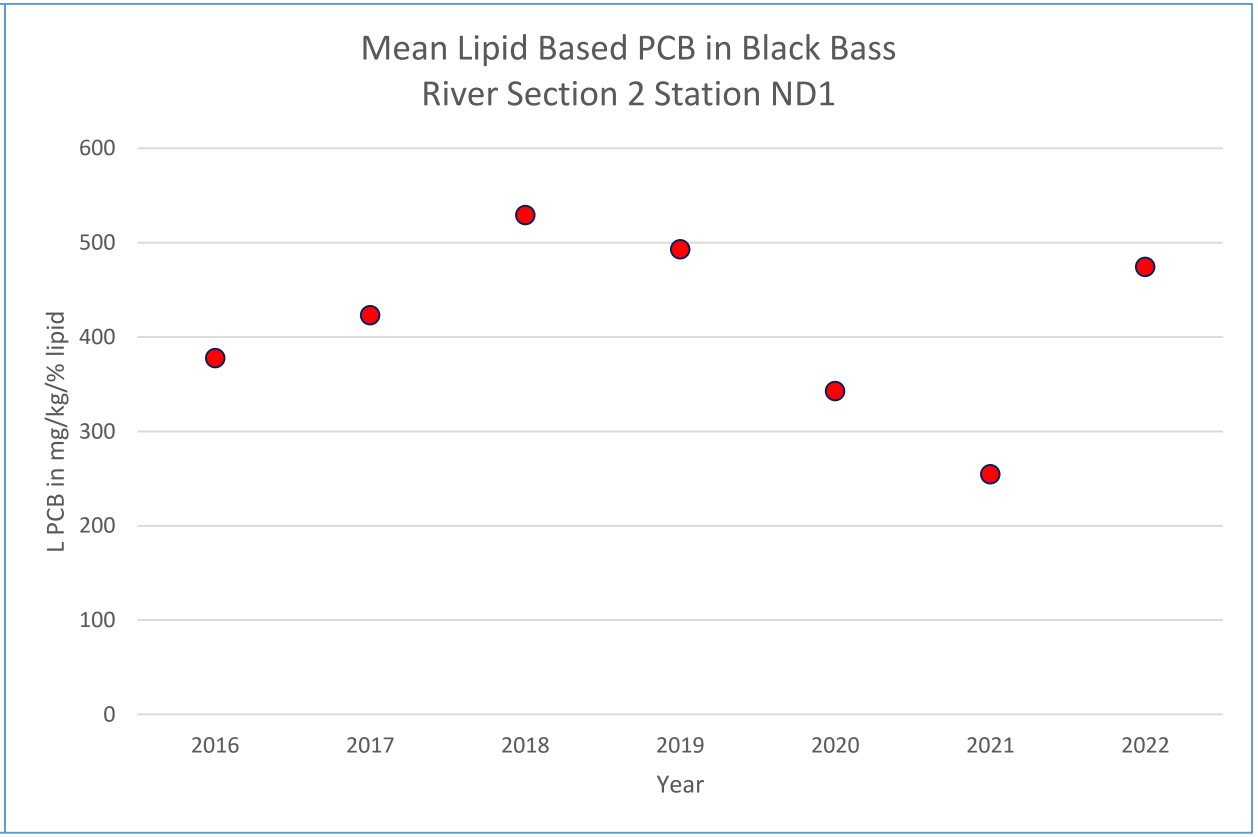
ND1 Black Bass Total PCB



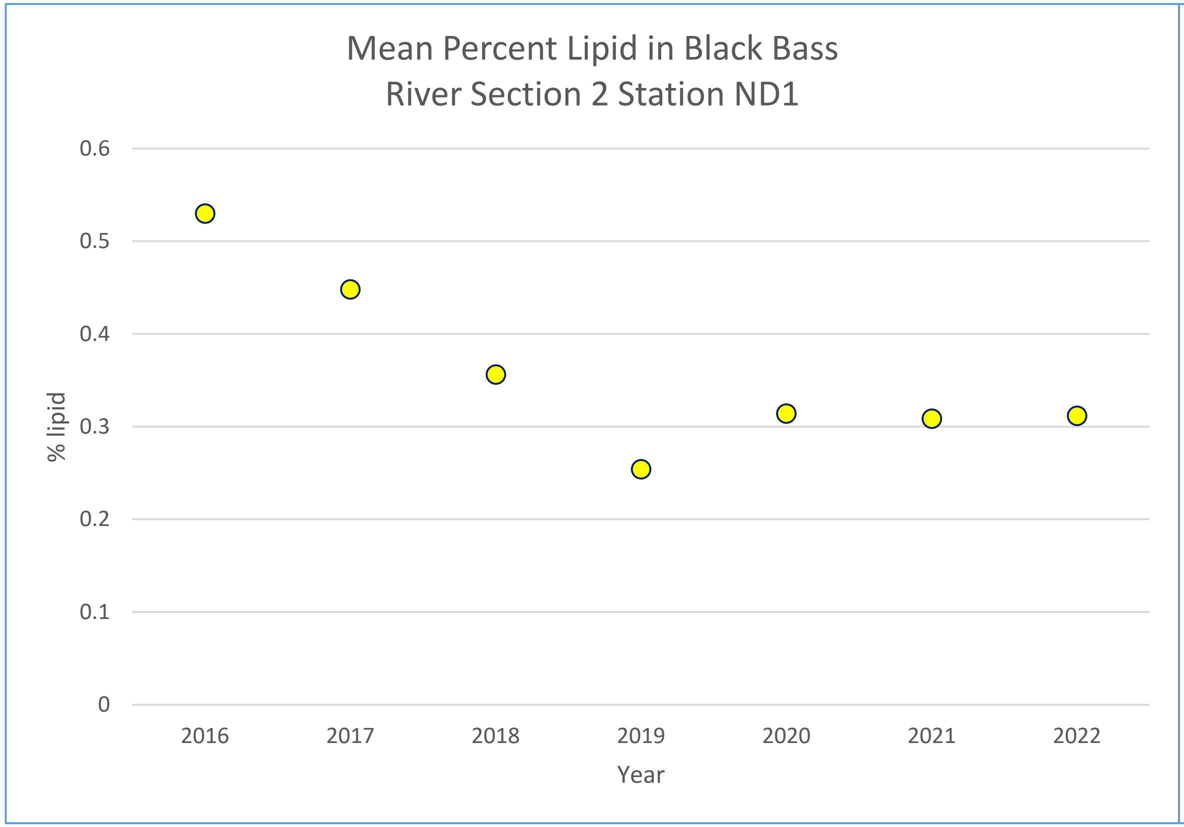


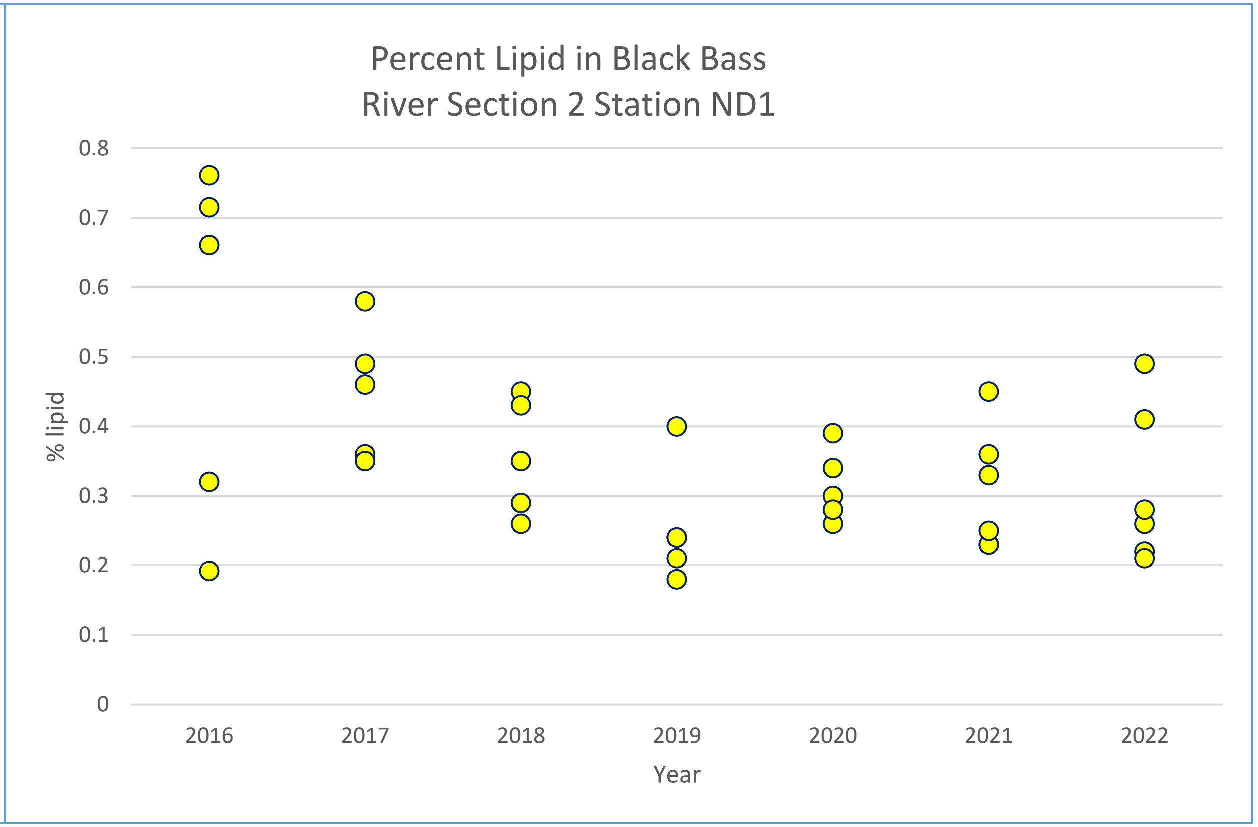
ND1 Black Bass Lipid Based PCB



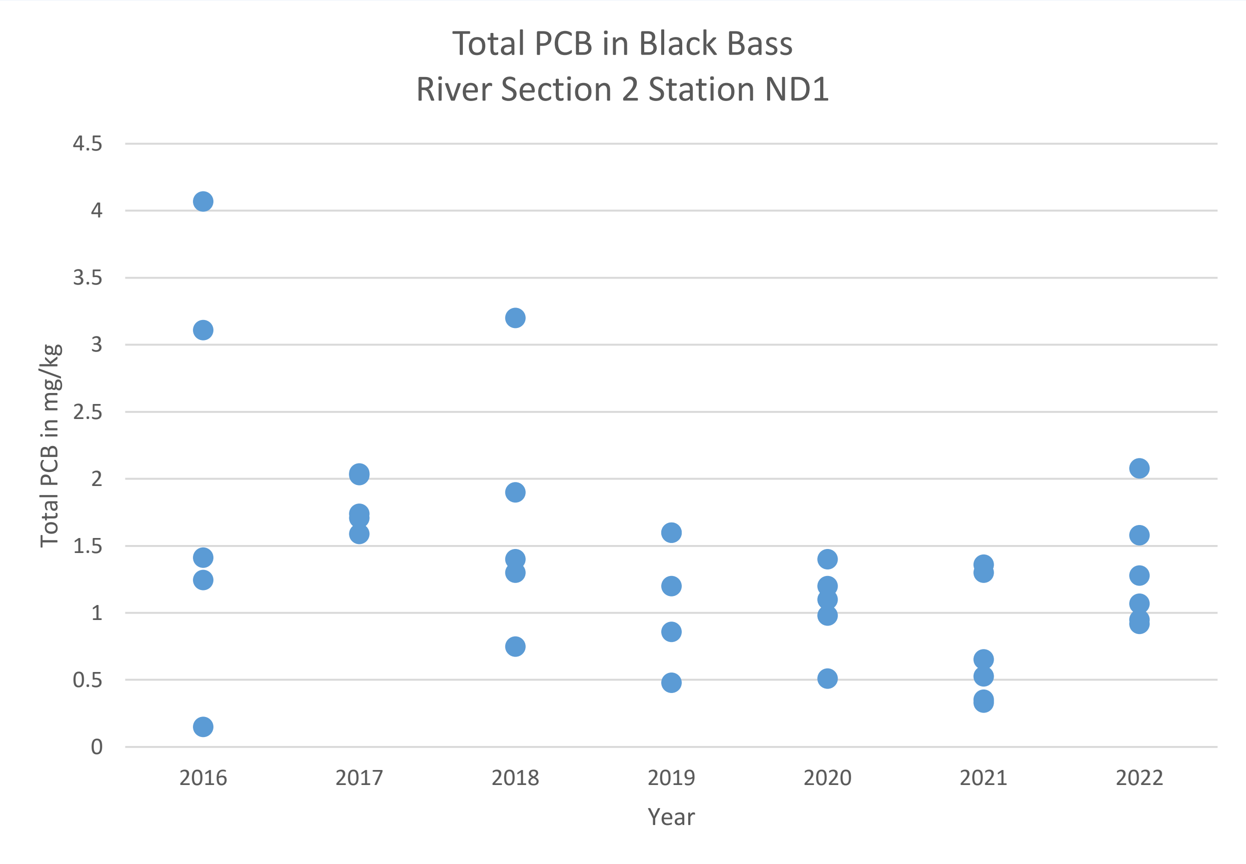


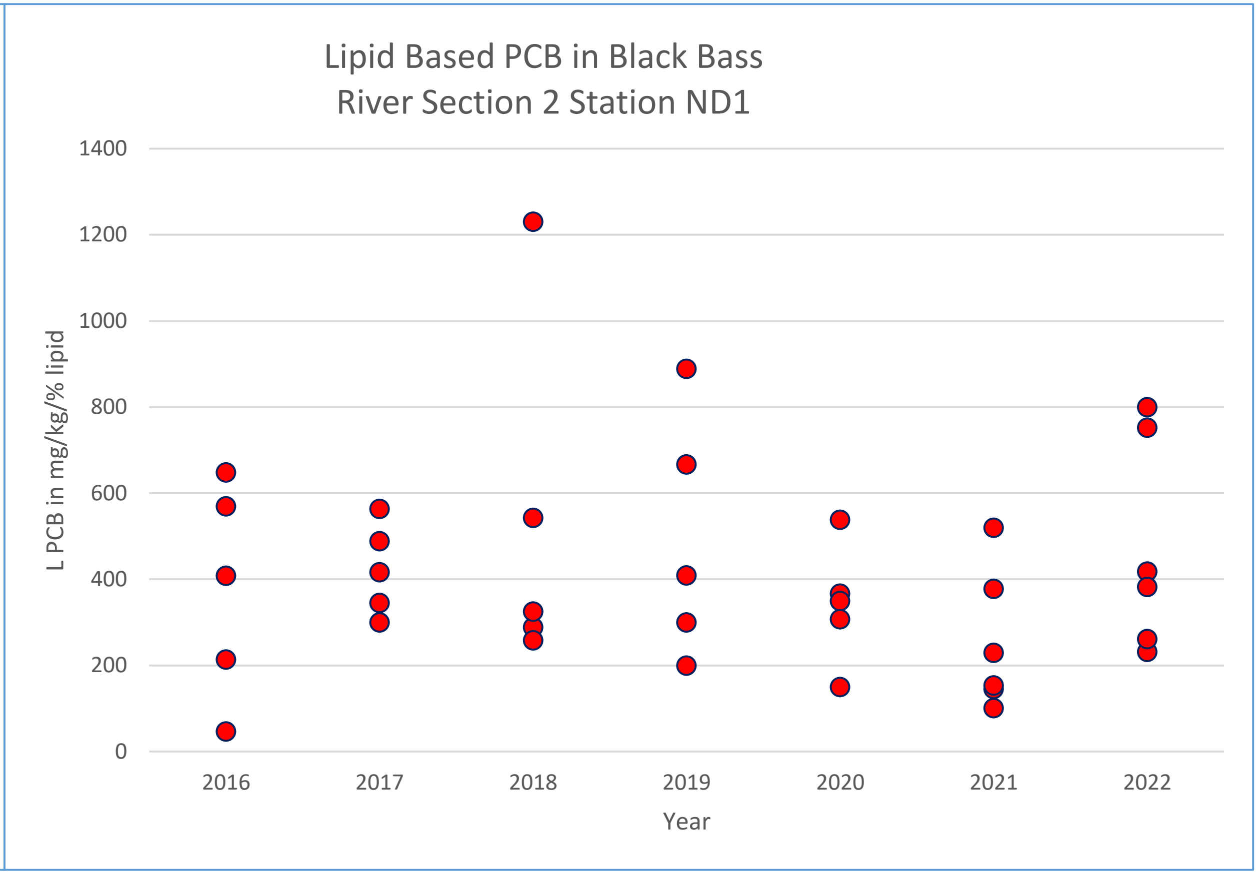
ND1 Black Bass Percent Lipid



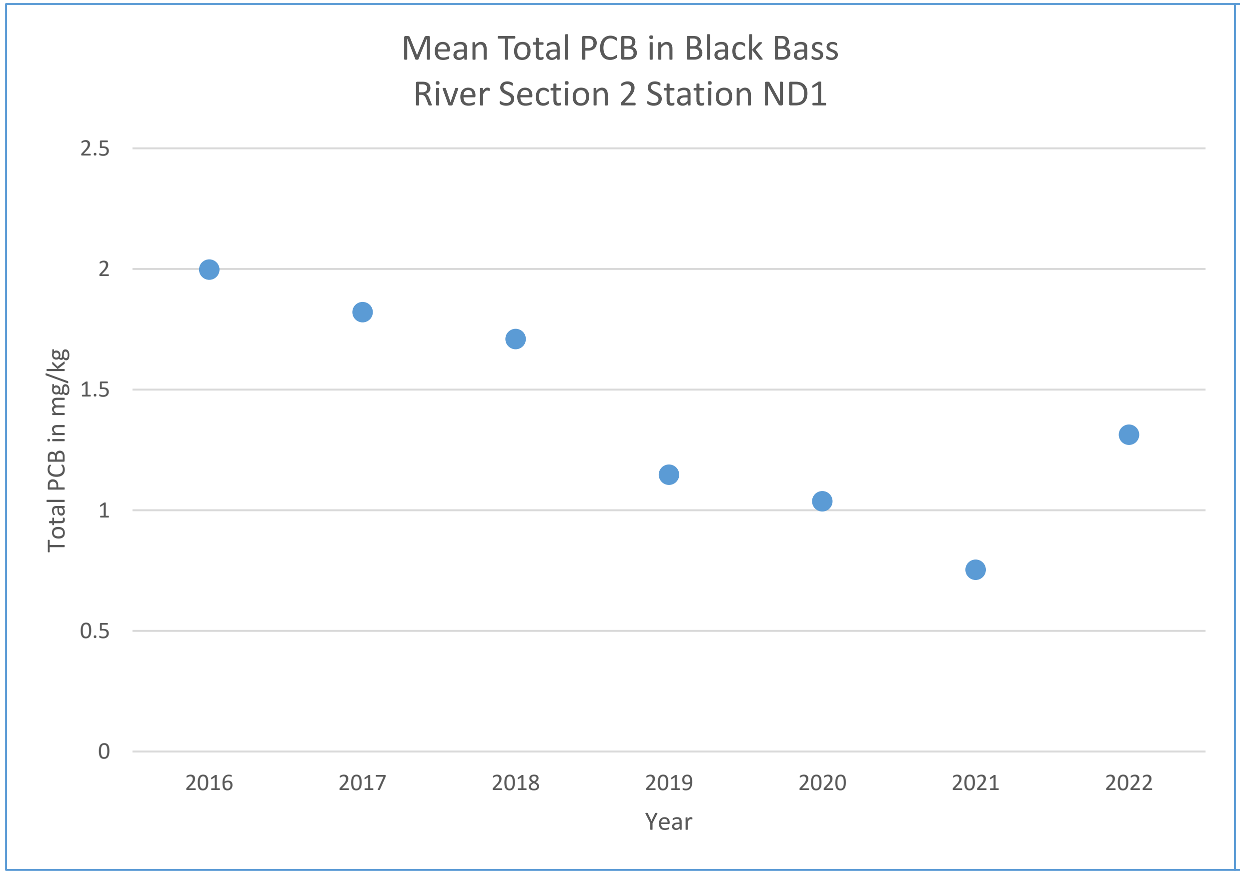


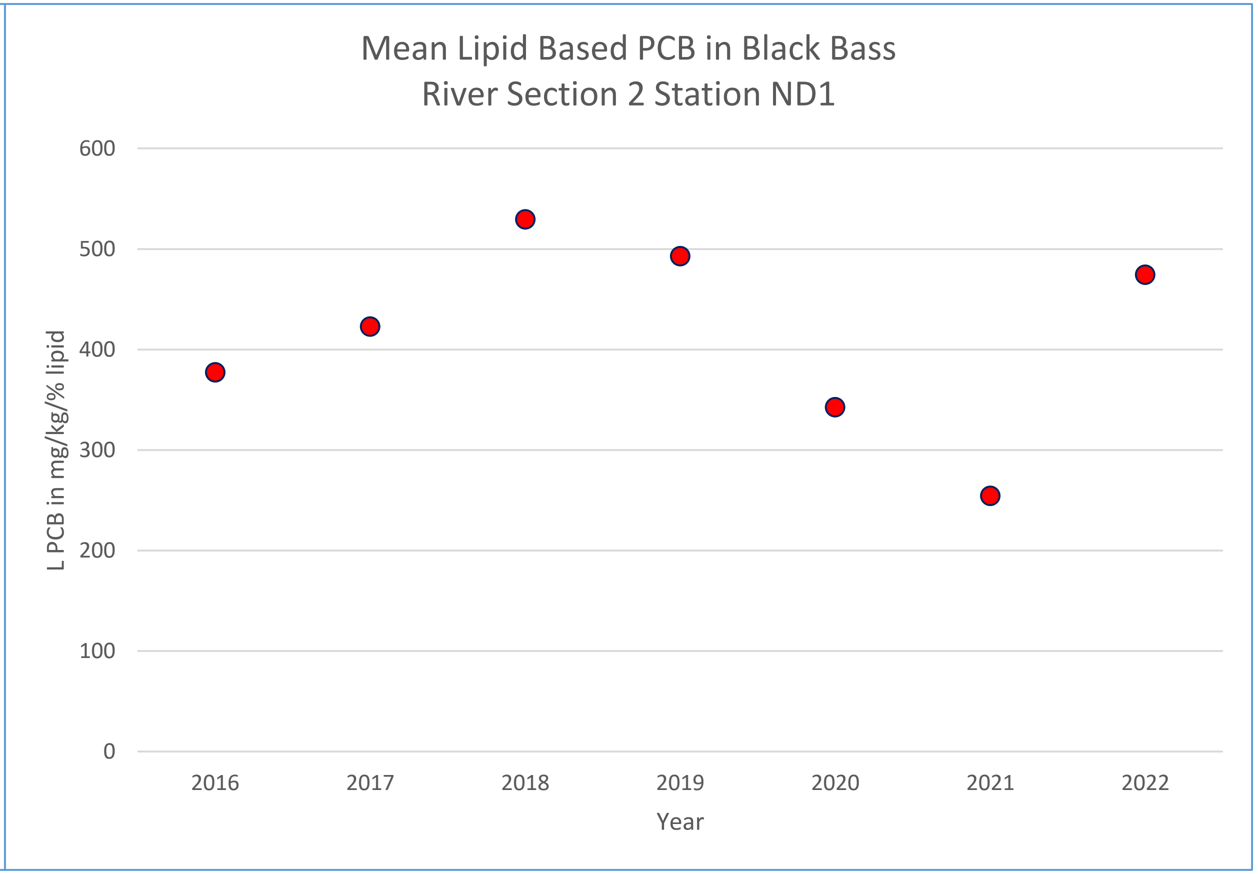
ND1 Black Bass Total PCB and Lipid Based PCB





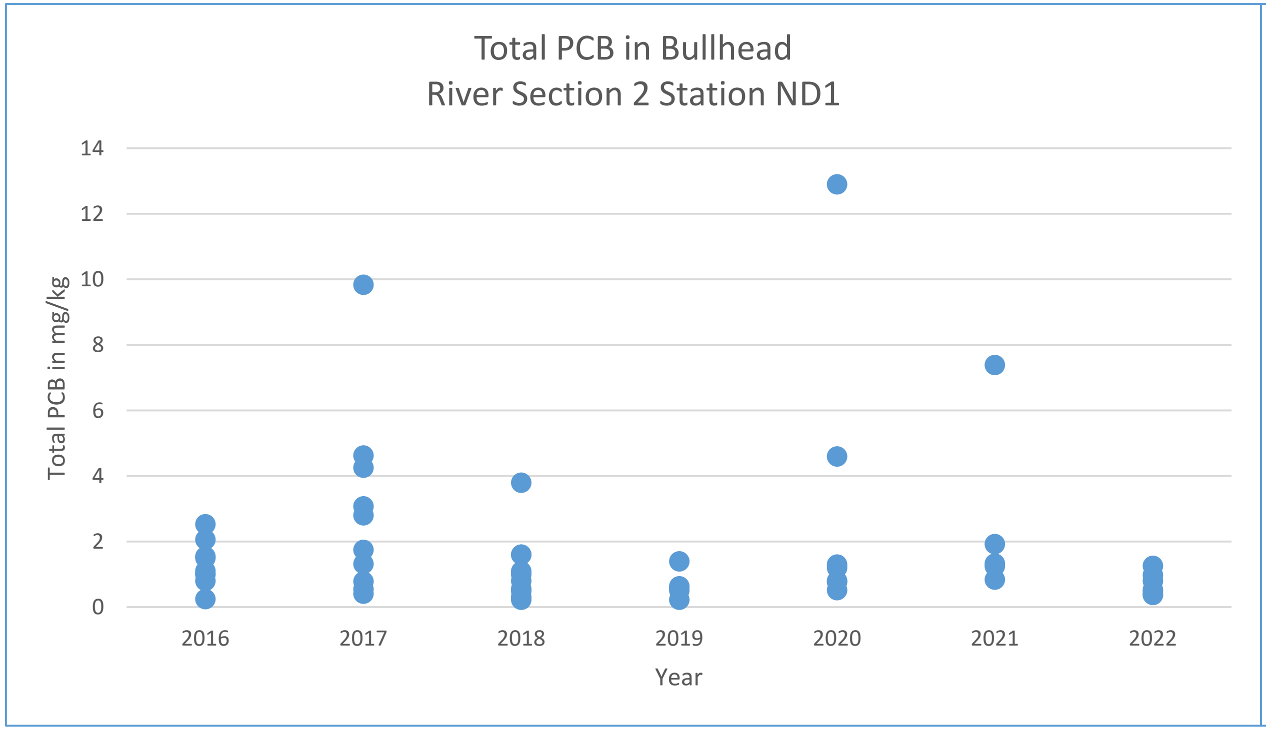
ND1 Black Bass Mean Total PCB and Mean Lipid Based PCB

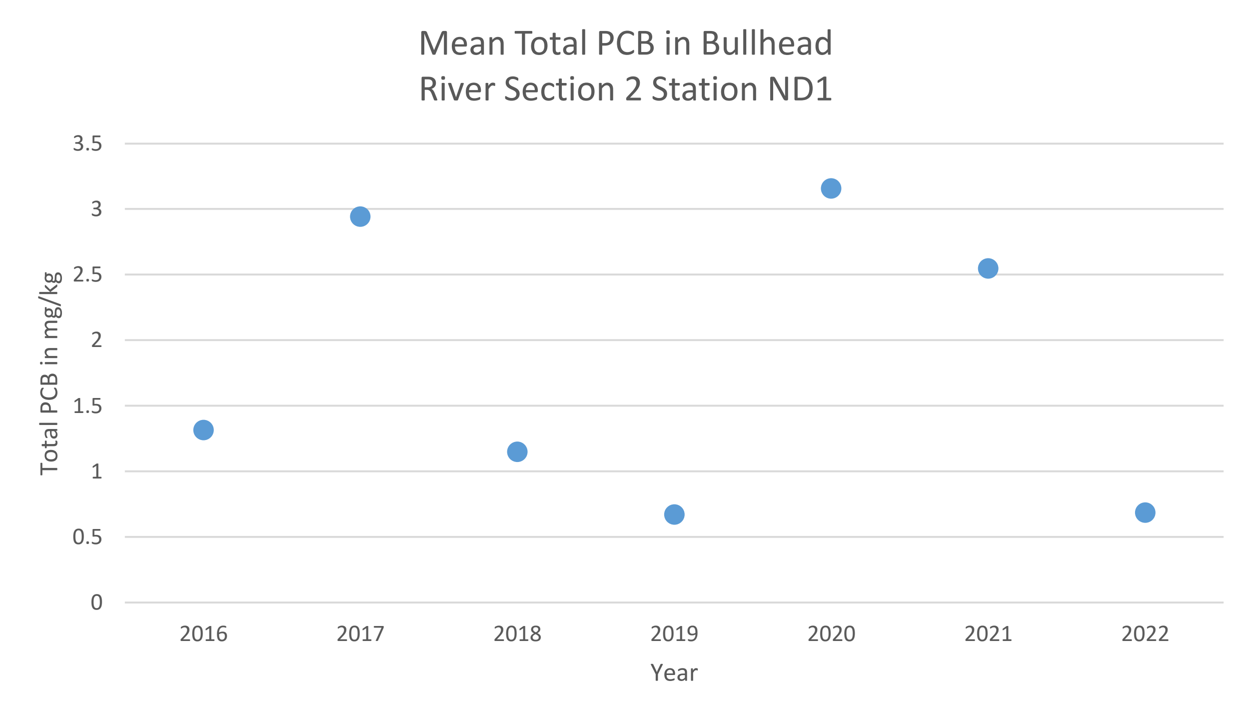




ND1 Bullhead Data

ND1 Bullhead Total PCB





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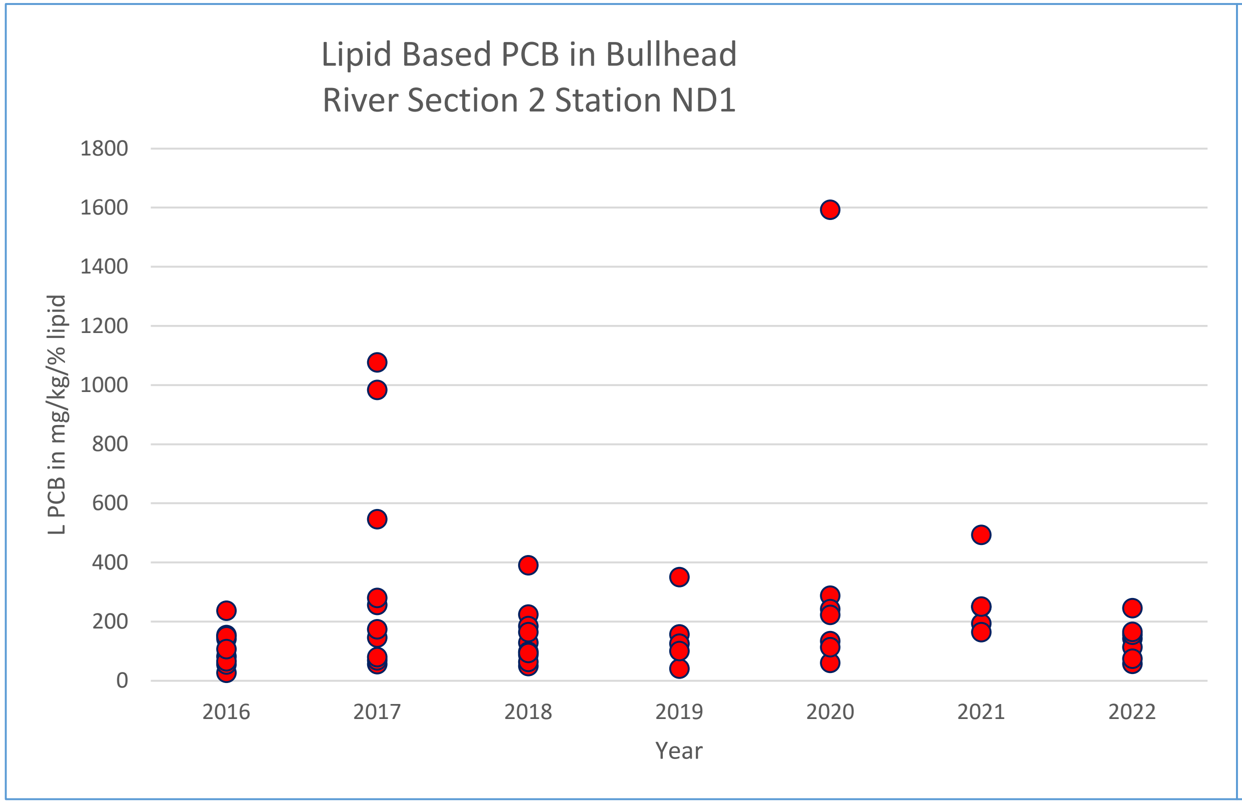
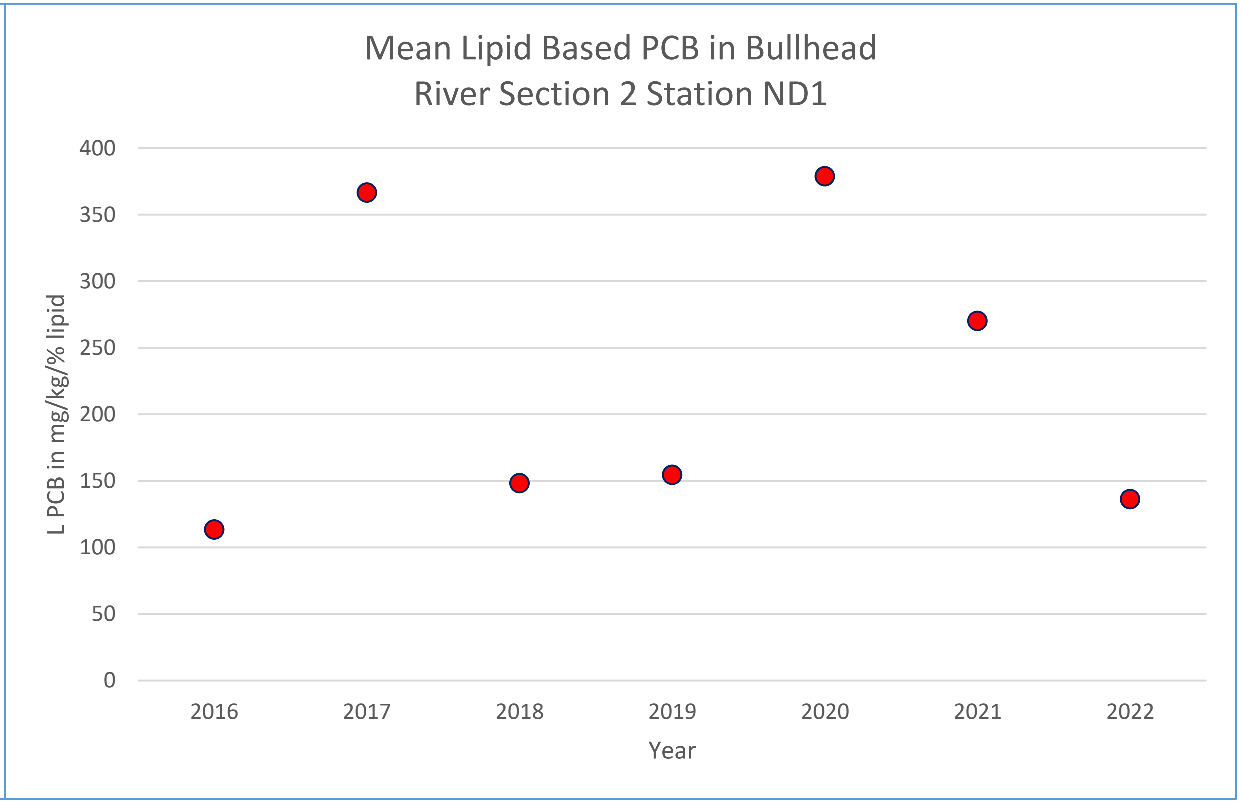
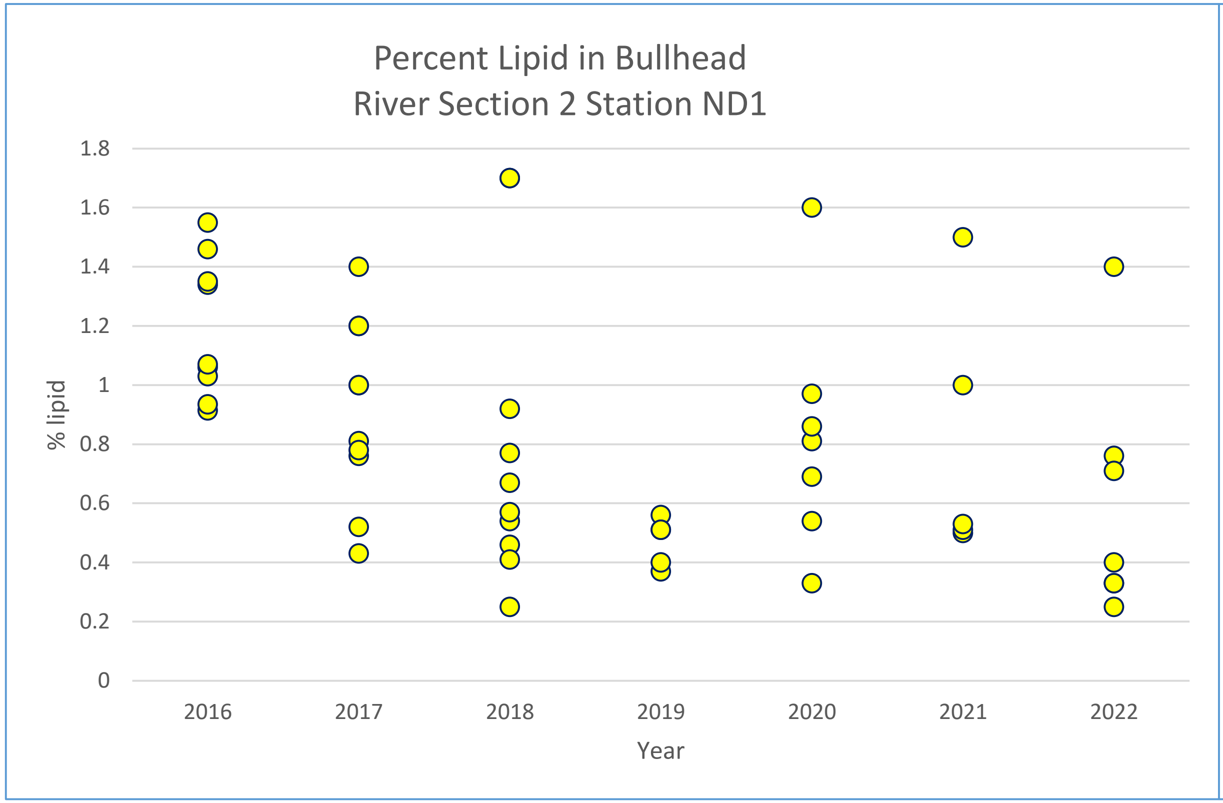
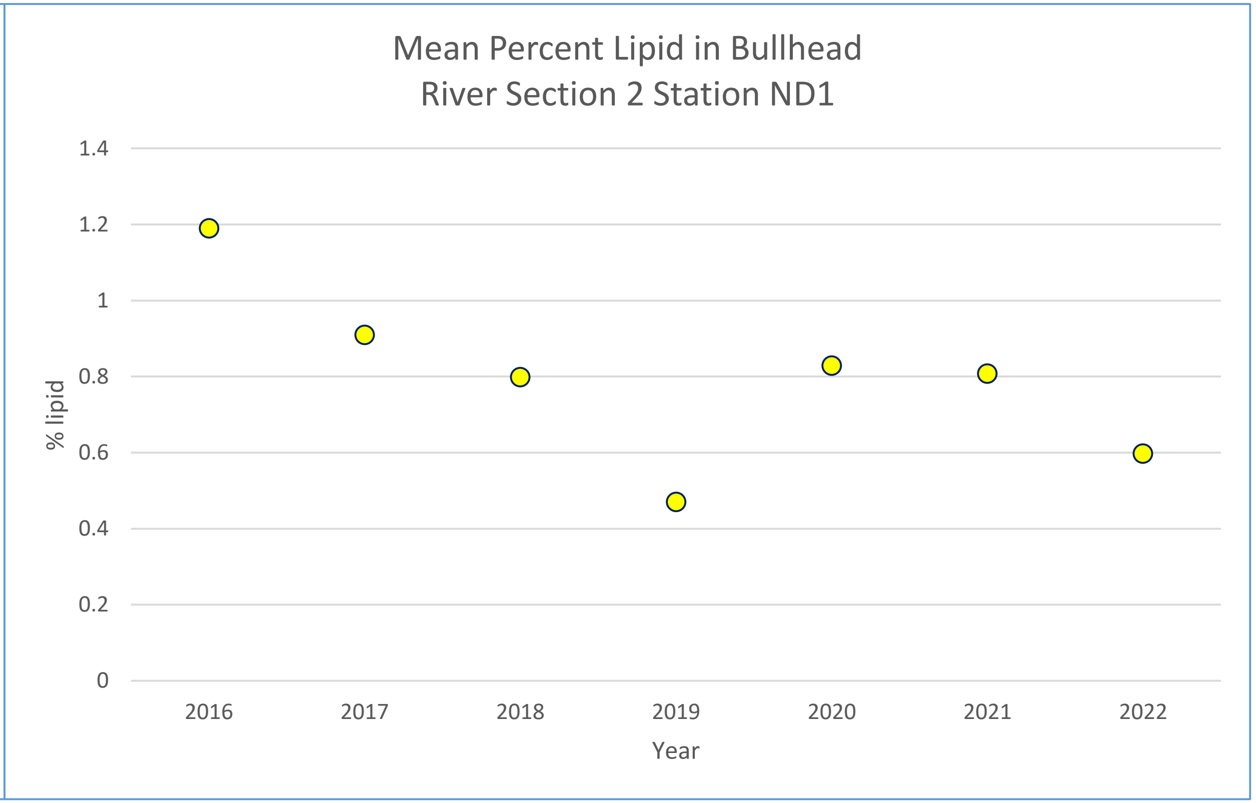


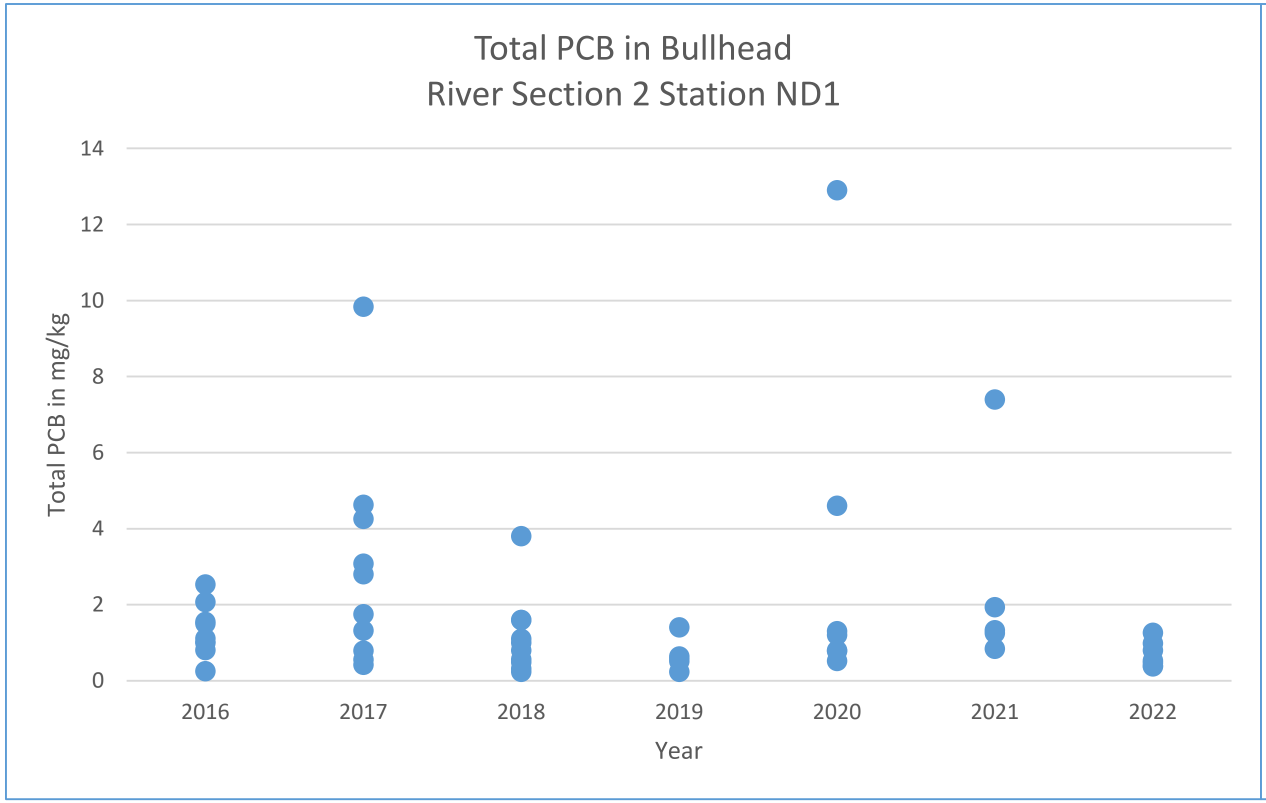


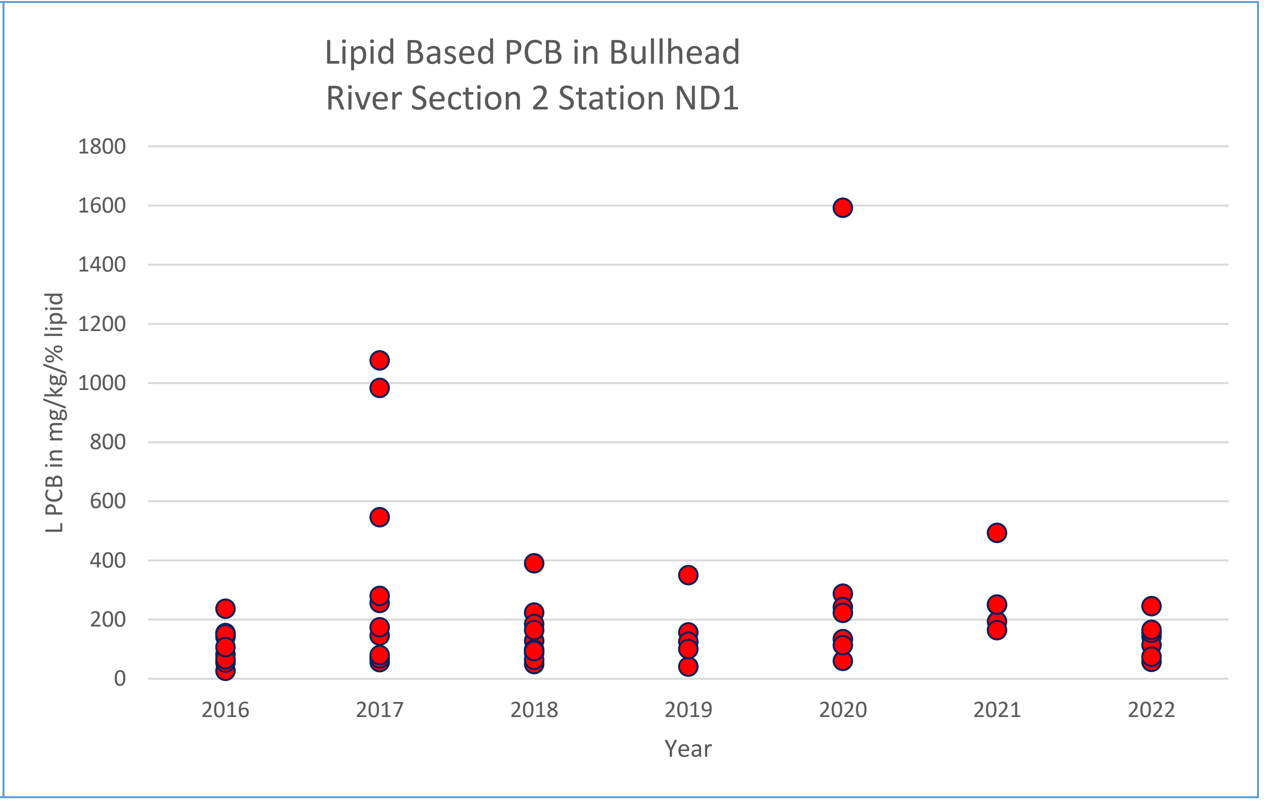
ND1 Bullhead Percent Lipid



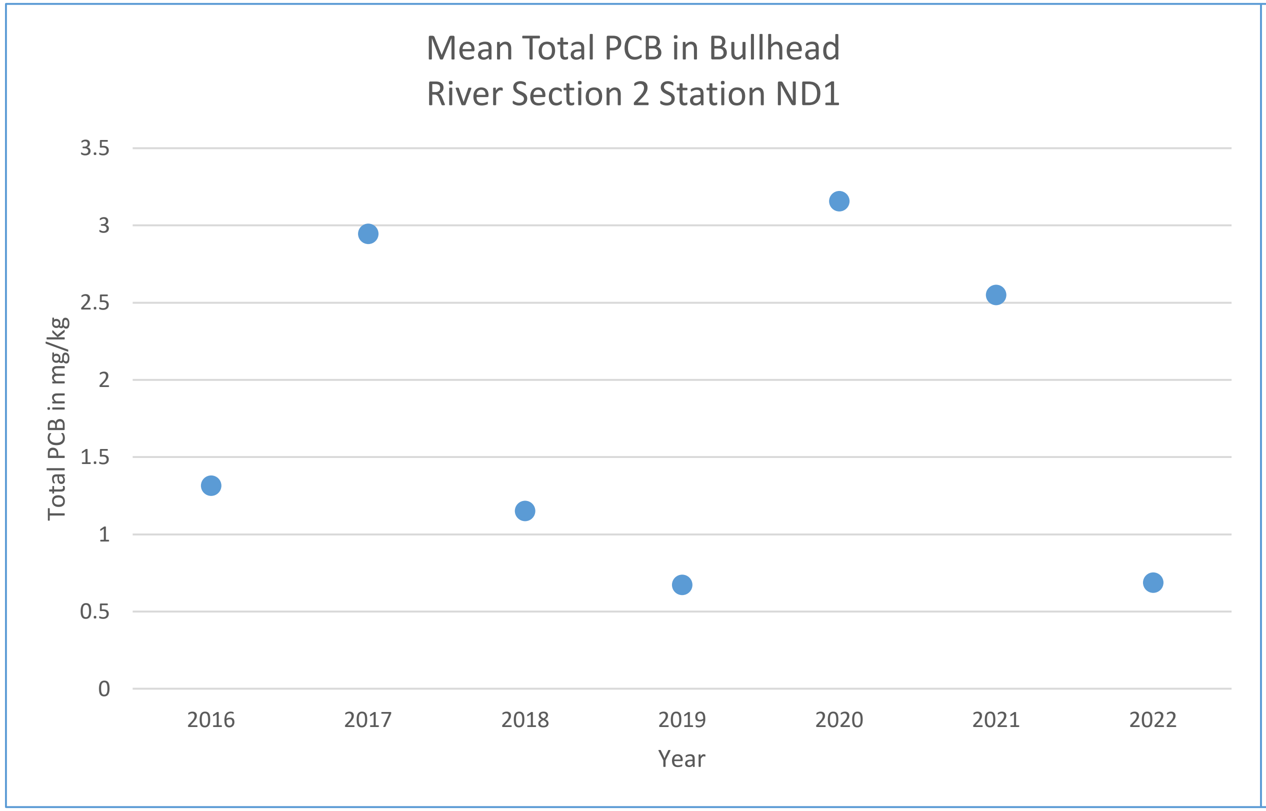


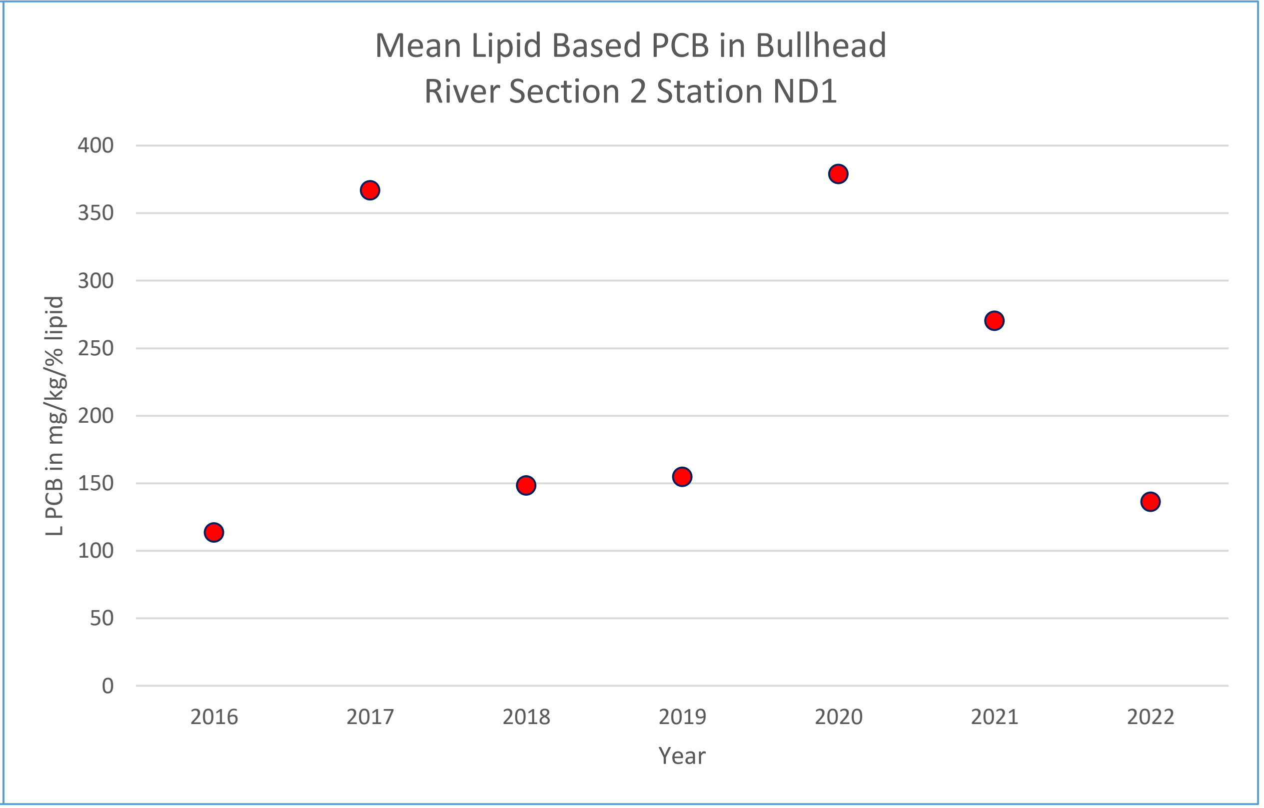
ND1 Bullhead Total PCB and Lipid Based PCB





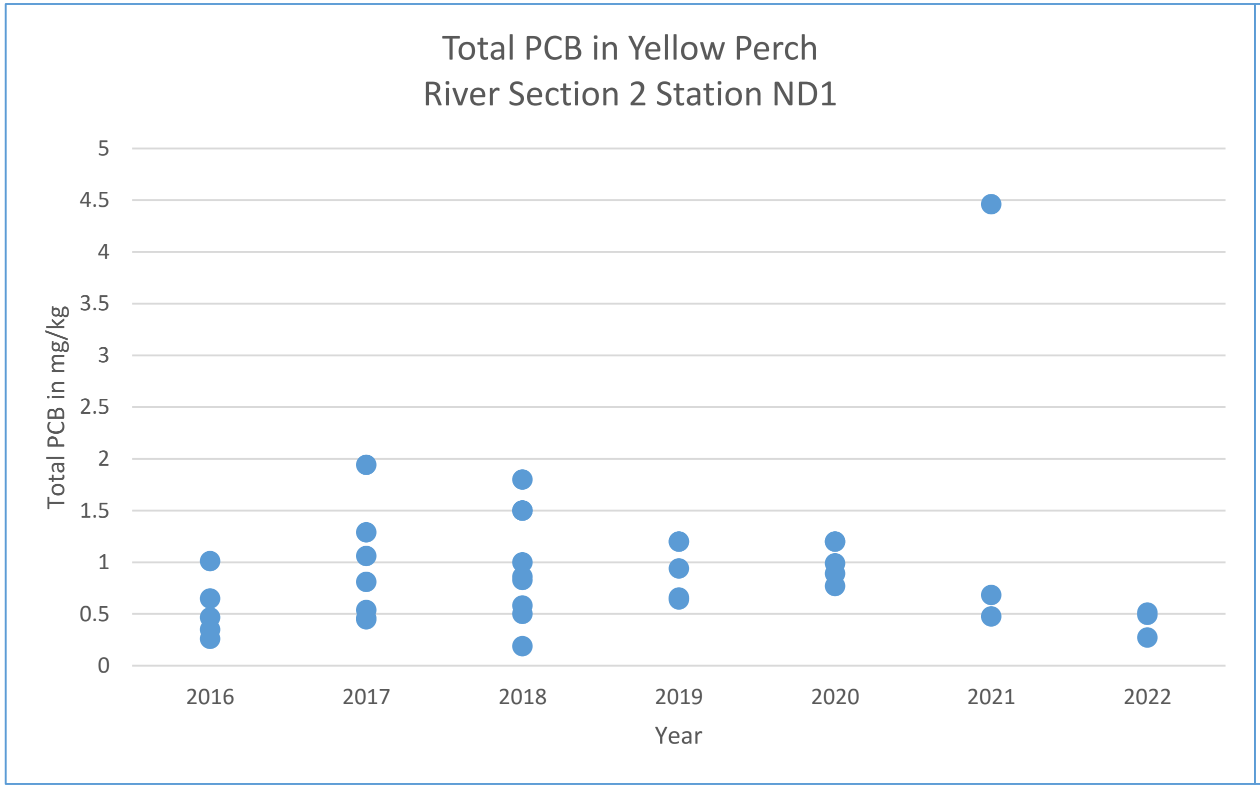
ND1 Bullhead Mean Total PCB and Mean Lipid Based PCB

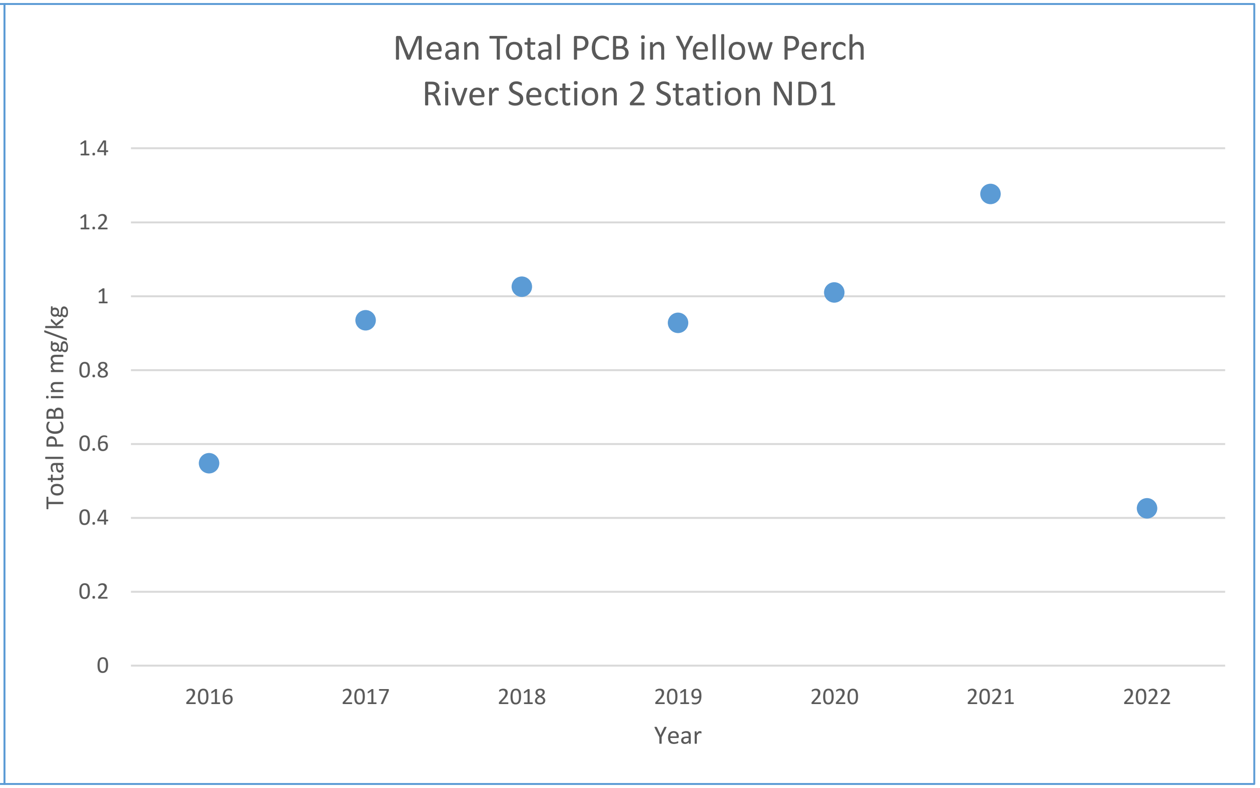




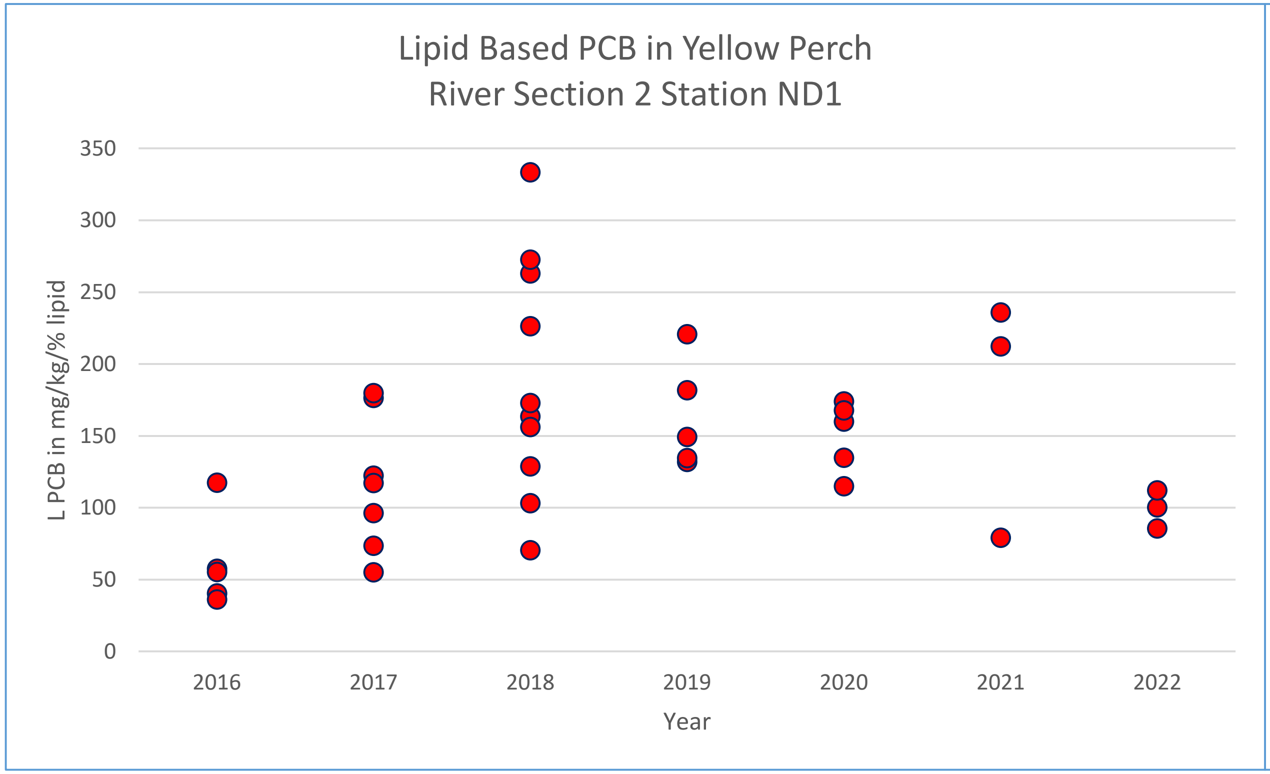
ND1 Yellow Perch Data

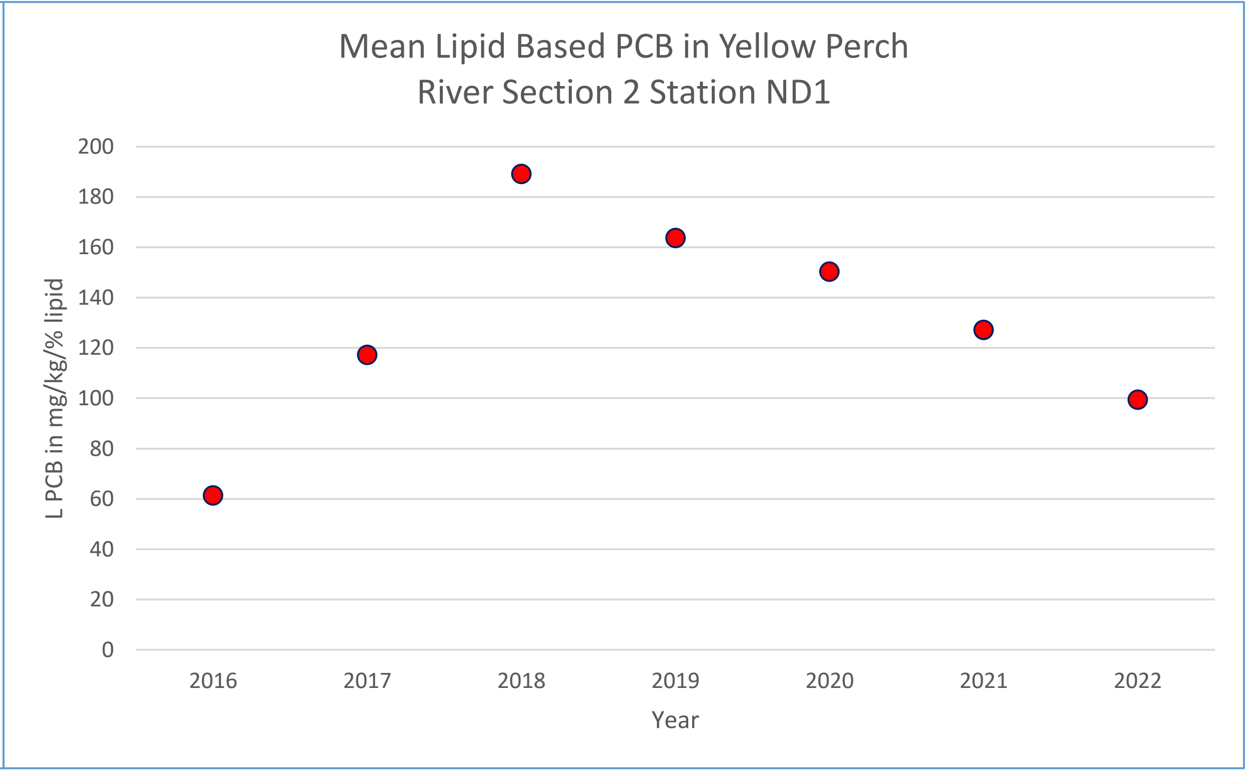
ND1 Yellow Perch Total PCB



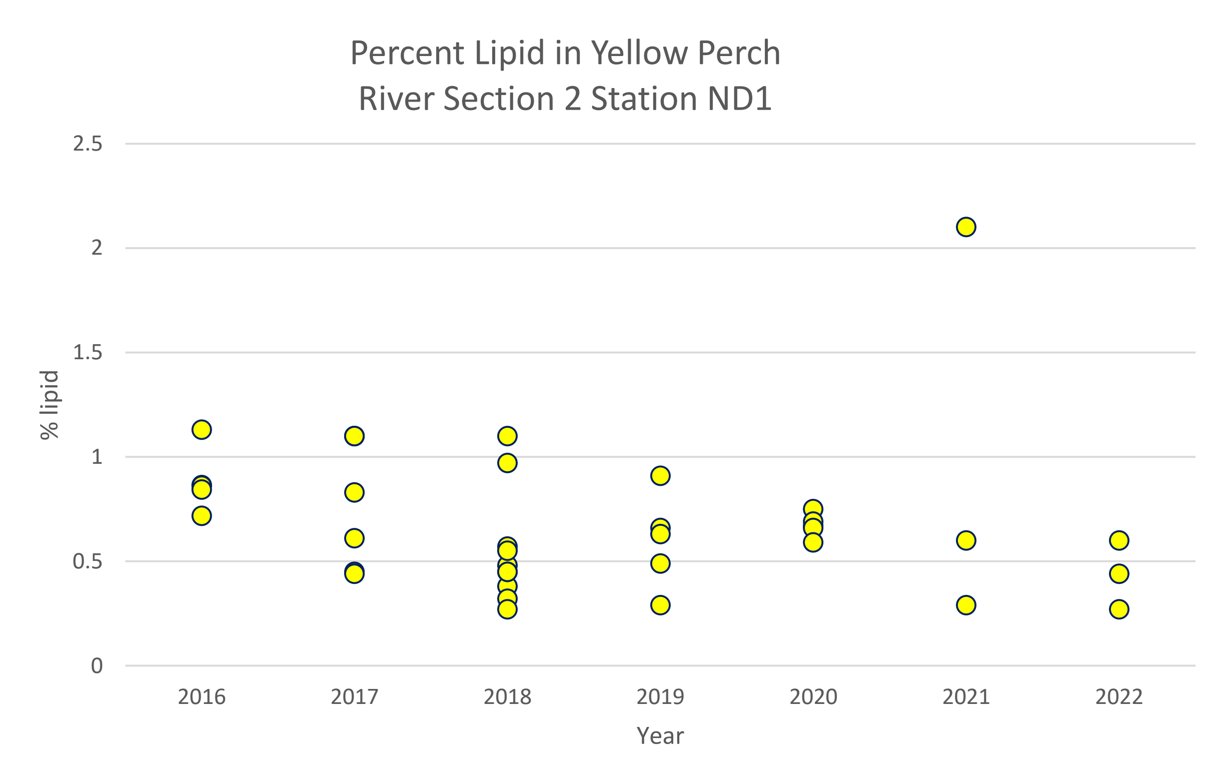


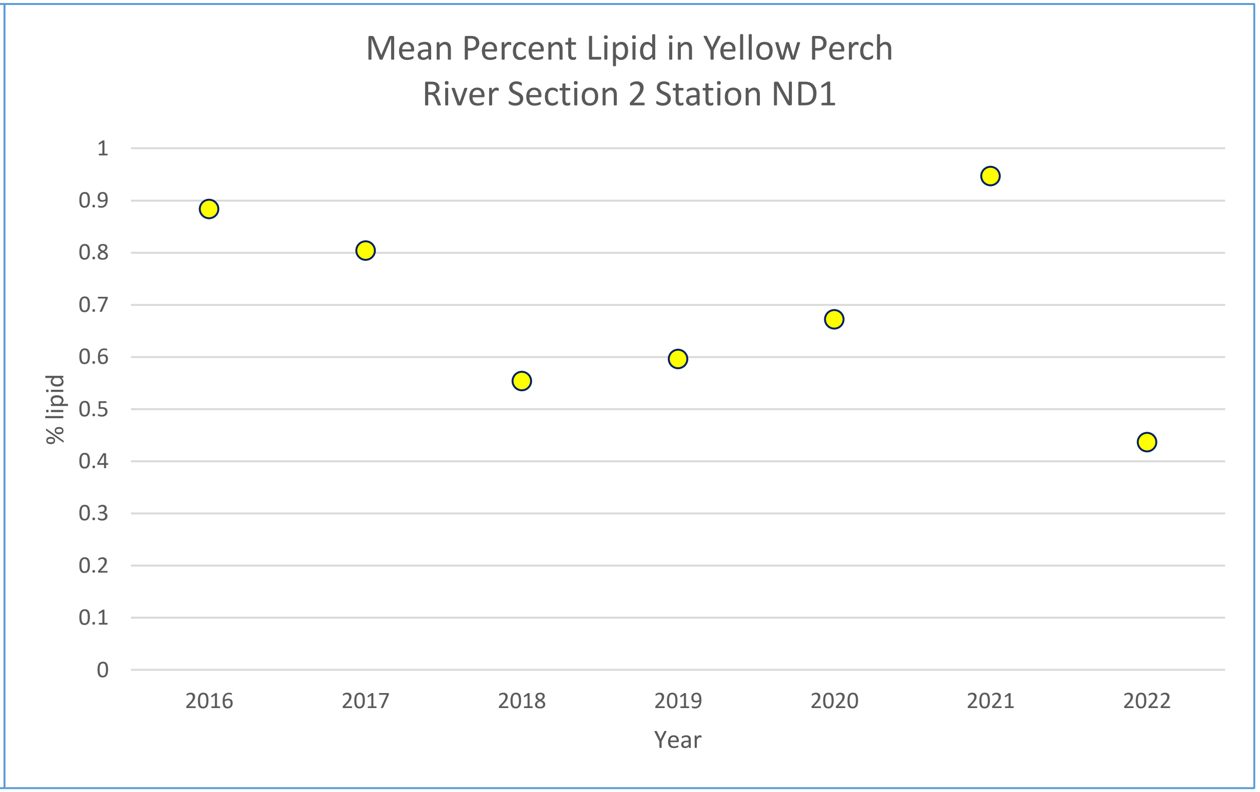
ND1 Yellow Perch Lipid Based PCB



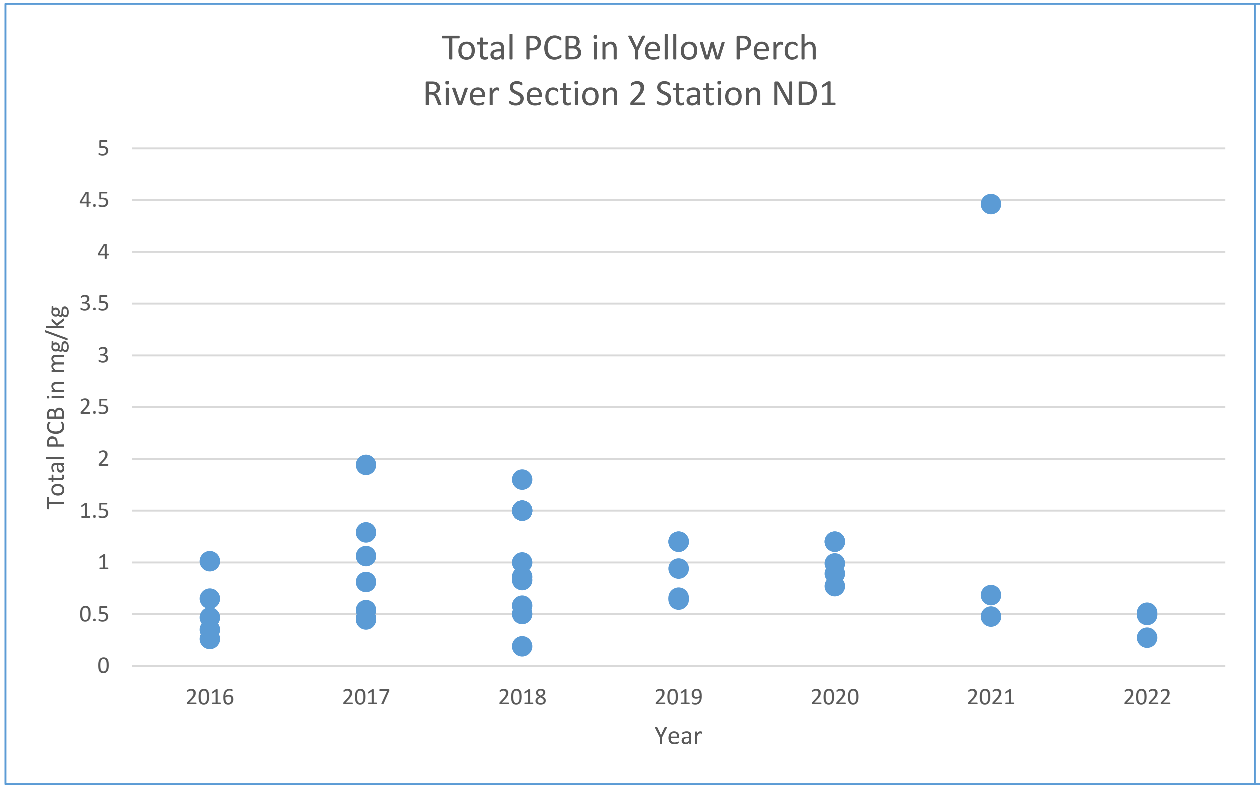


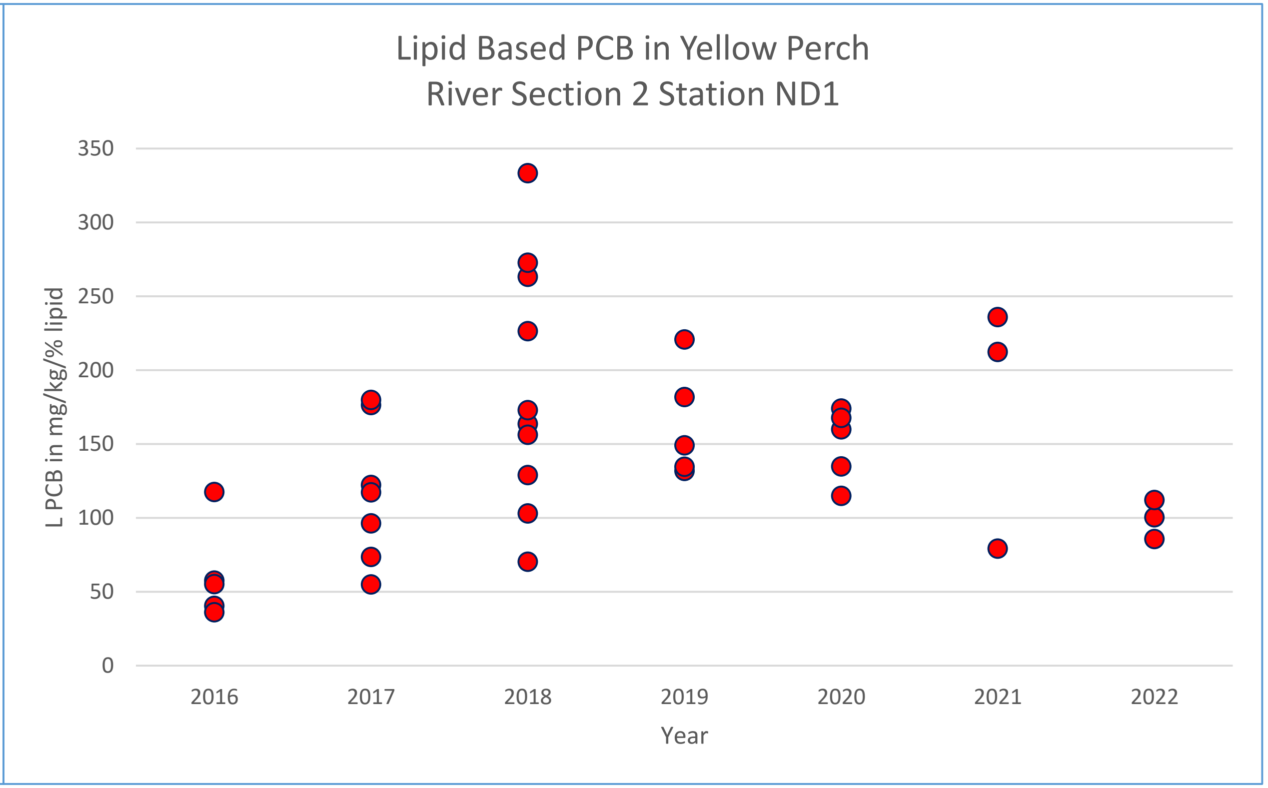
ND1 Yellow Perch Percent Lipid



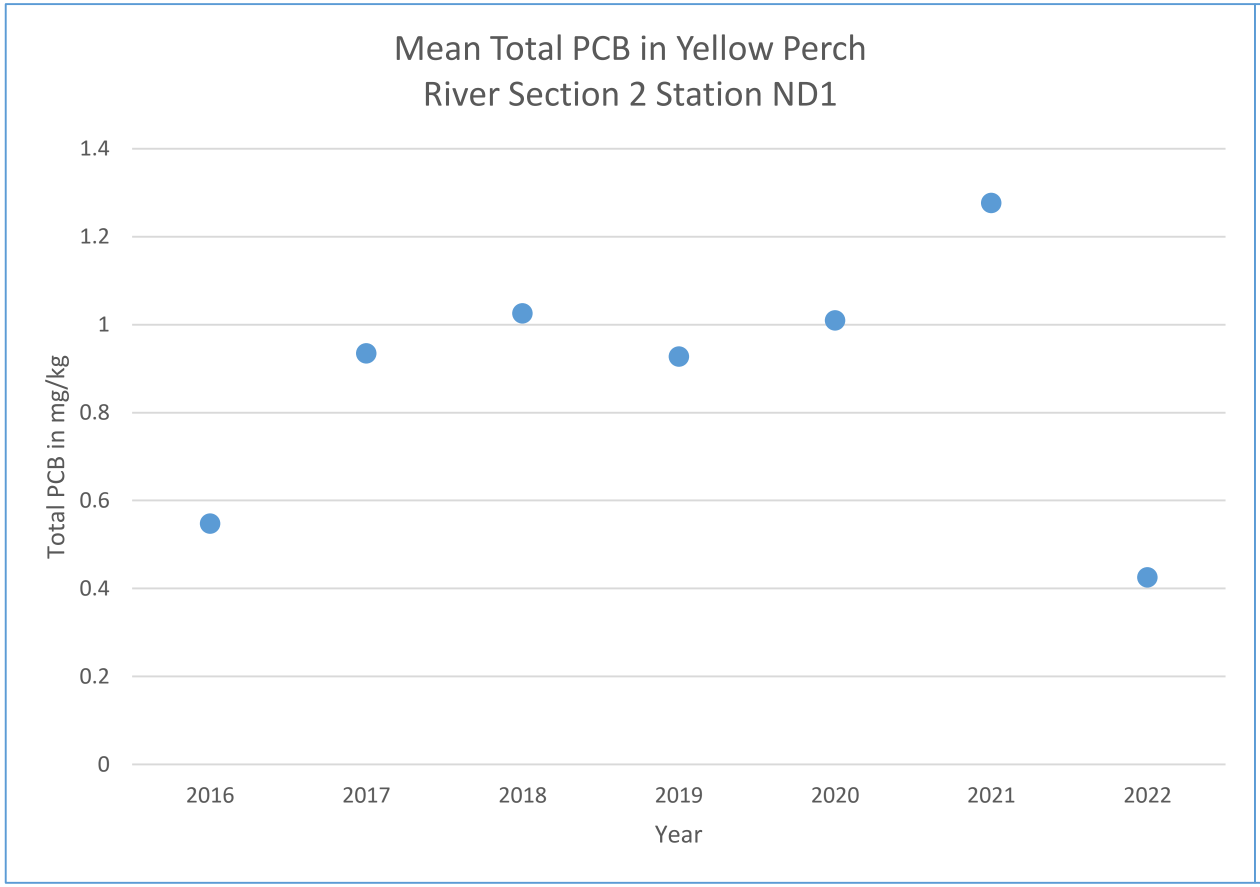


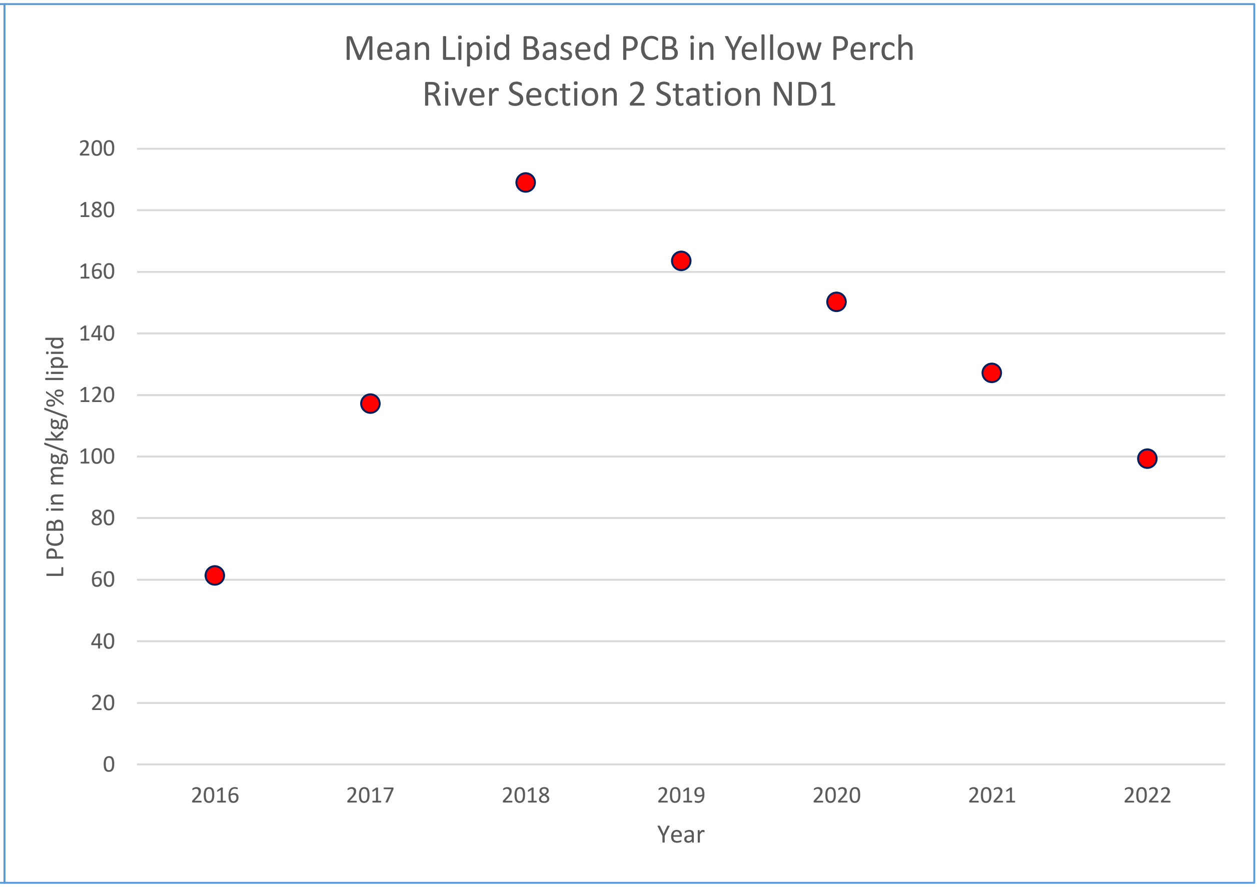
ND1 Yellow Perch Total PCB and Lipid Based PCB





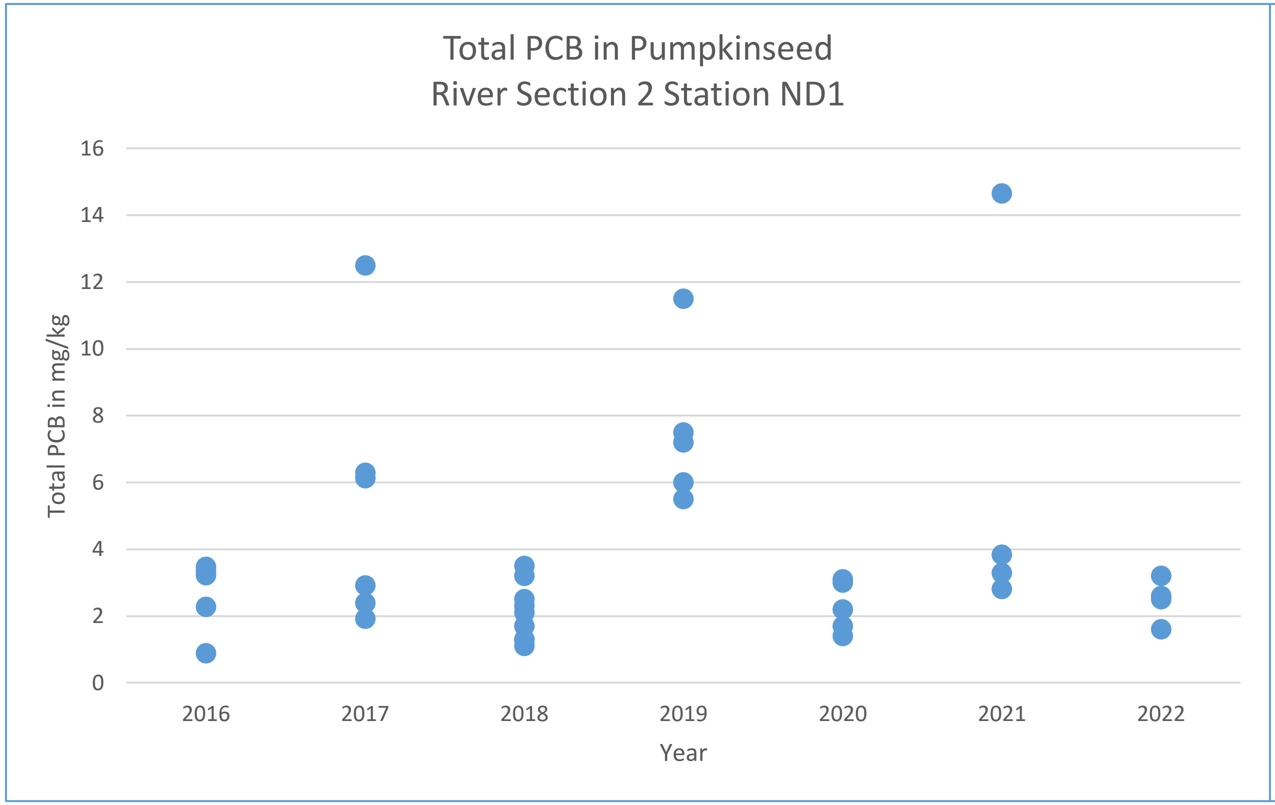
ND1 Yellow Perch Mean Total PCB and Mean Lipid Based PCB

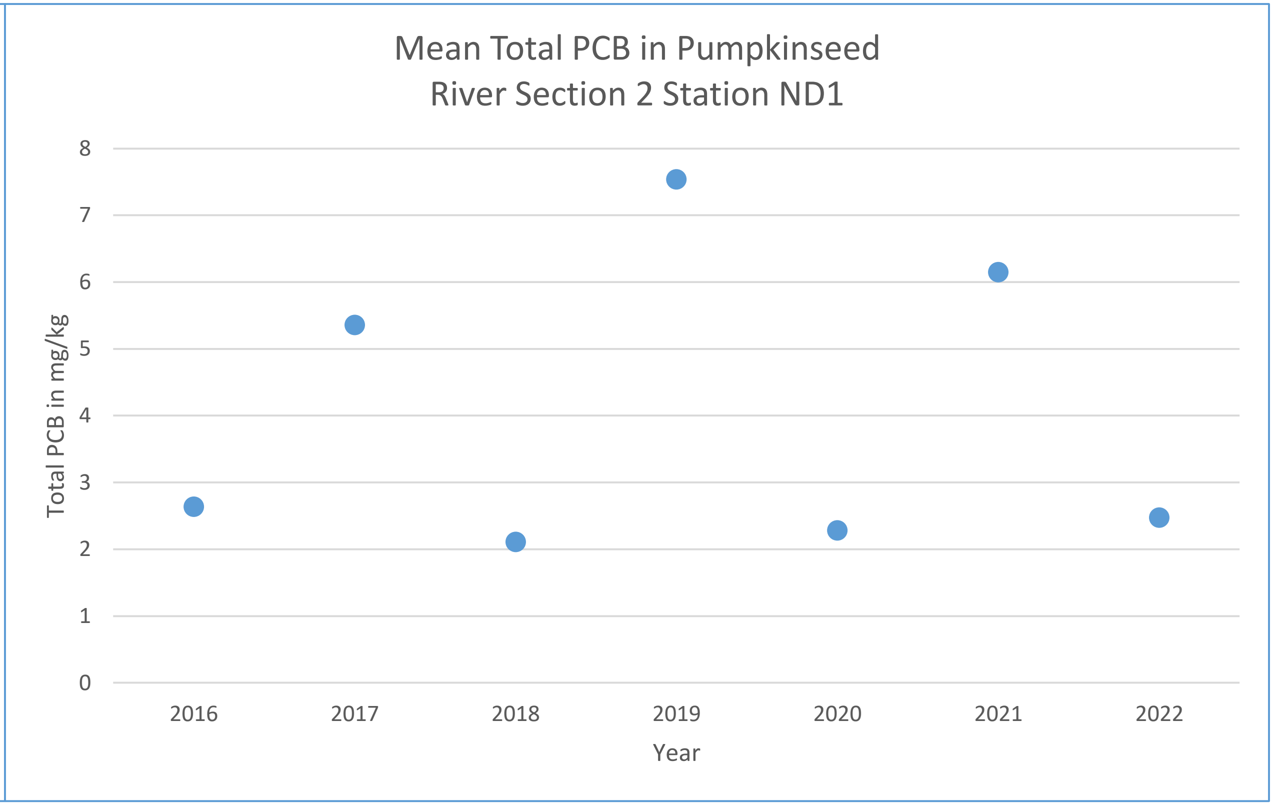




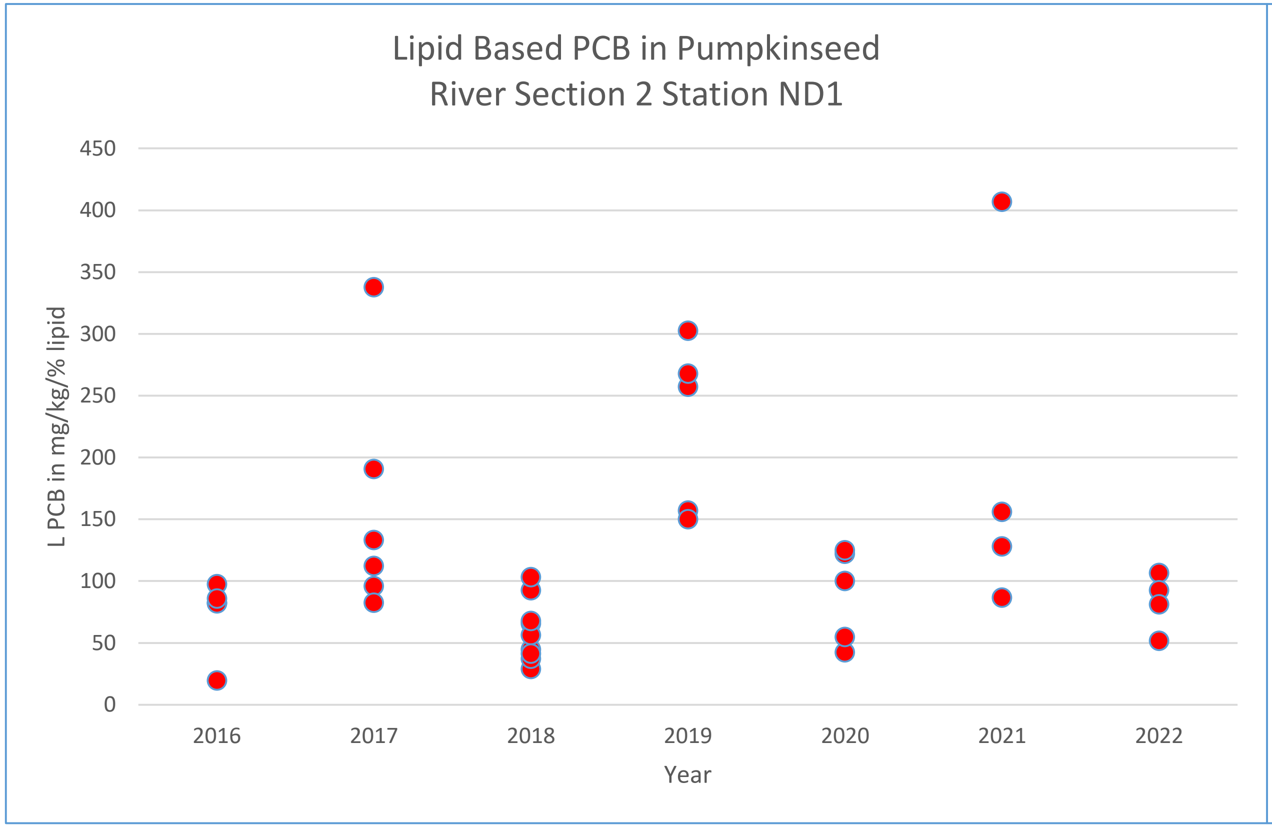
ND1 Pumpkinseed Data

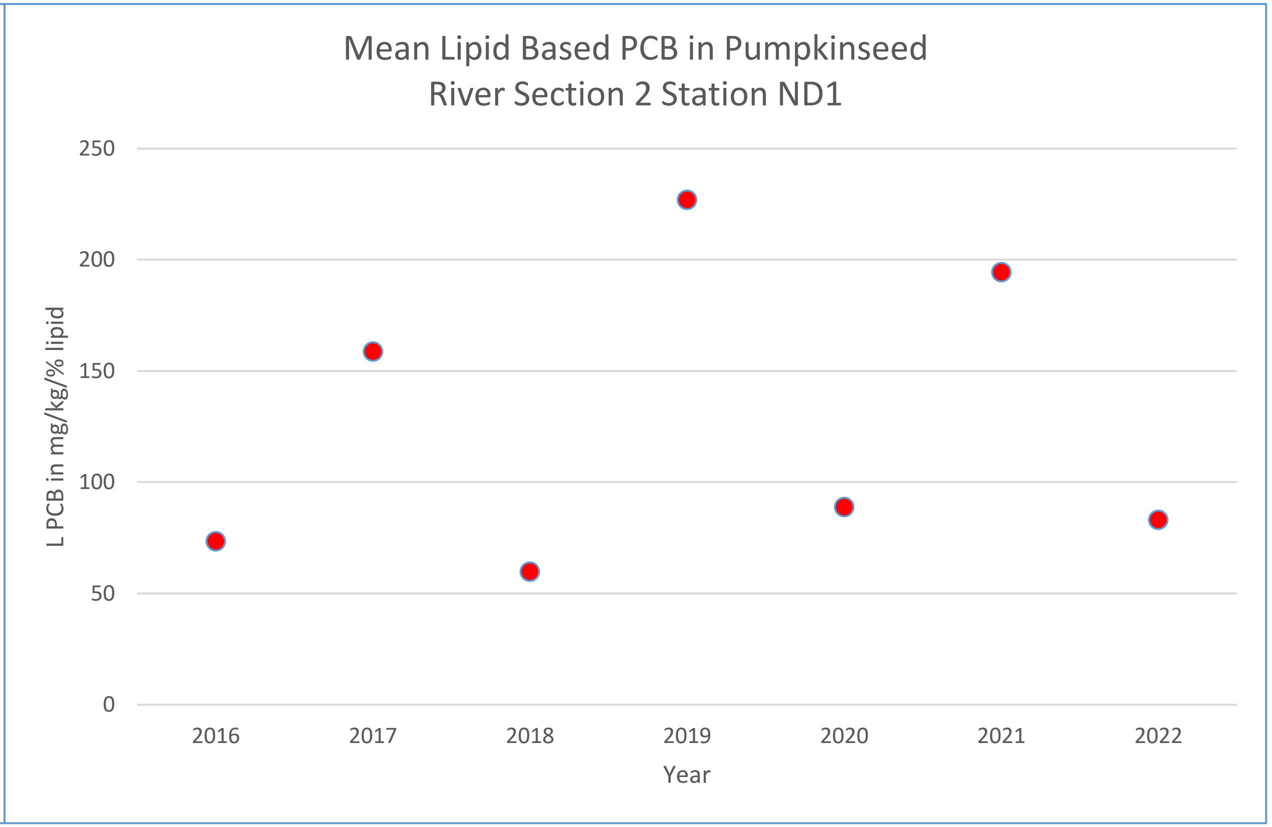
ND1 Pumpkinseed Total PCB



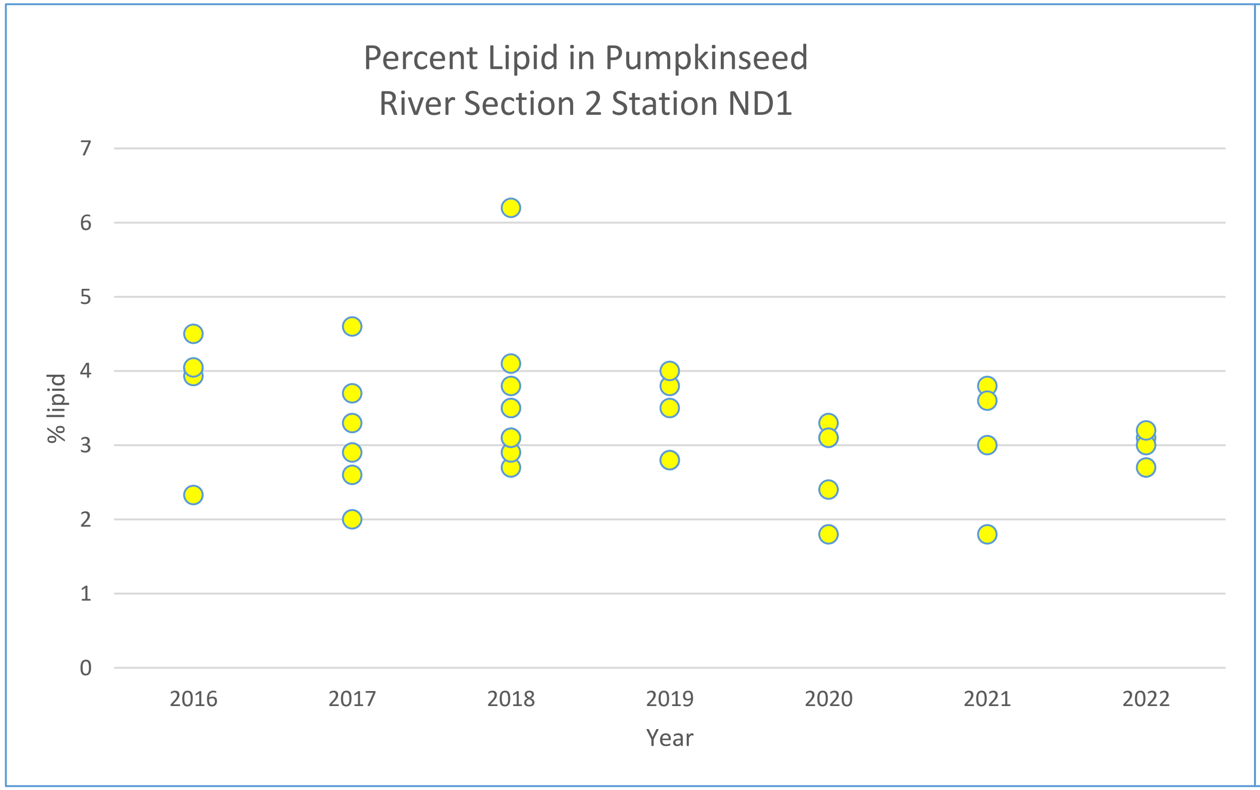


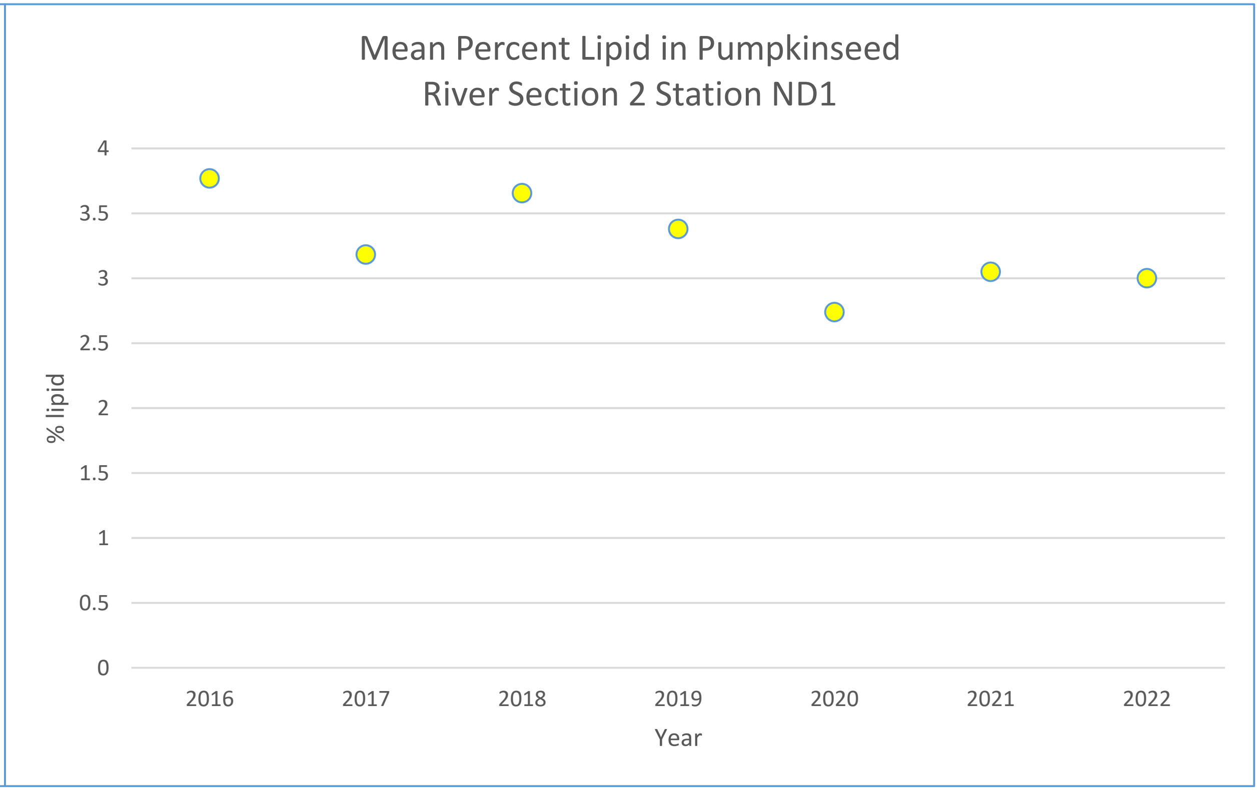
ND1 Pumpkinseed Lipid Based PCB



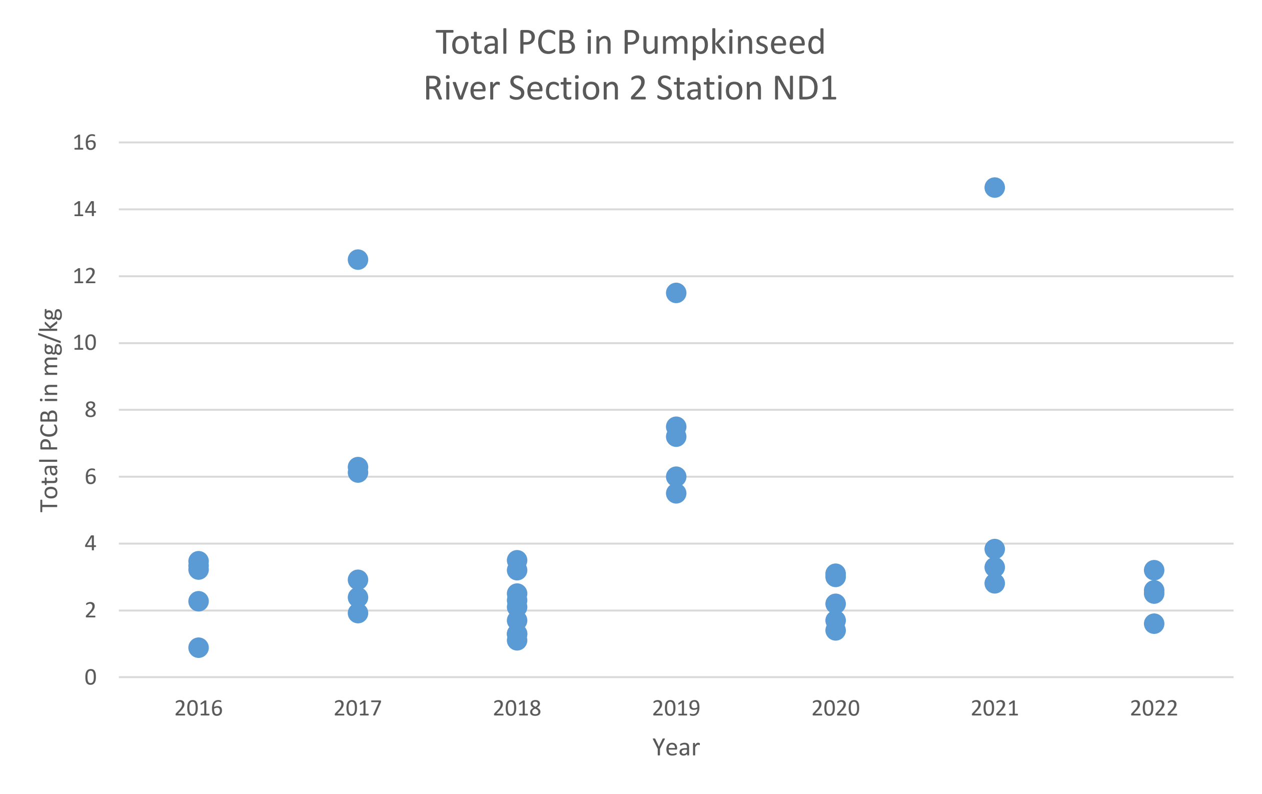


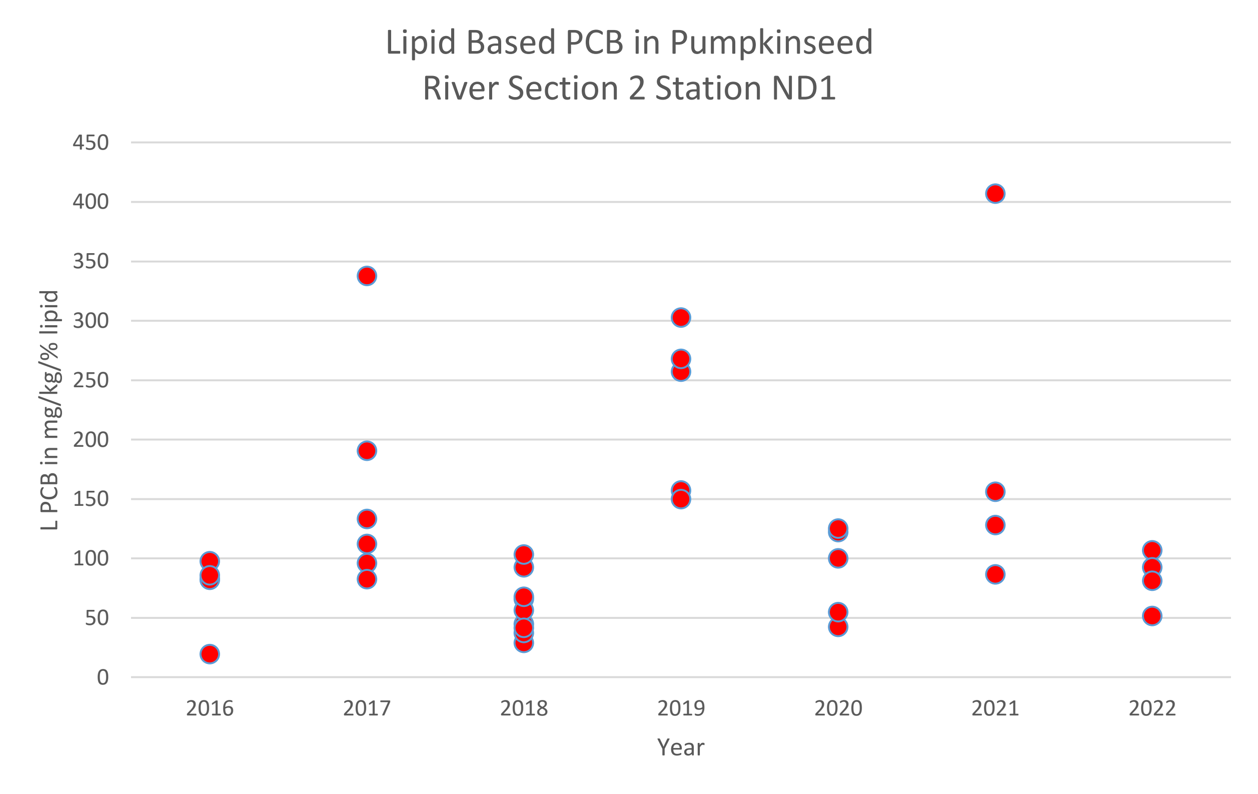
ND1 Pumpkinseed Percent Lipid



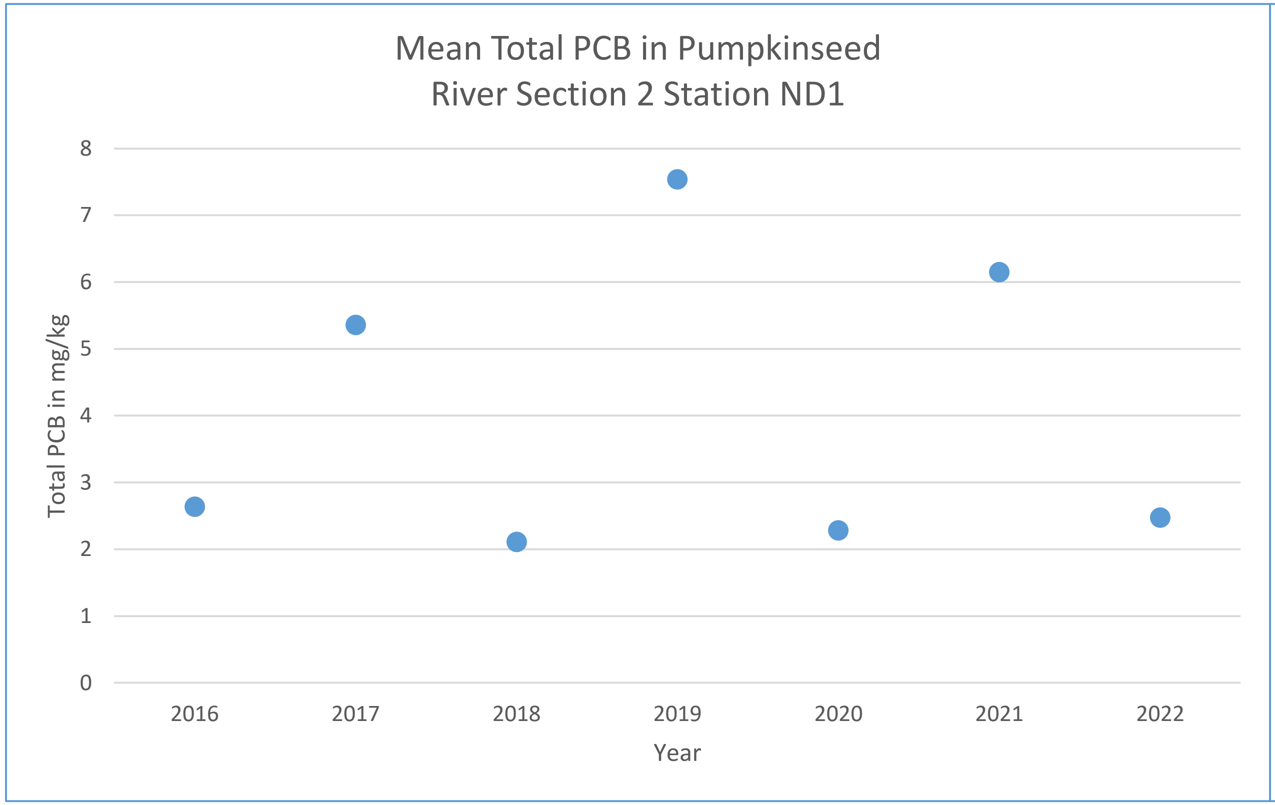


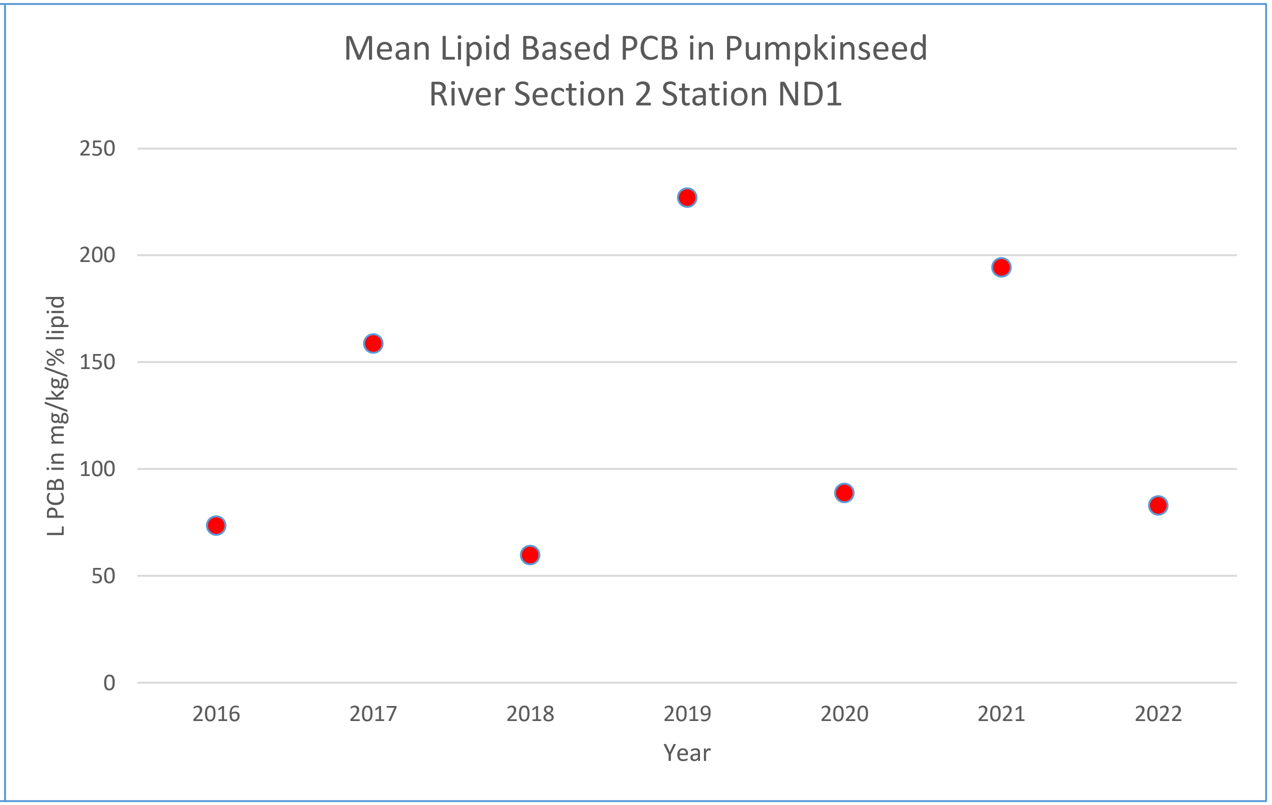
ND1 Pumpkinseed Total PCB and Lipid Based PCB





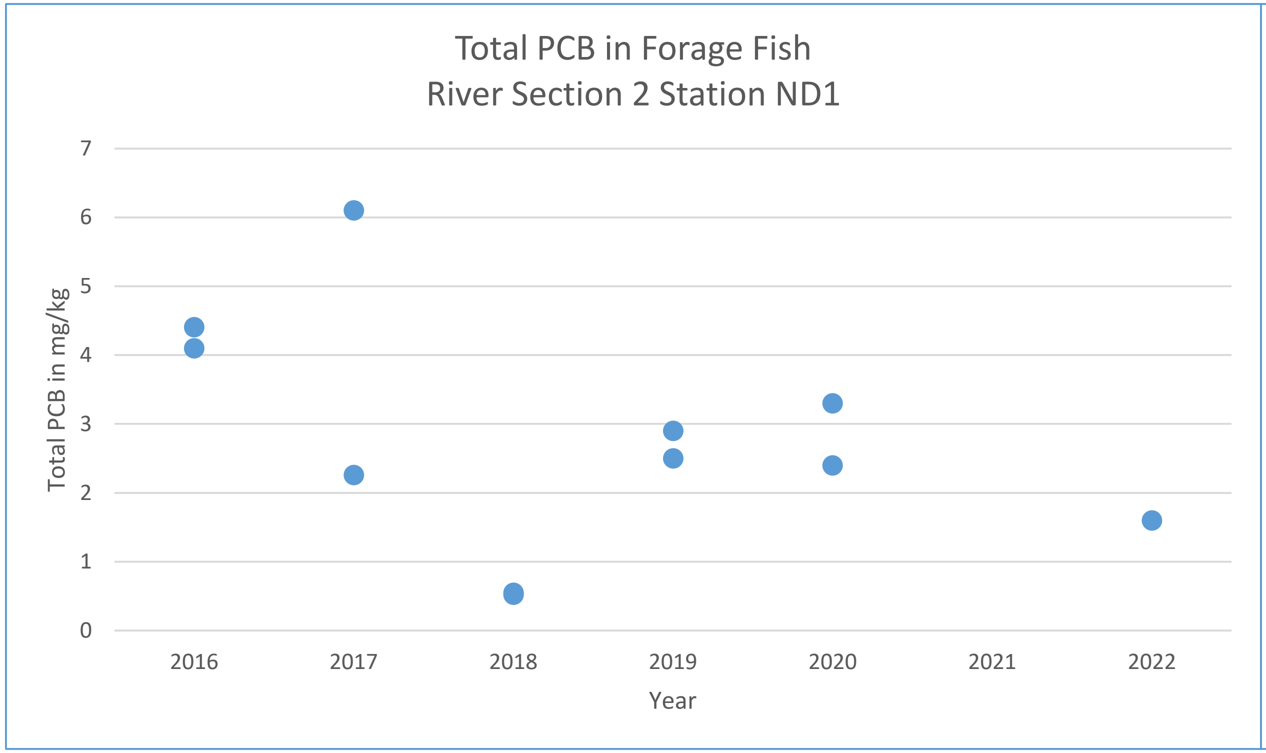
ND1 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

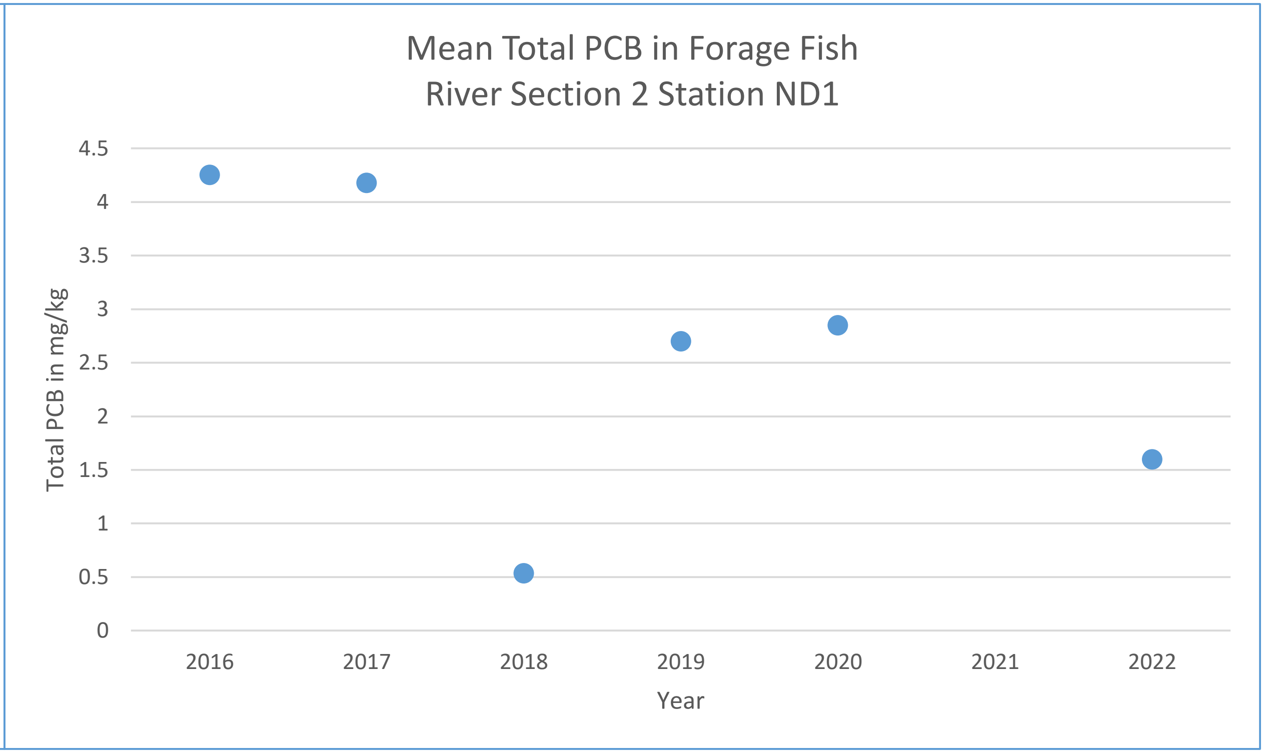




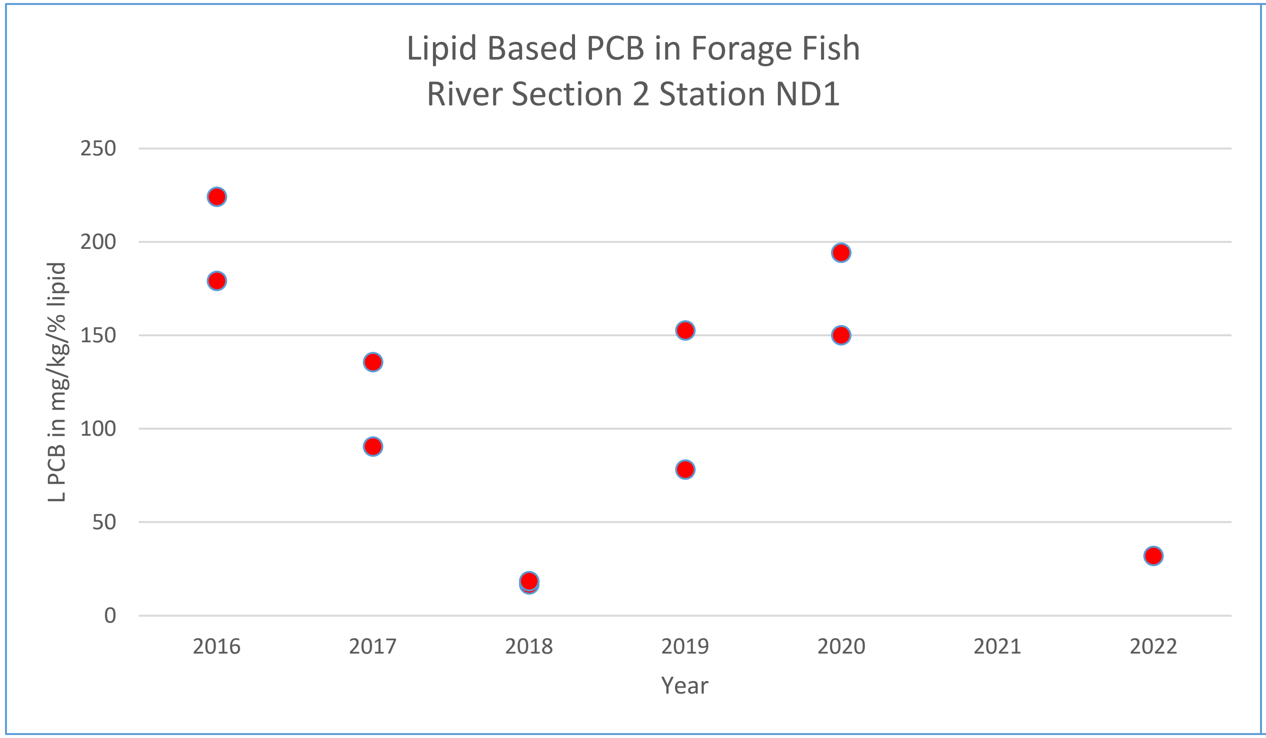
ND1 Forage Fish Data

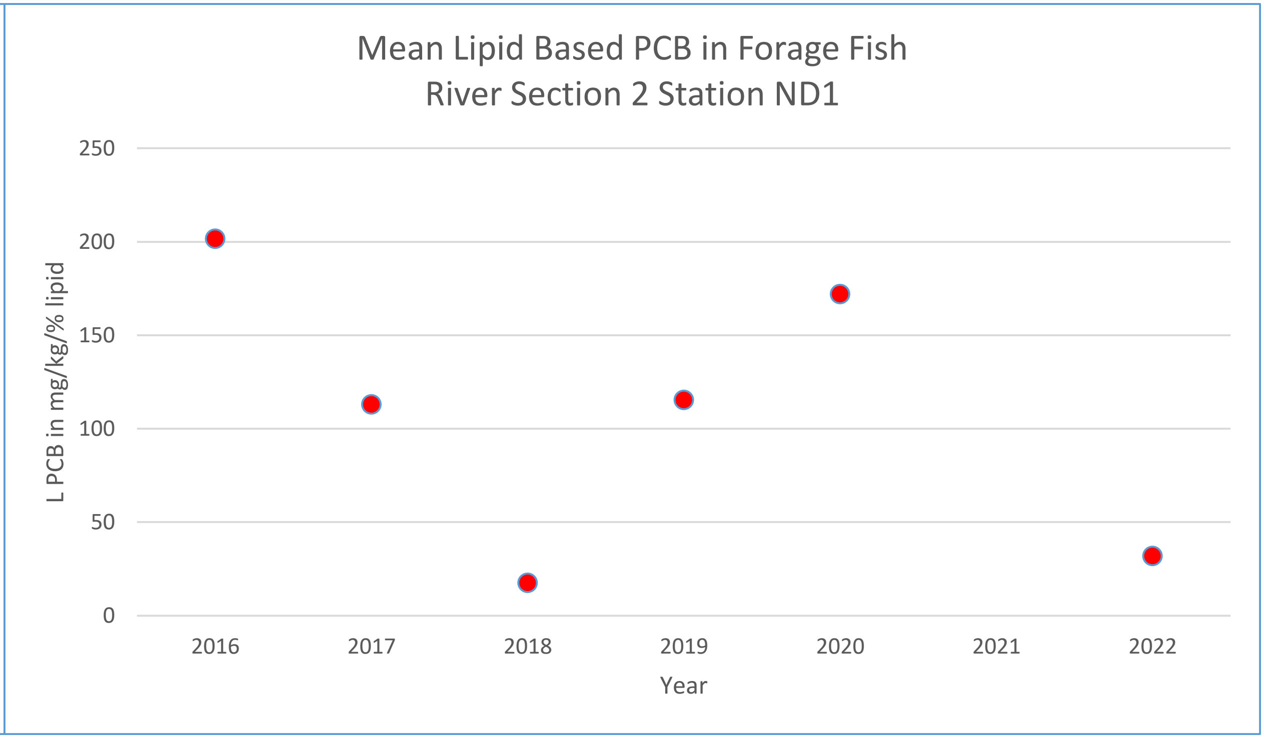
ND1 Forage Fish Total PCB



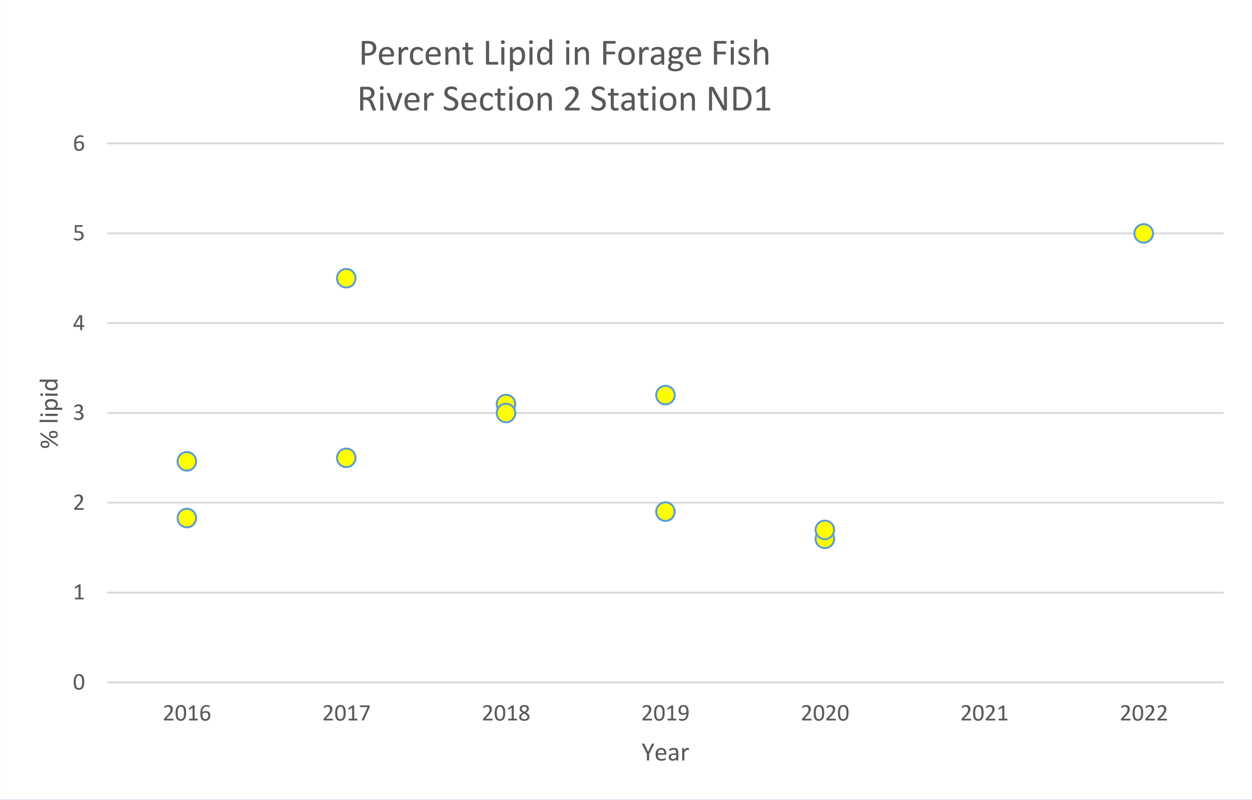


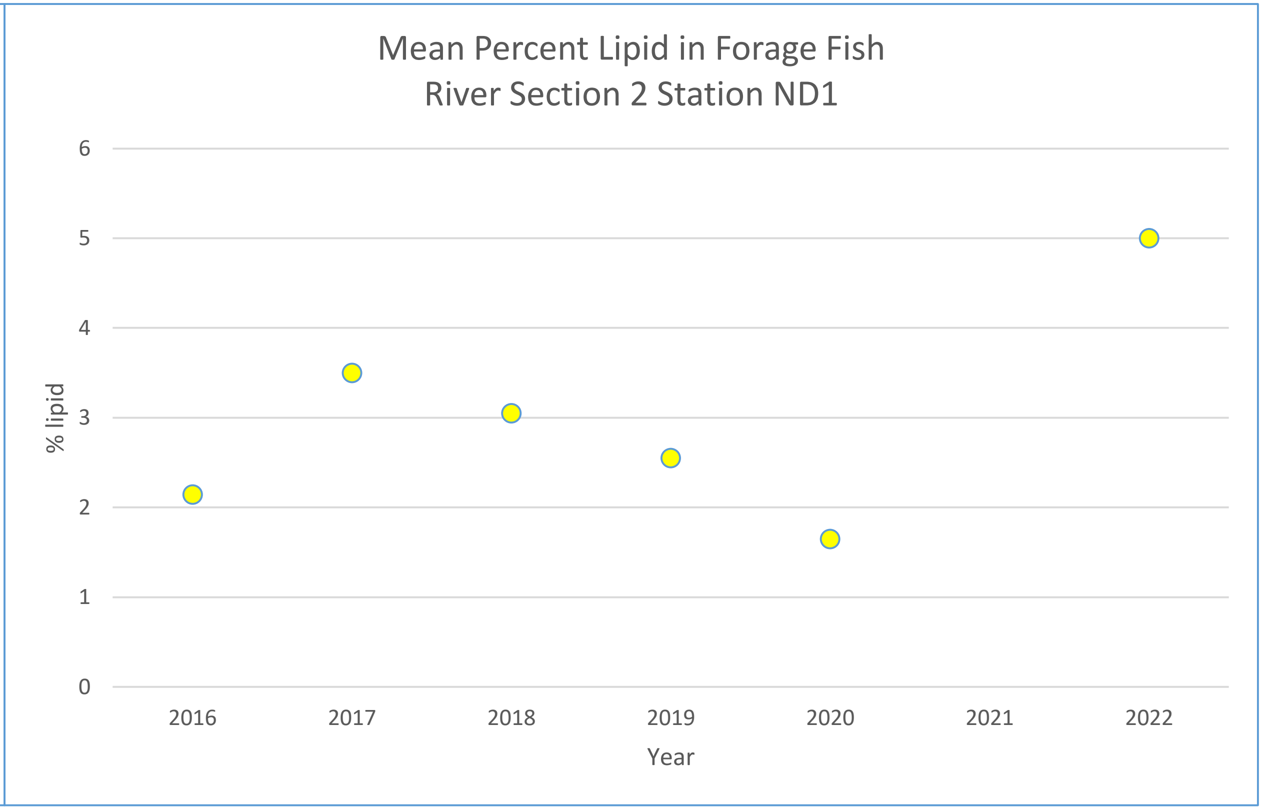
ND1 Forage Fish Lipid Based PCB



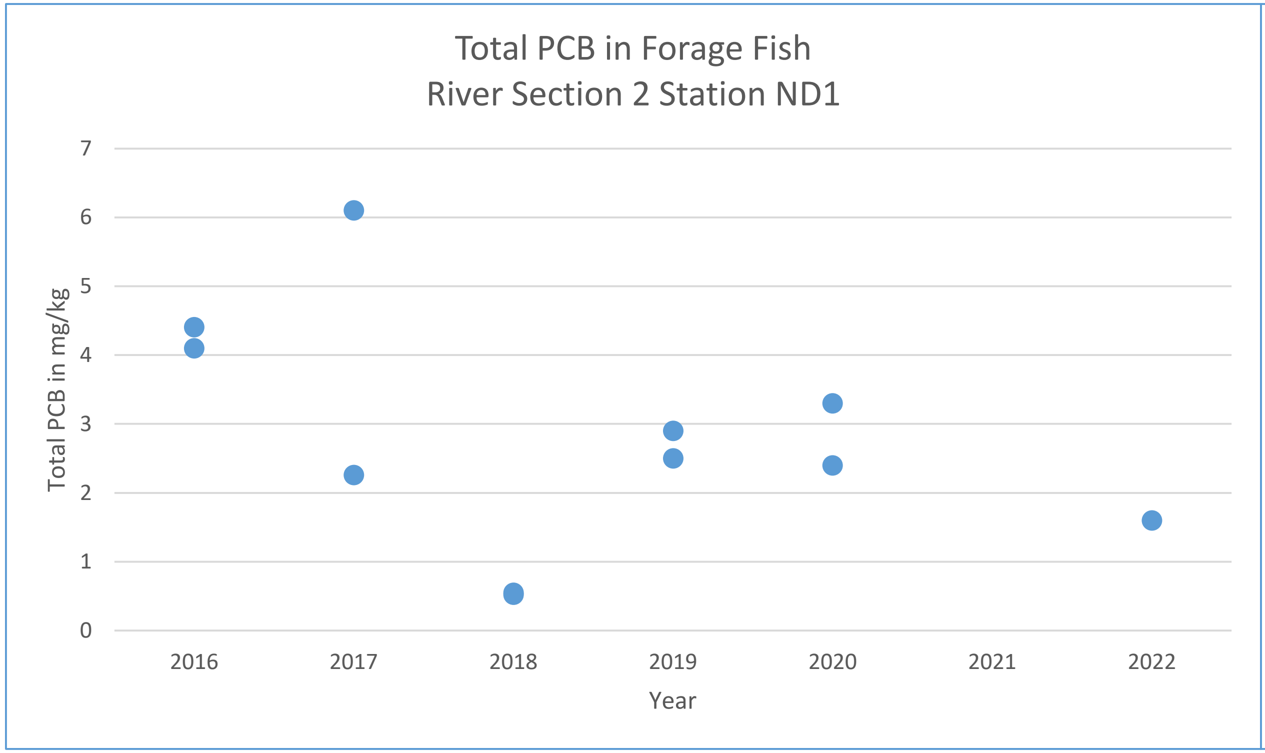


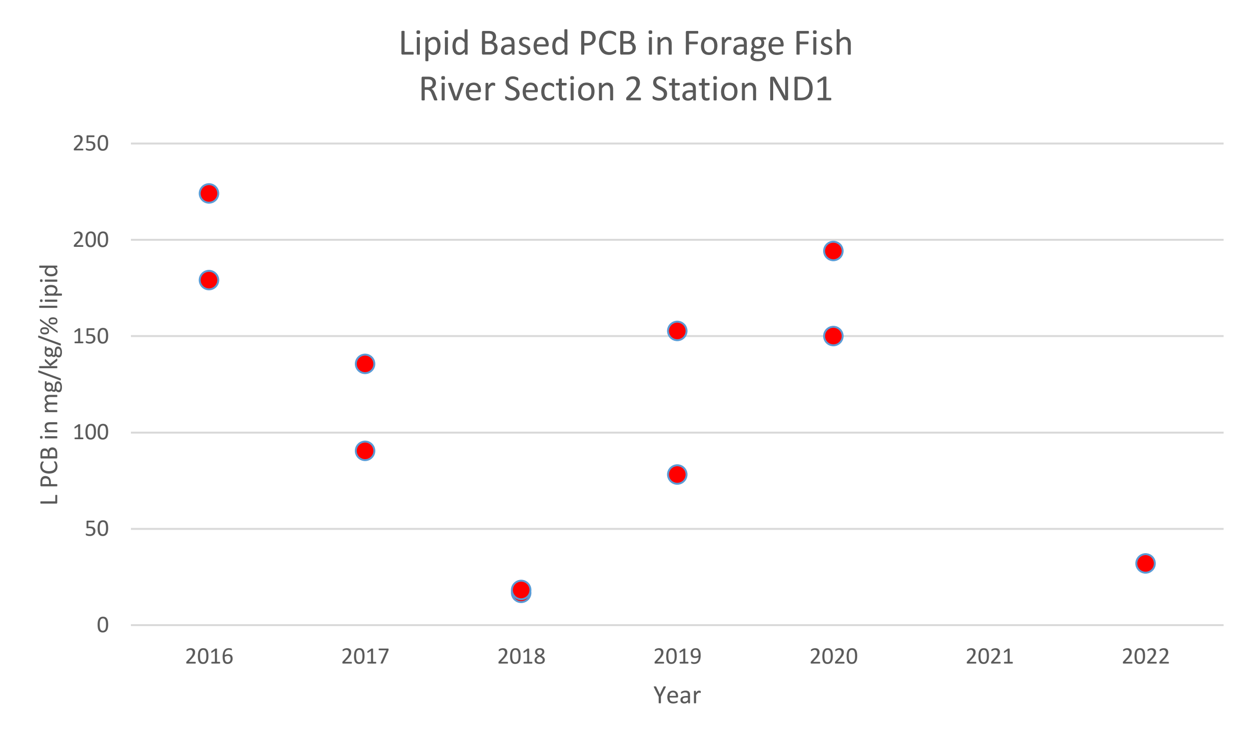
ND1 Forage Fish Percent Lipid



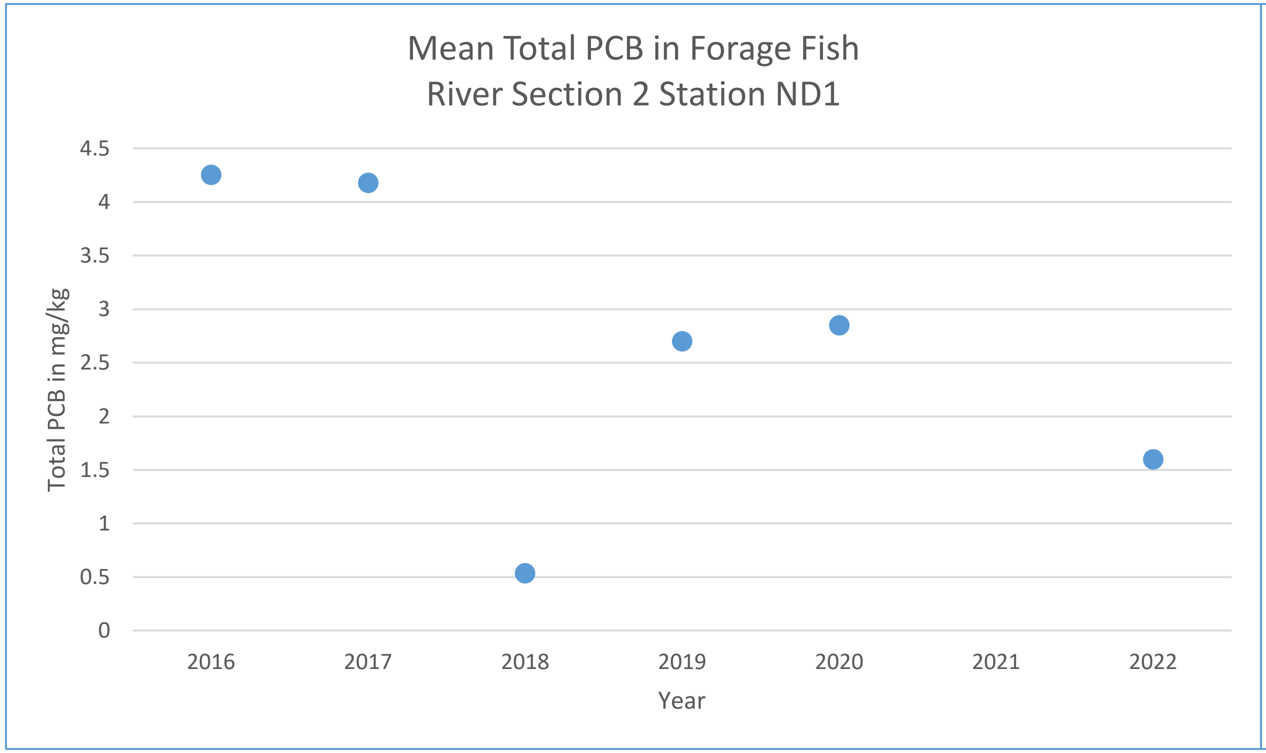


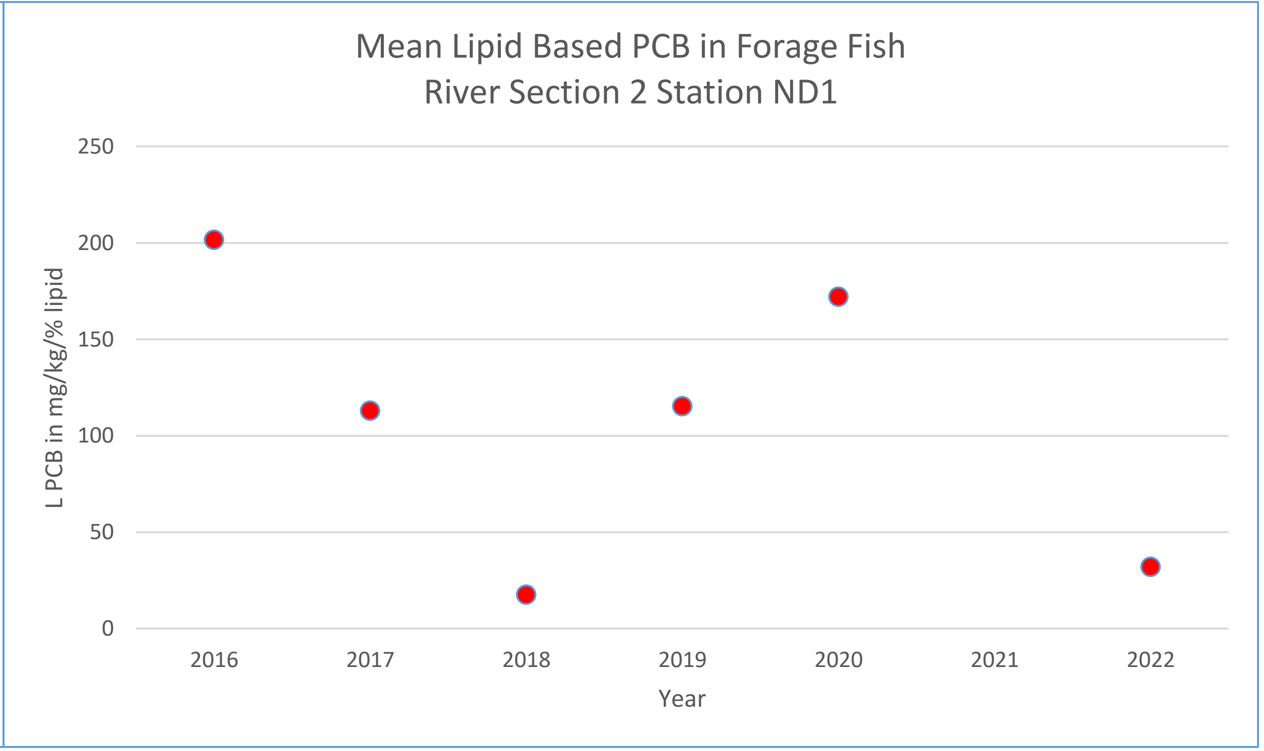
ND1 Forage Fish Total PCB and Lipid Based PCB





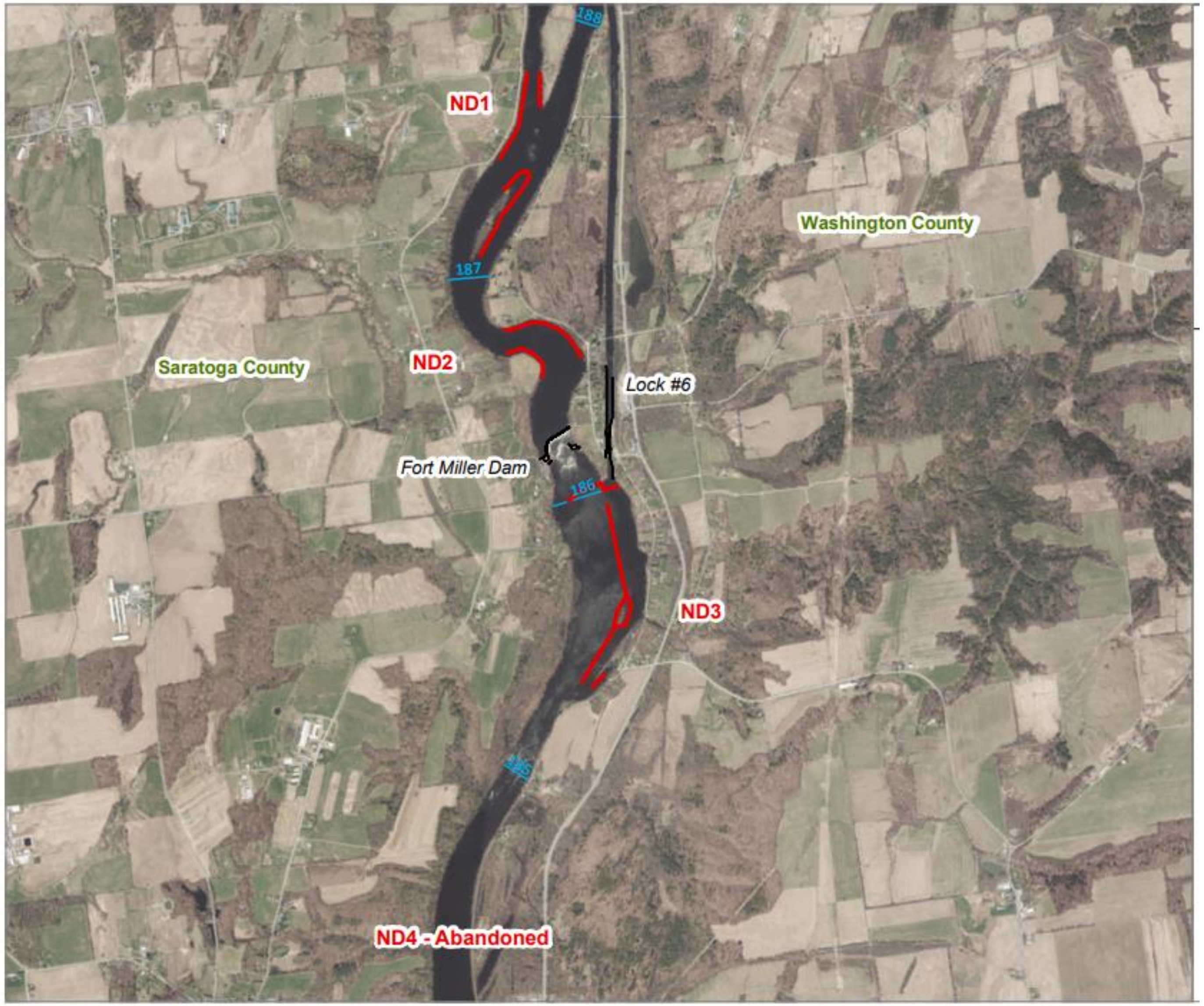
ND1 Forage Fish Mean Total PCB and Mean Lipid Based PCB





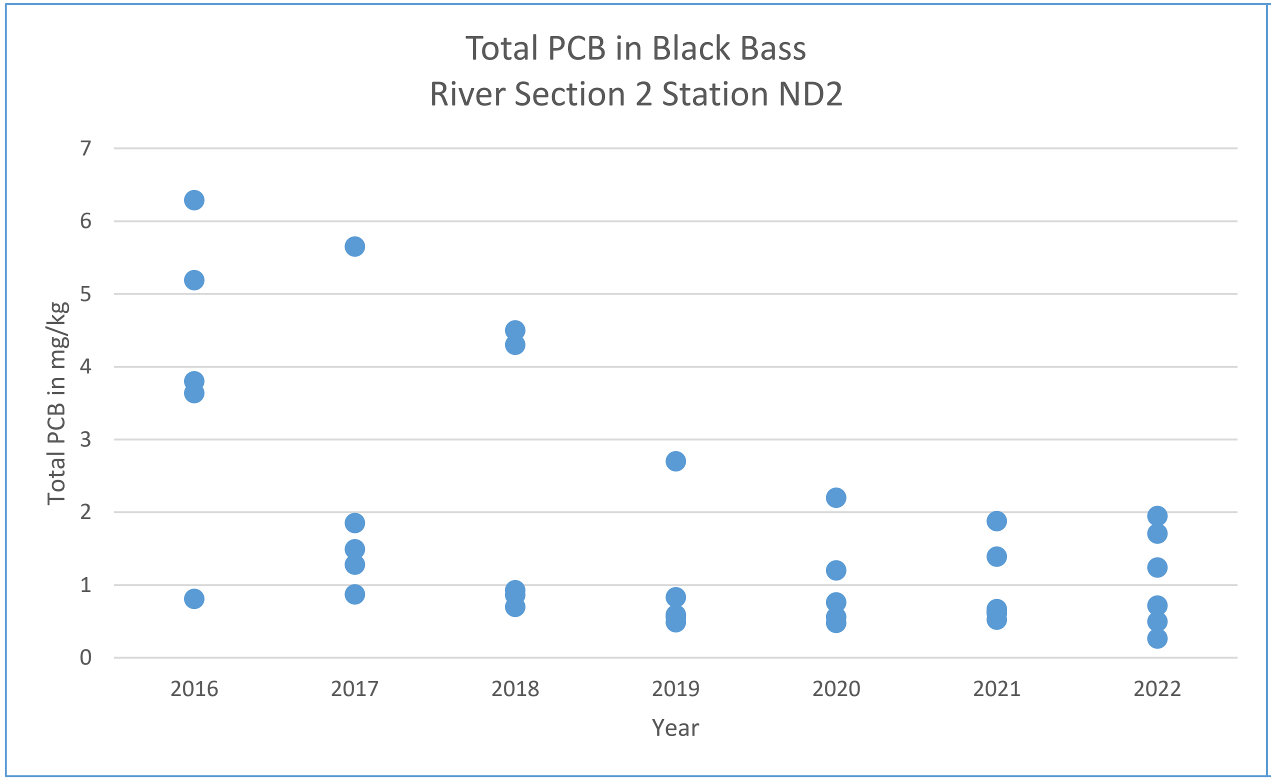
Station ND2

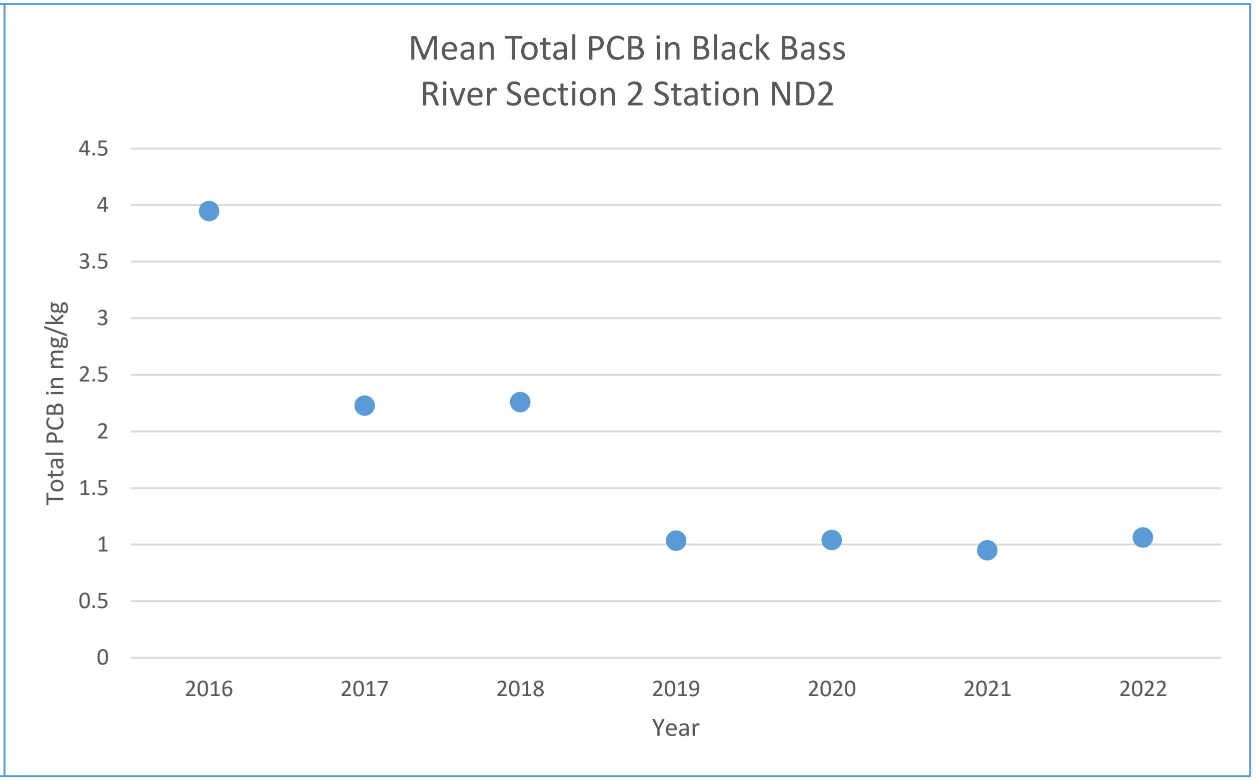
Stations ND1, ND2, and ND3



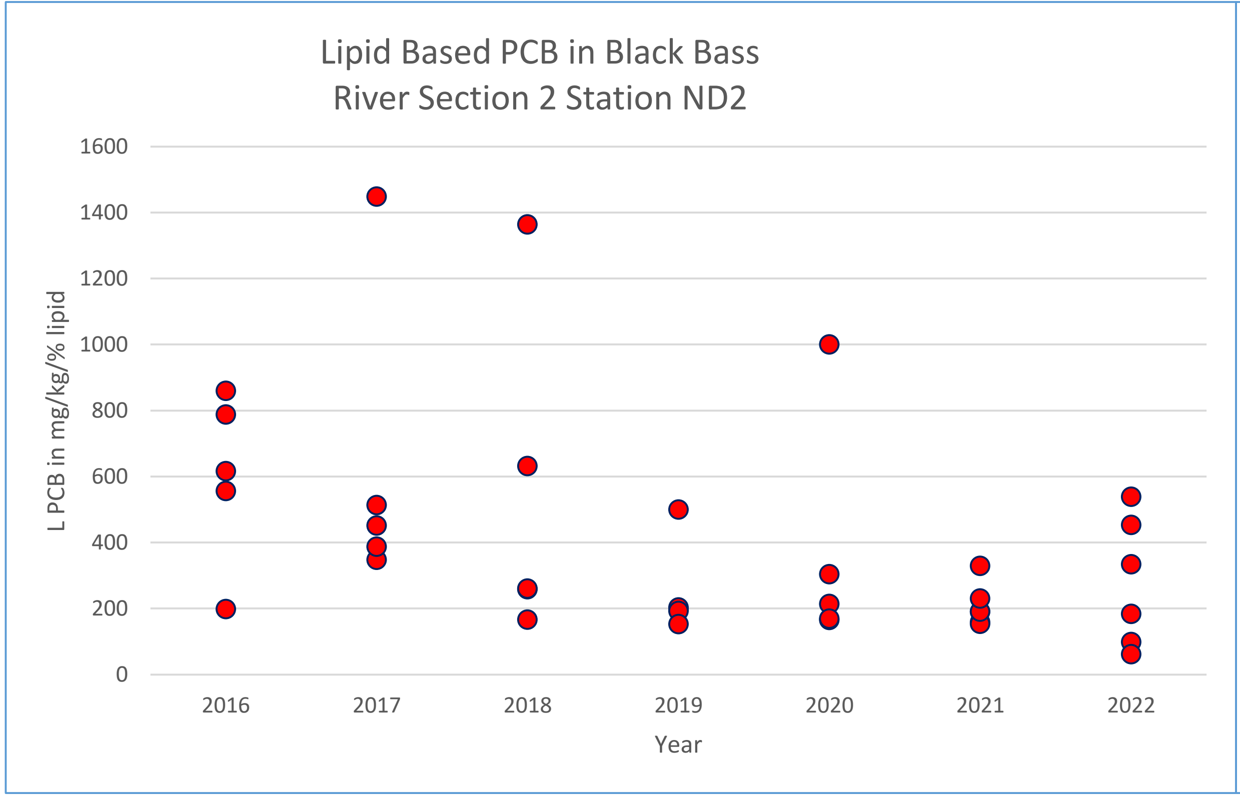
ND2 Black Bass Data

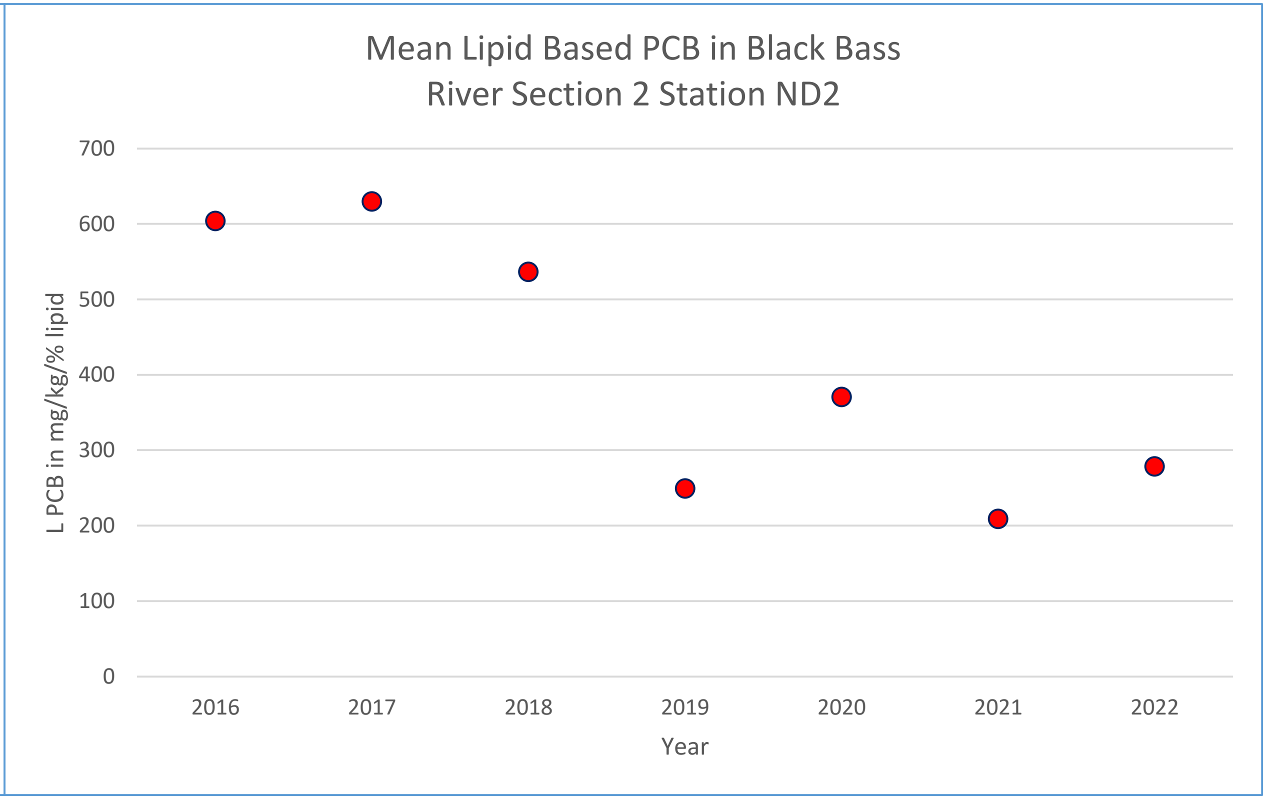
ND2 Black Bass Total PCB



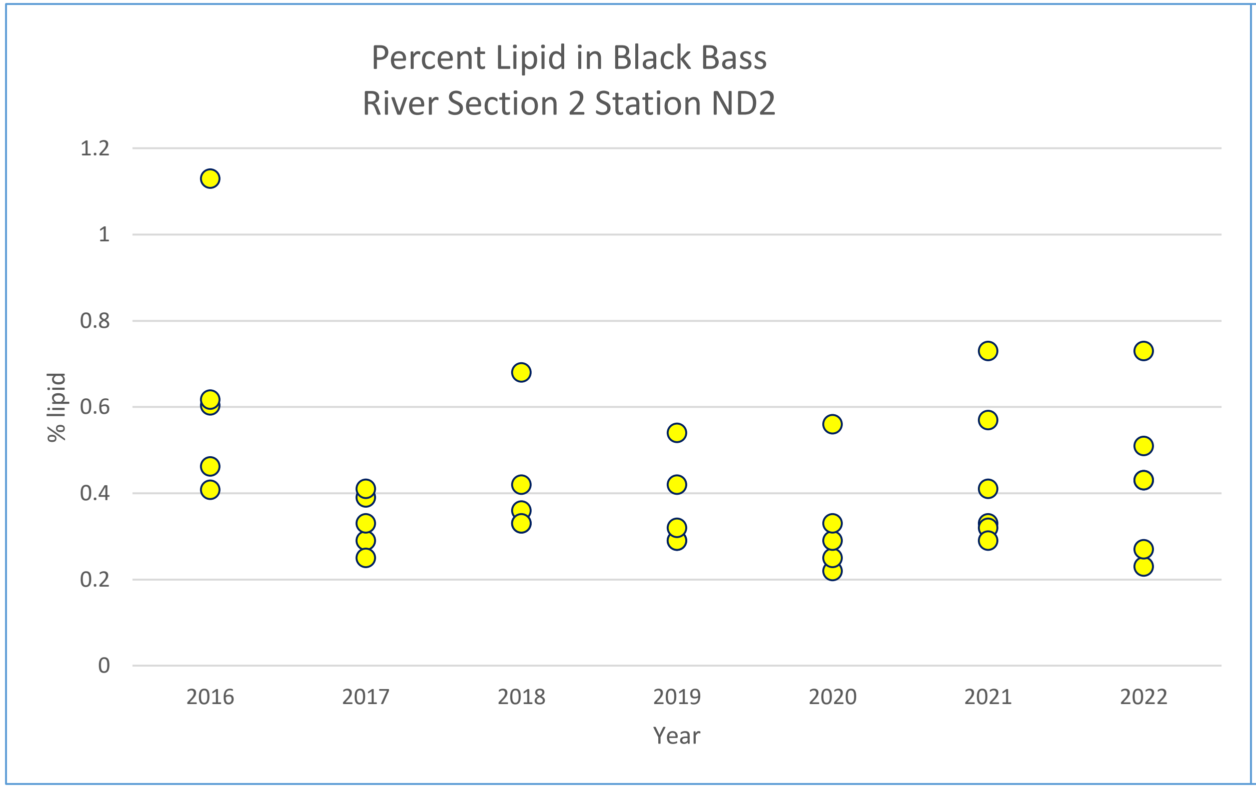


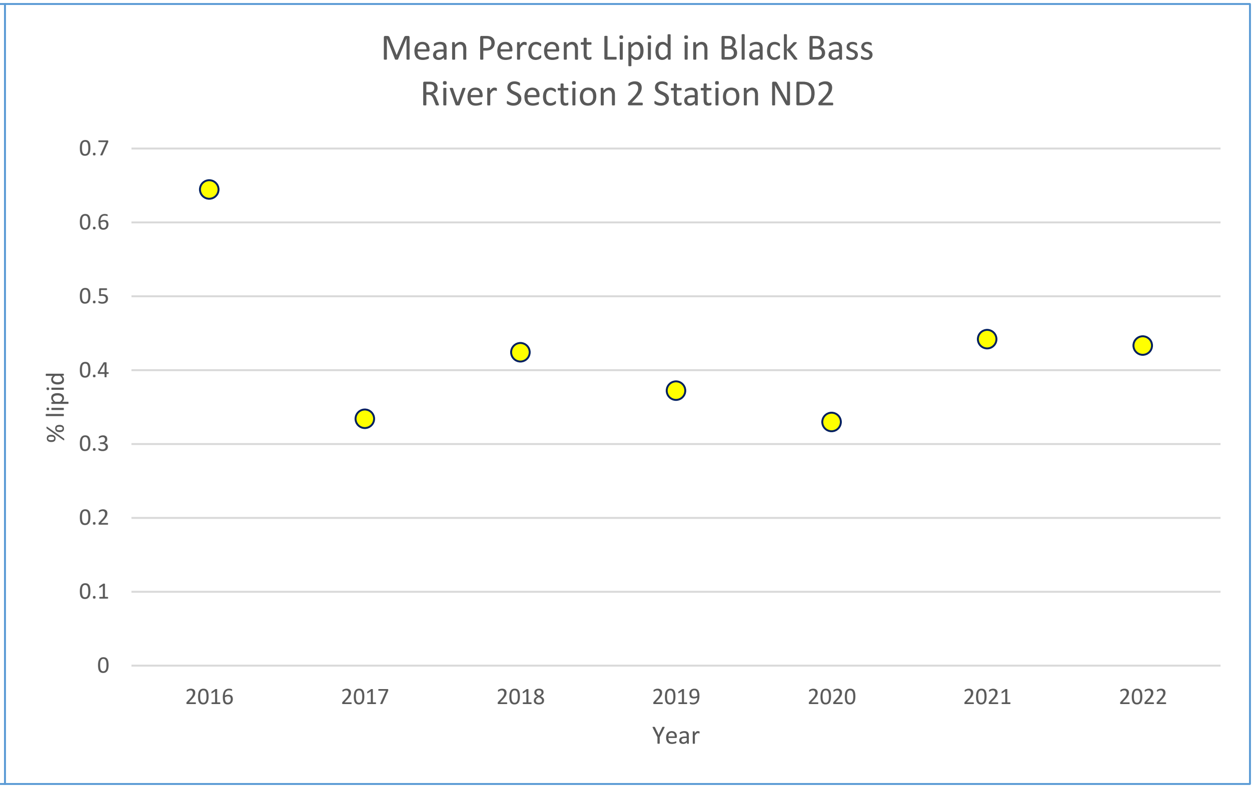
ND2 Black Bass Lipid Based PCB



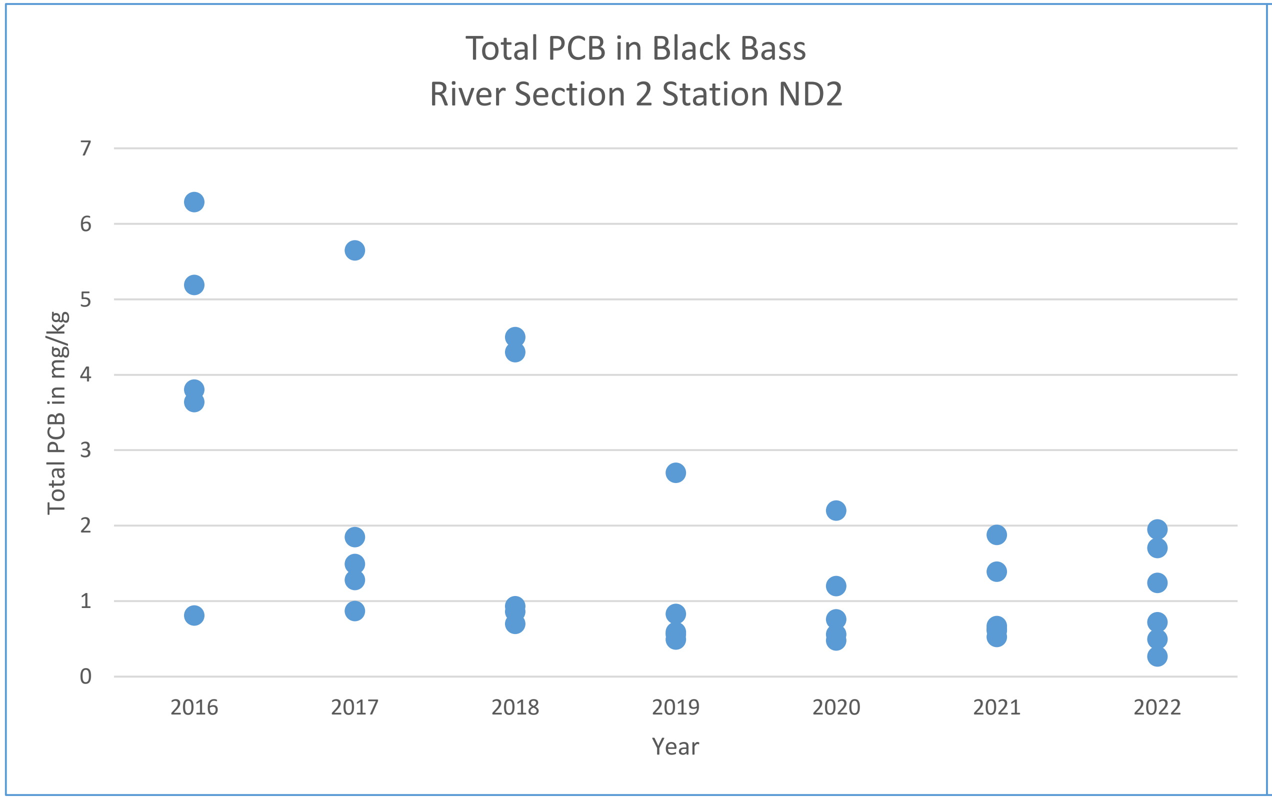


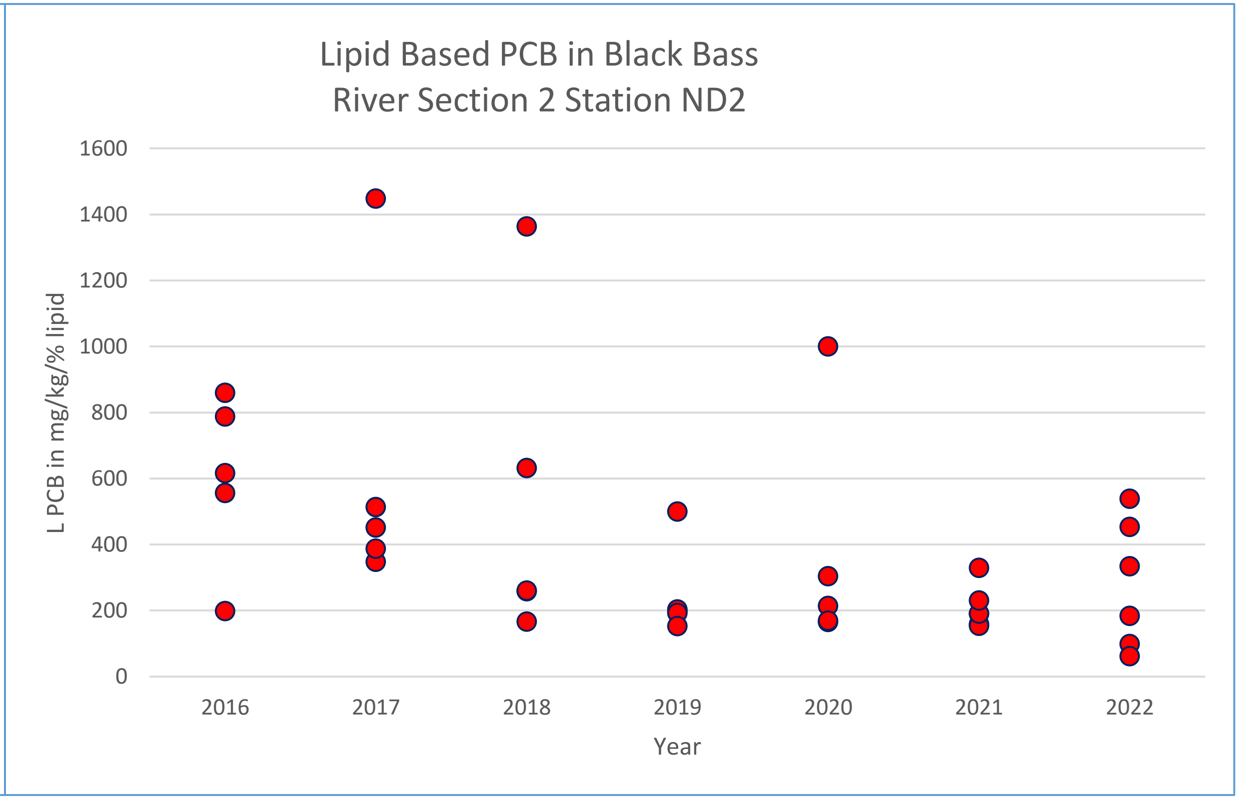
ND2 Black Bass Percent Lipid



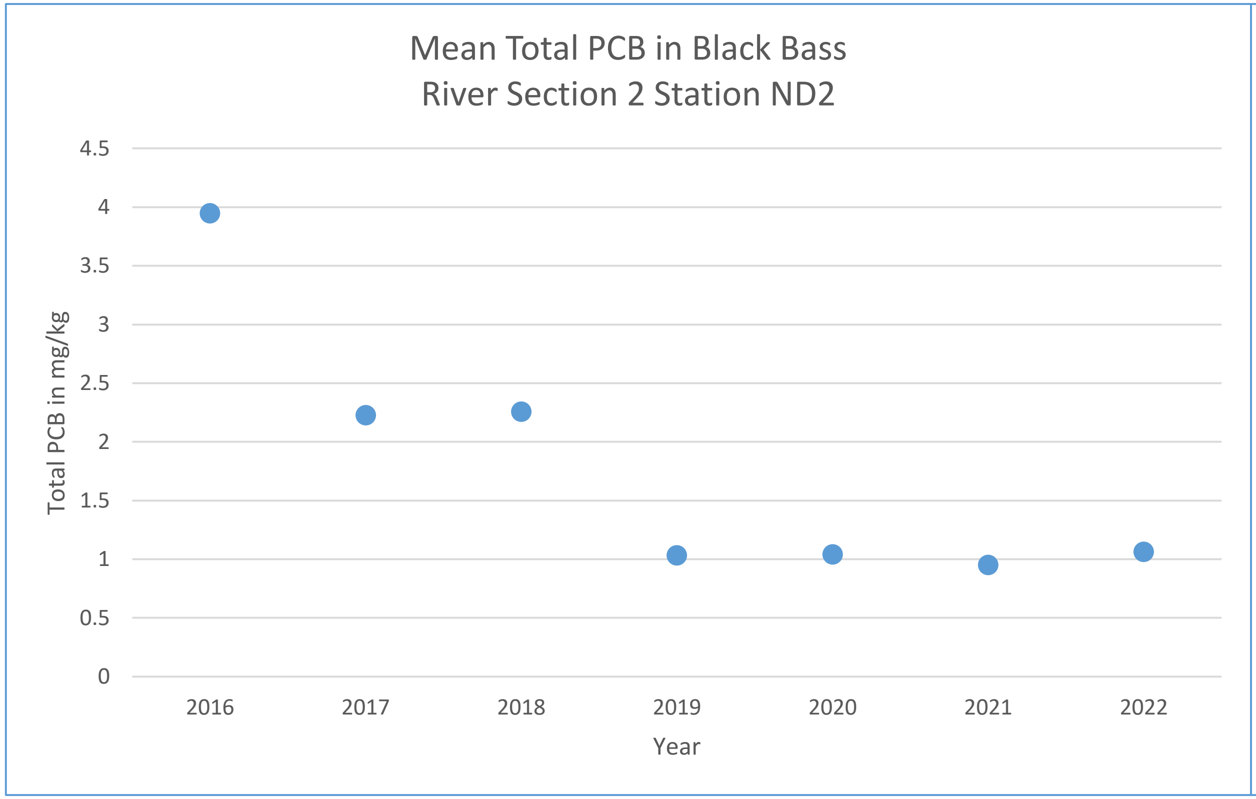


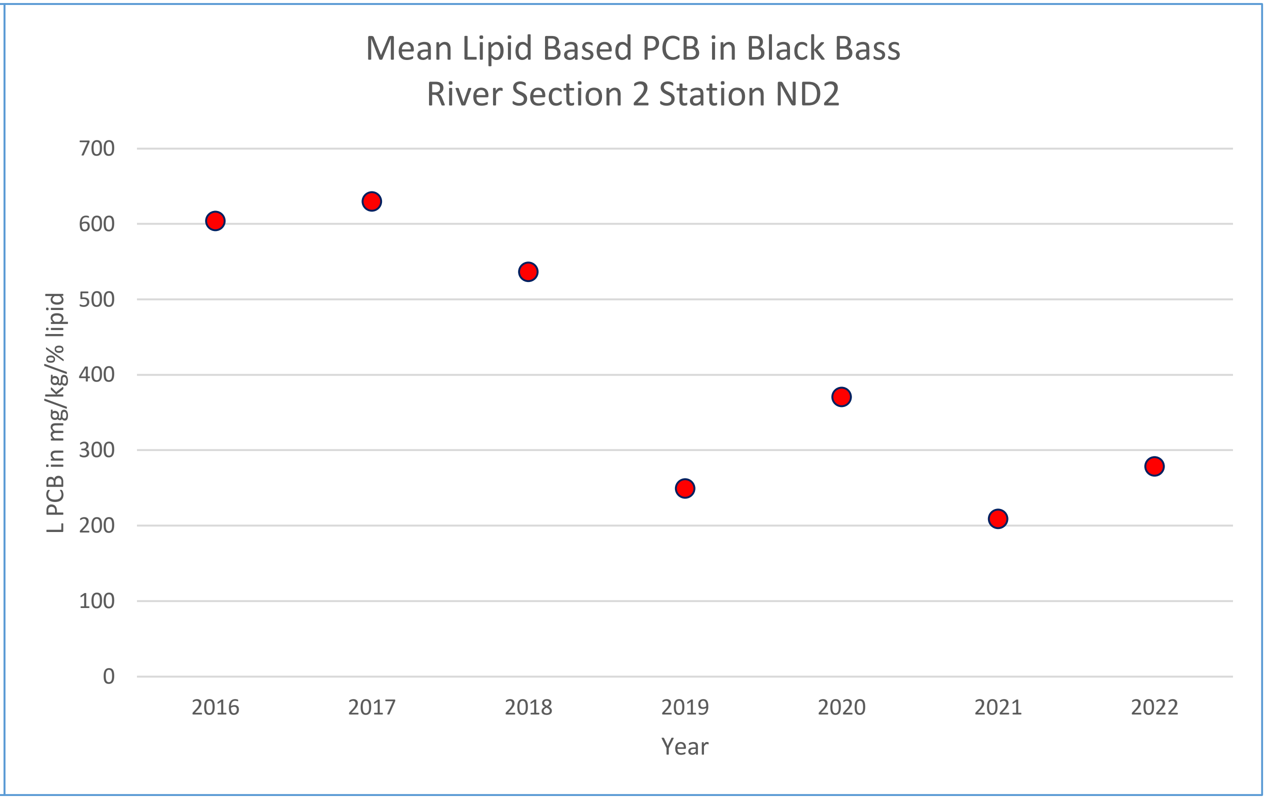
ND2 Black Bass Total PCB and Lipid Based PCB





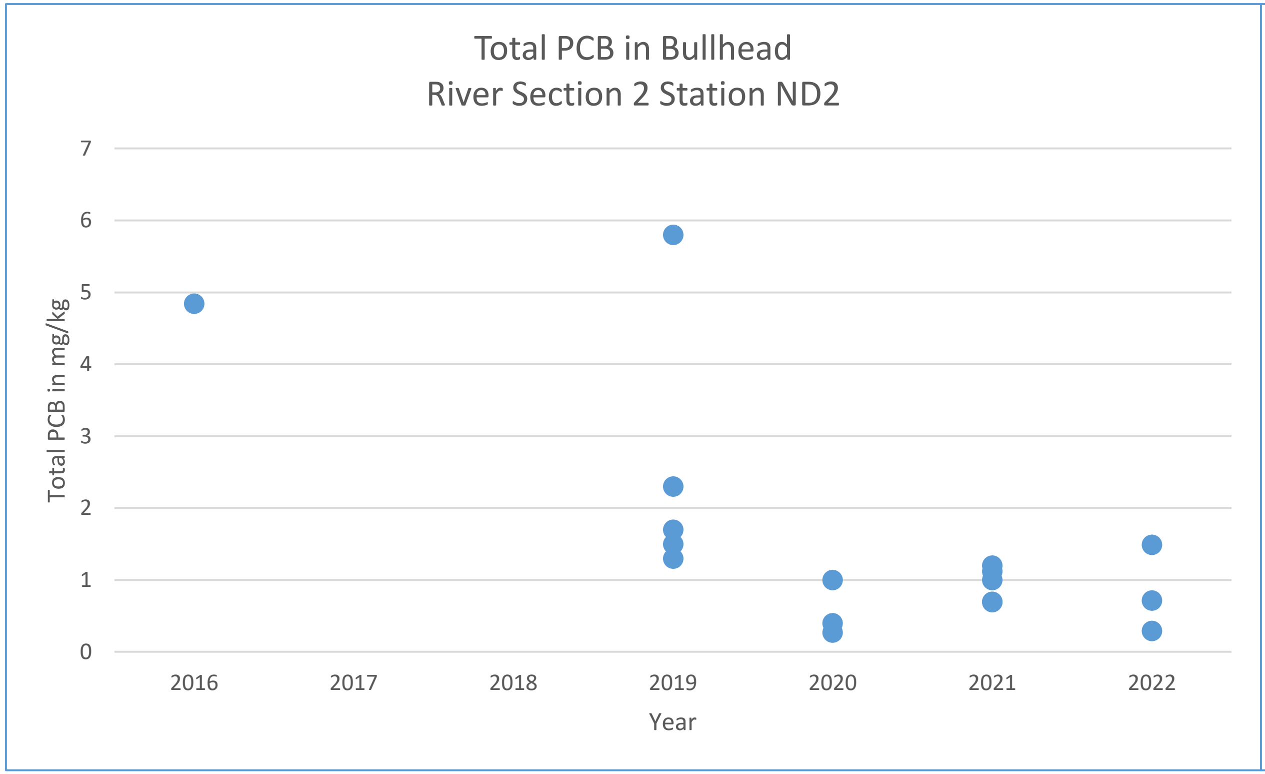
ND2 Black Bass Mean Total PCB and Mean Lipid Based PCB

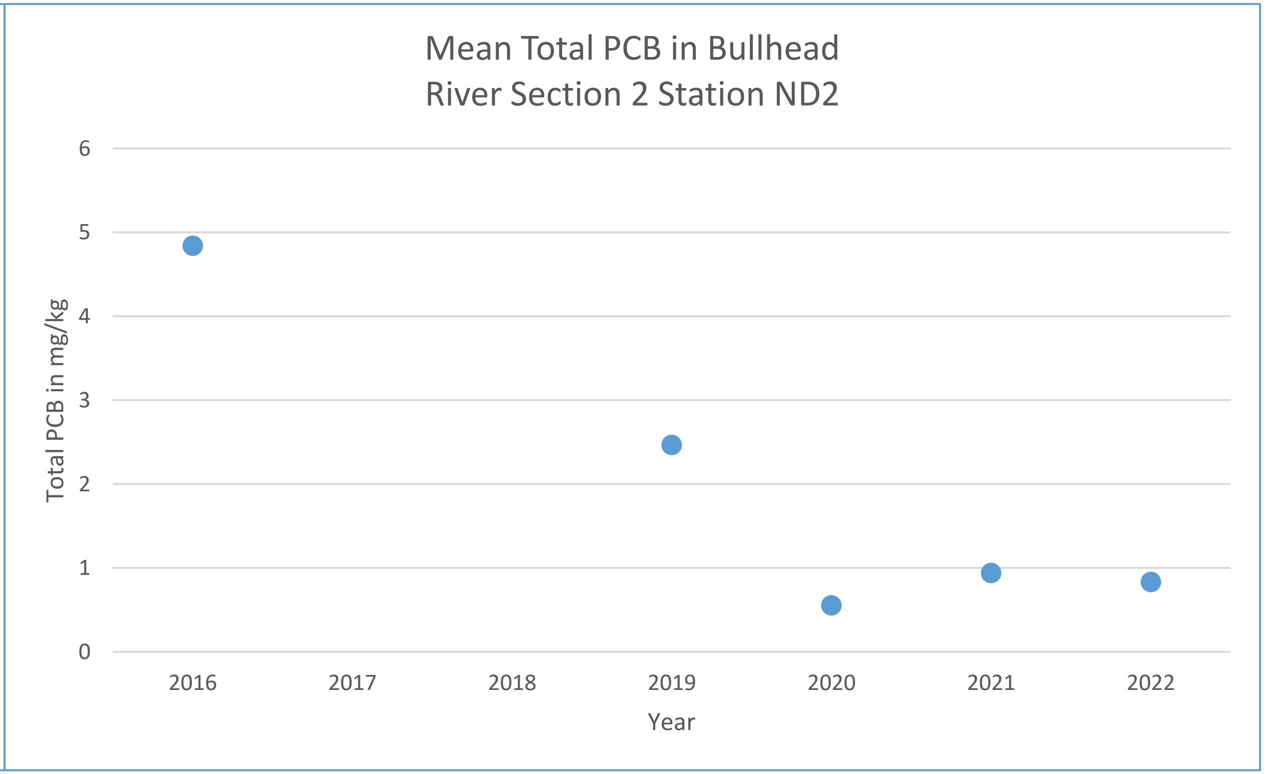




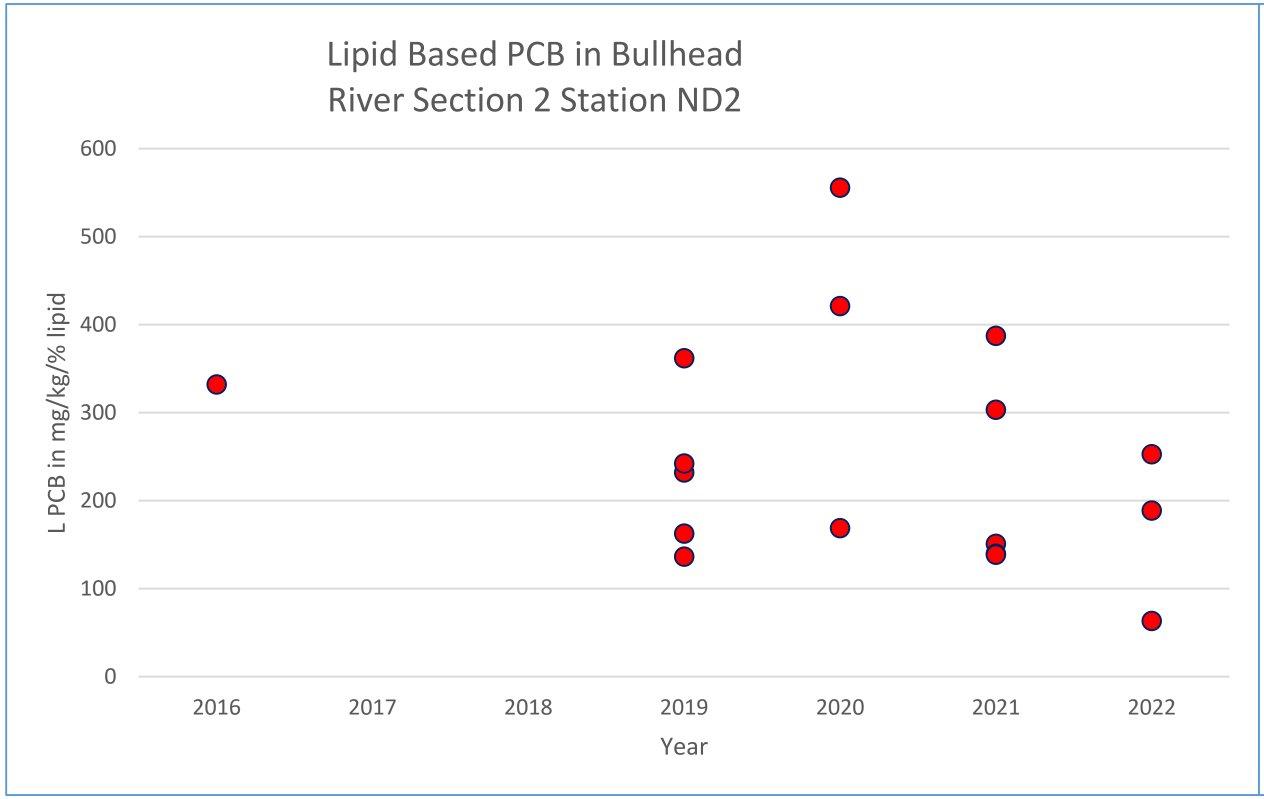
ND2 Bullhead Data

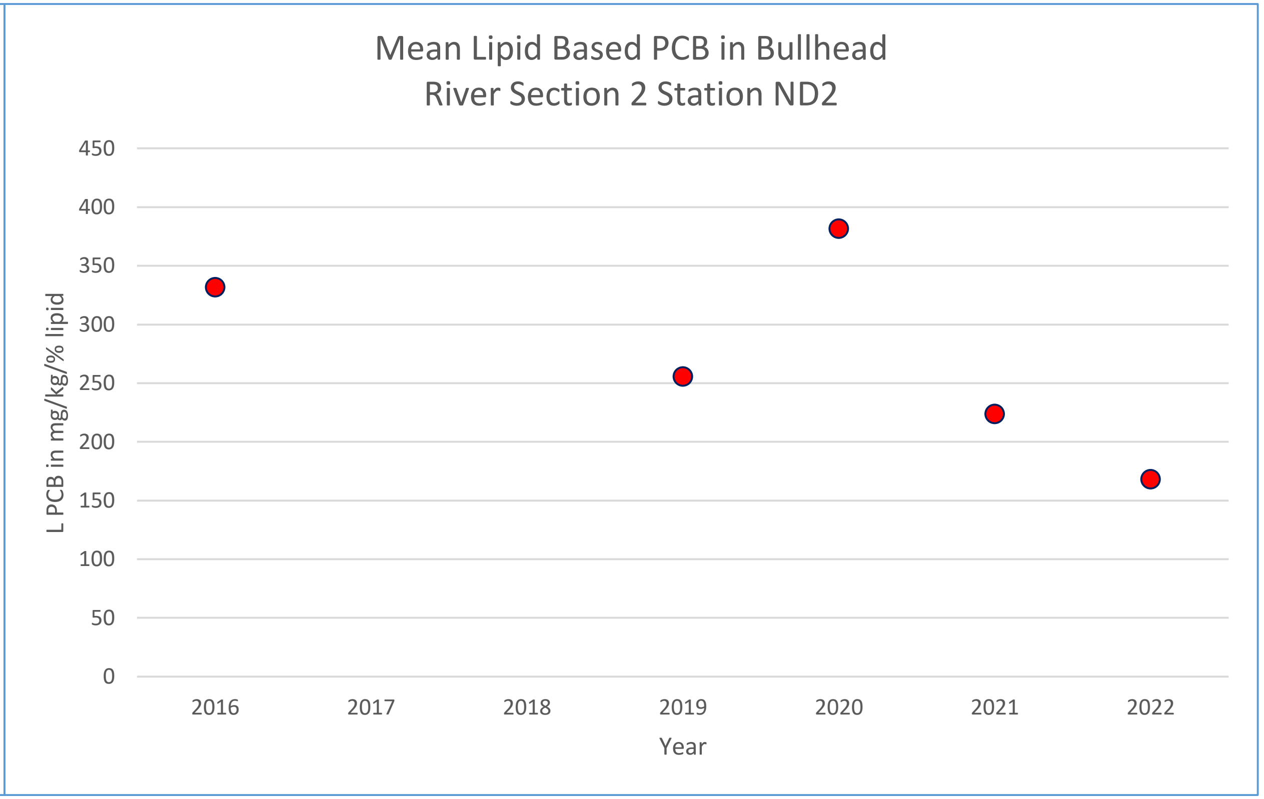
ND2 Bullhead Total PCB



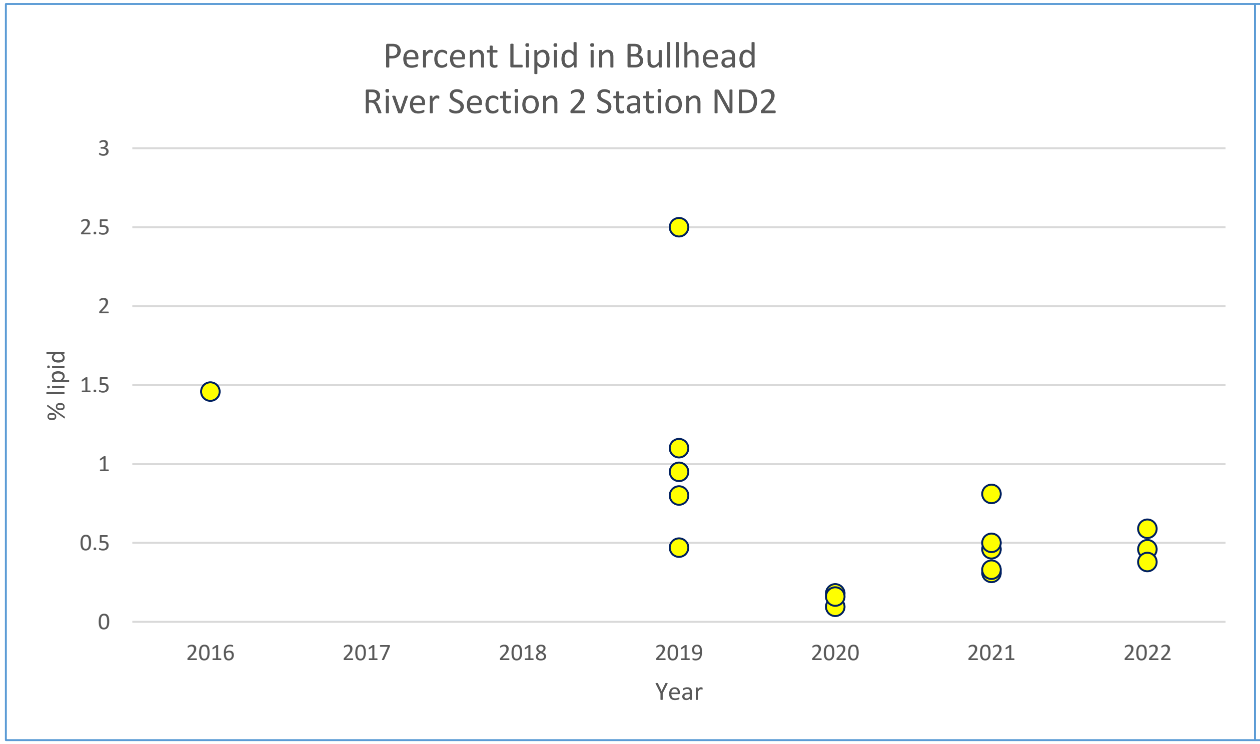


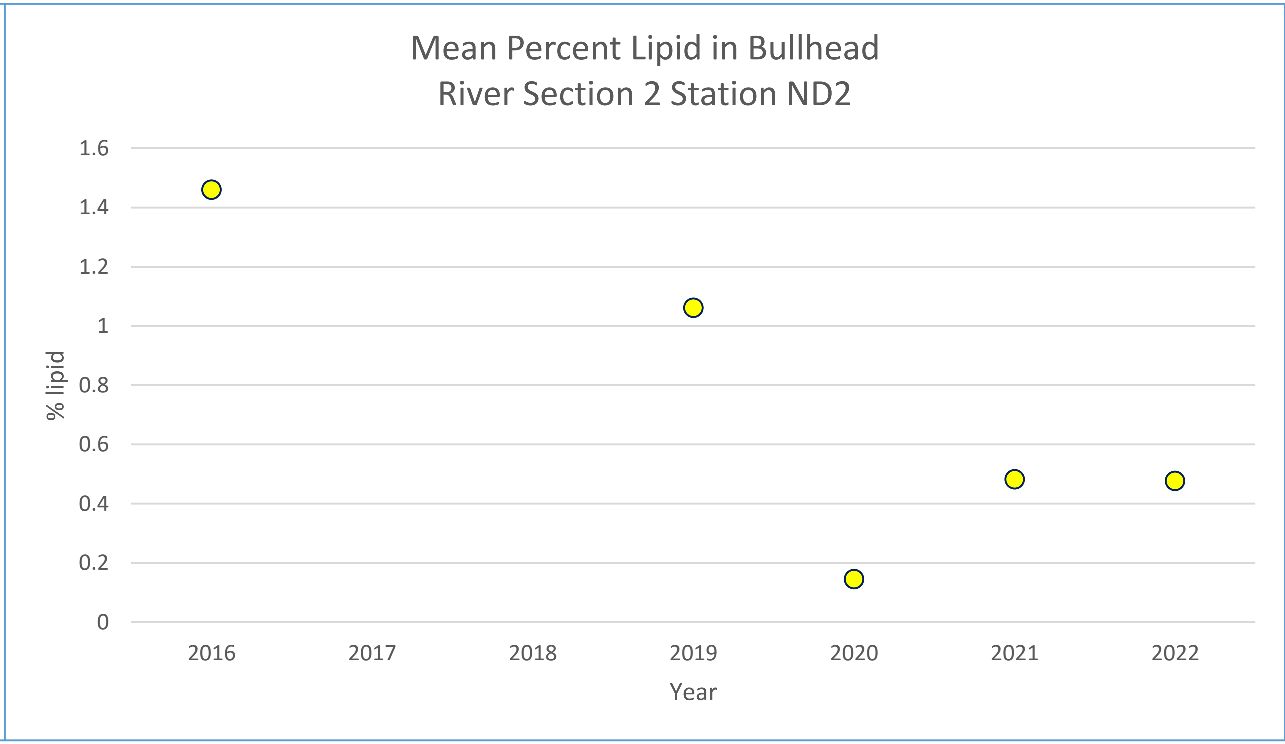
ND2 Bullhead Lipid Based PCB



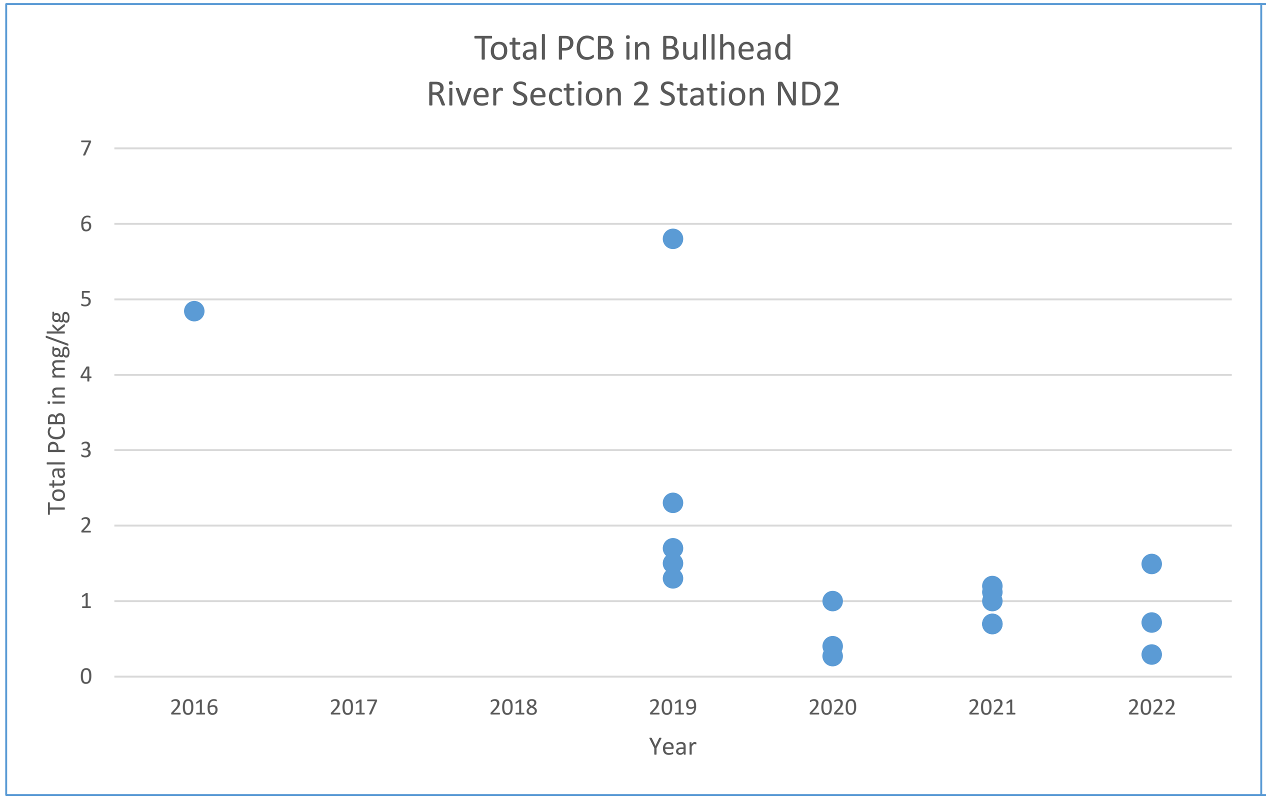


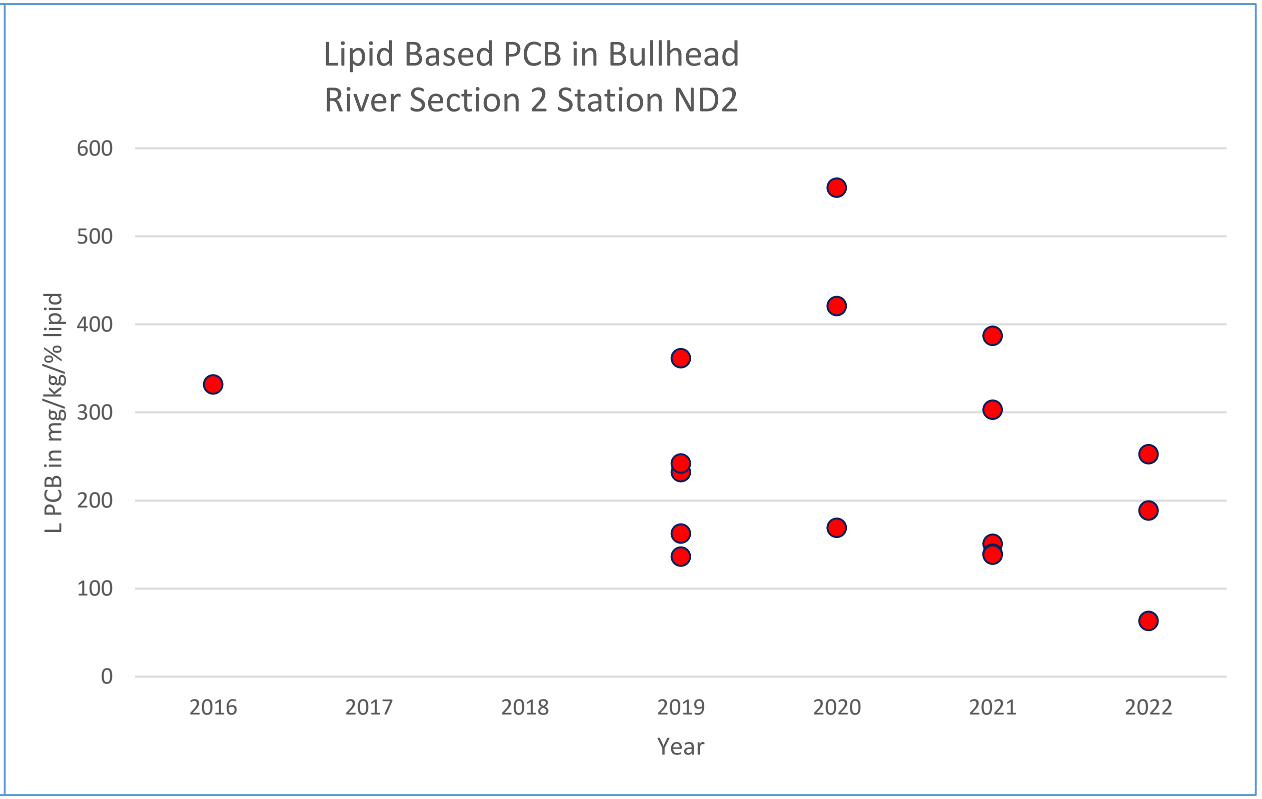
ND2 Bullhead Percent Lipid



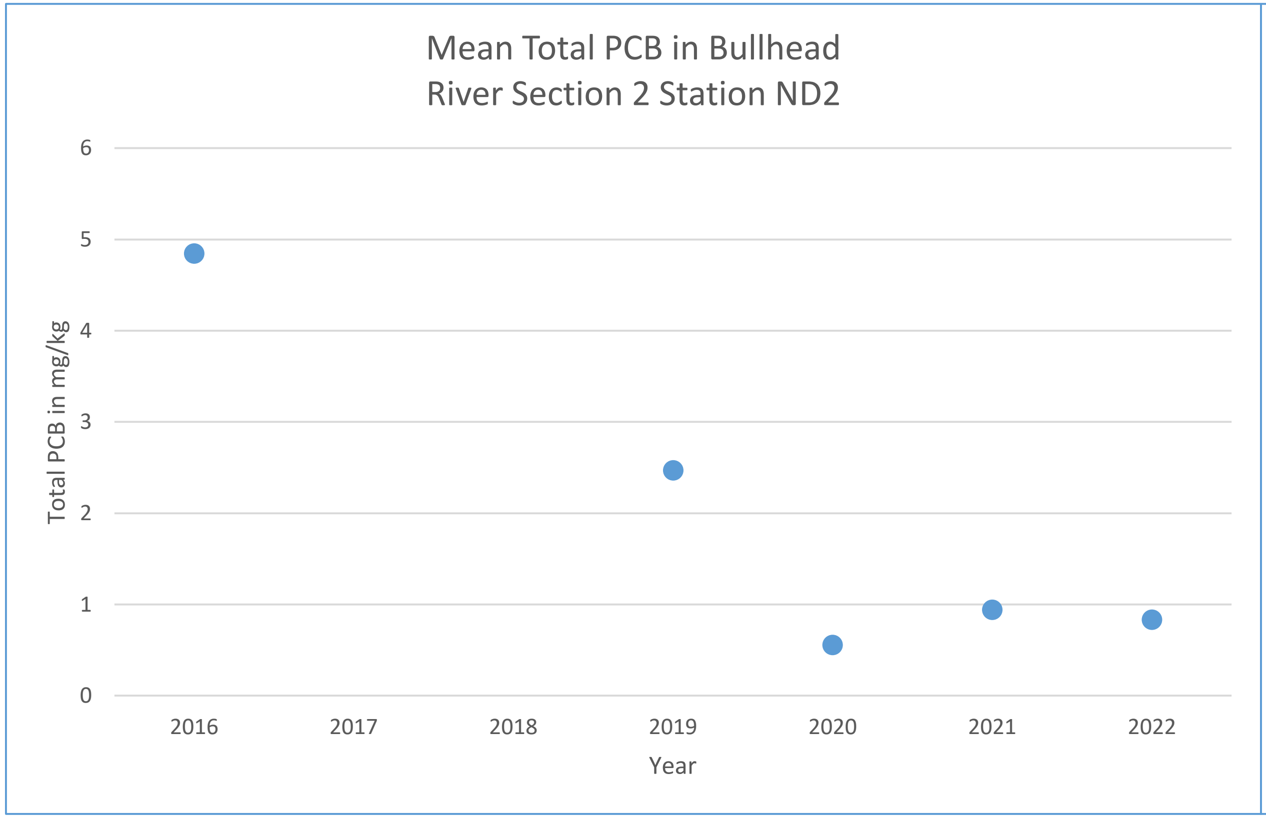


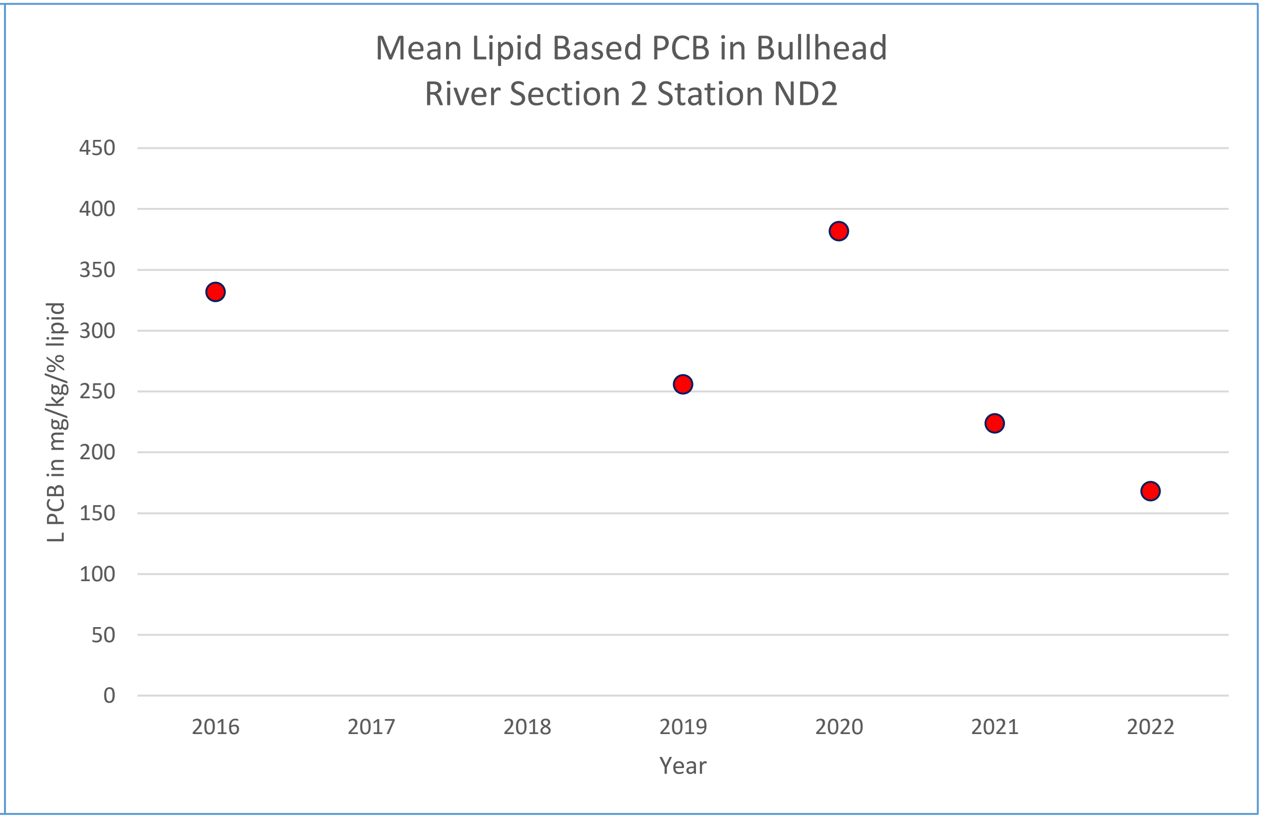
ND2 Bullhead Total PCB and Lipid Based PCB





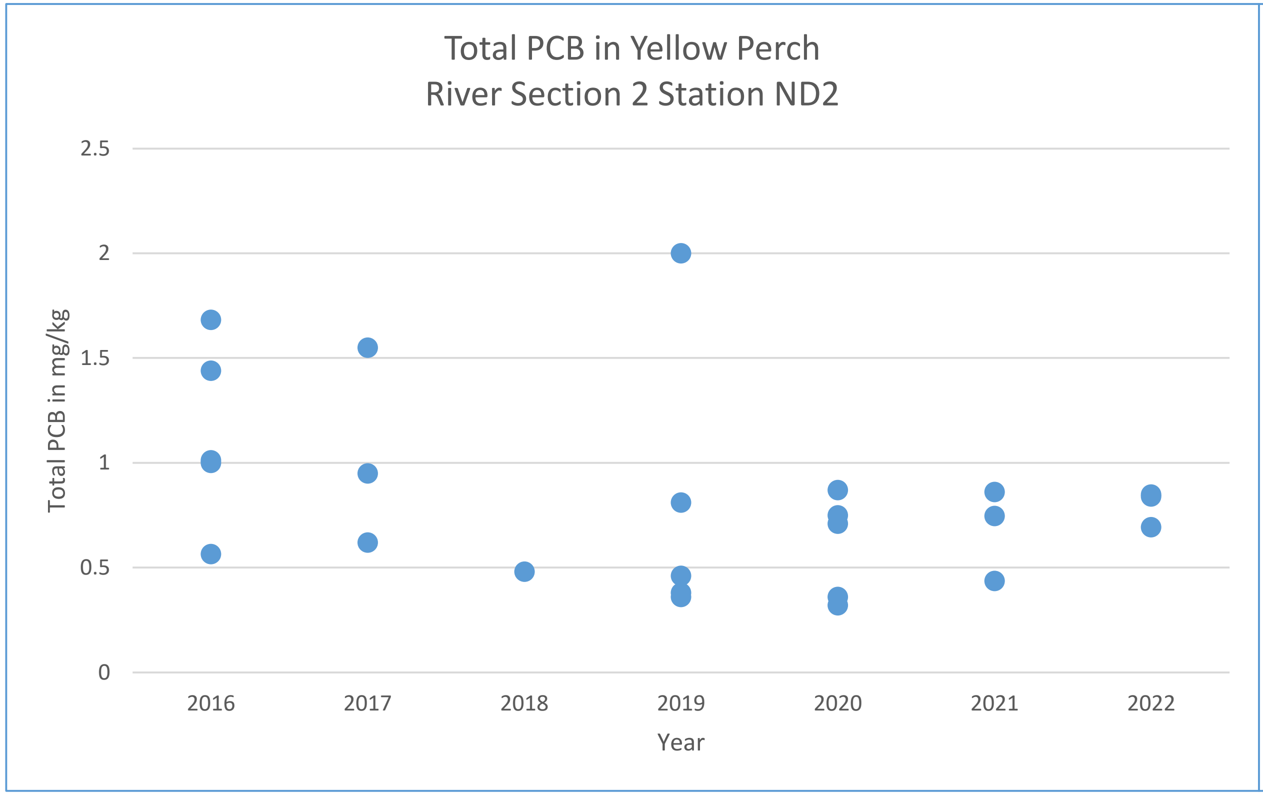
ND2 Bullhead Mean Total PCB and Mean Lipid Based PCB

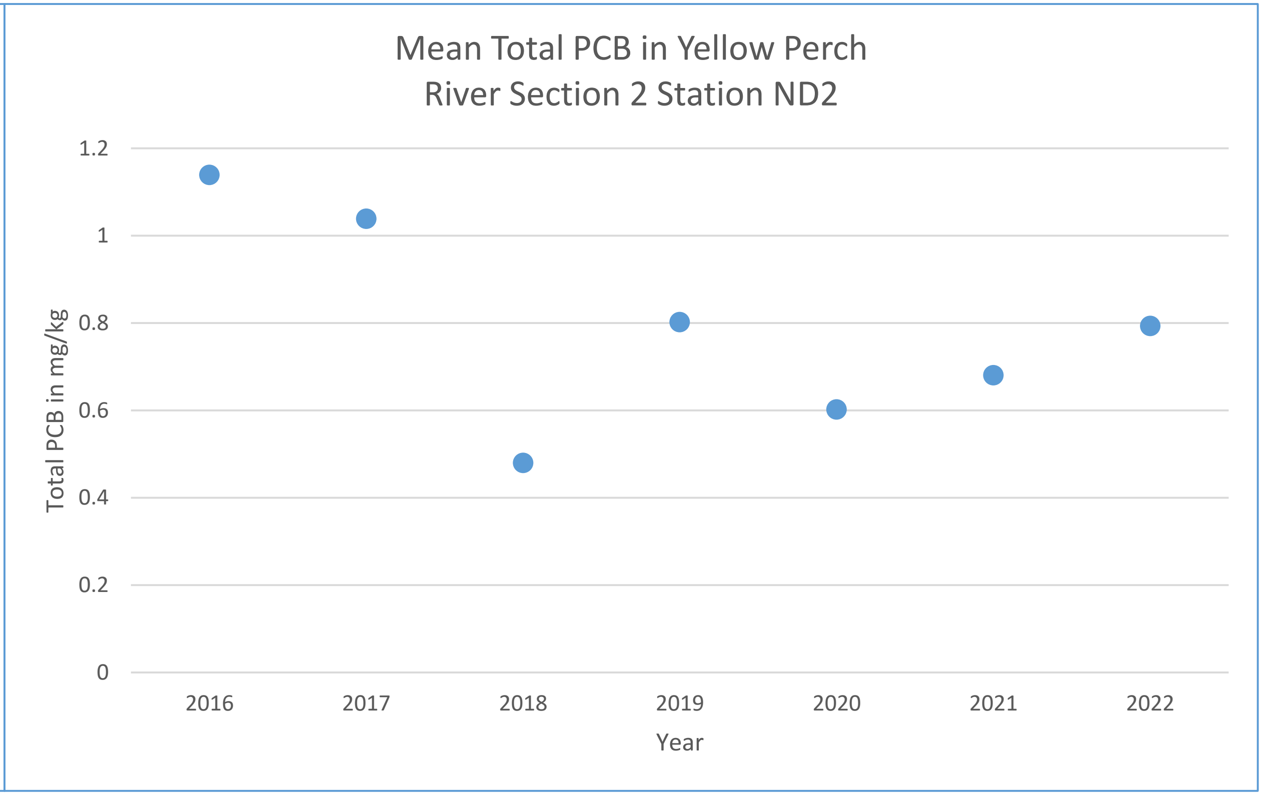




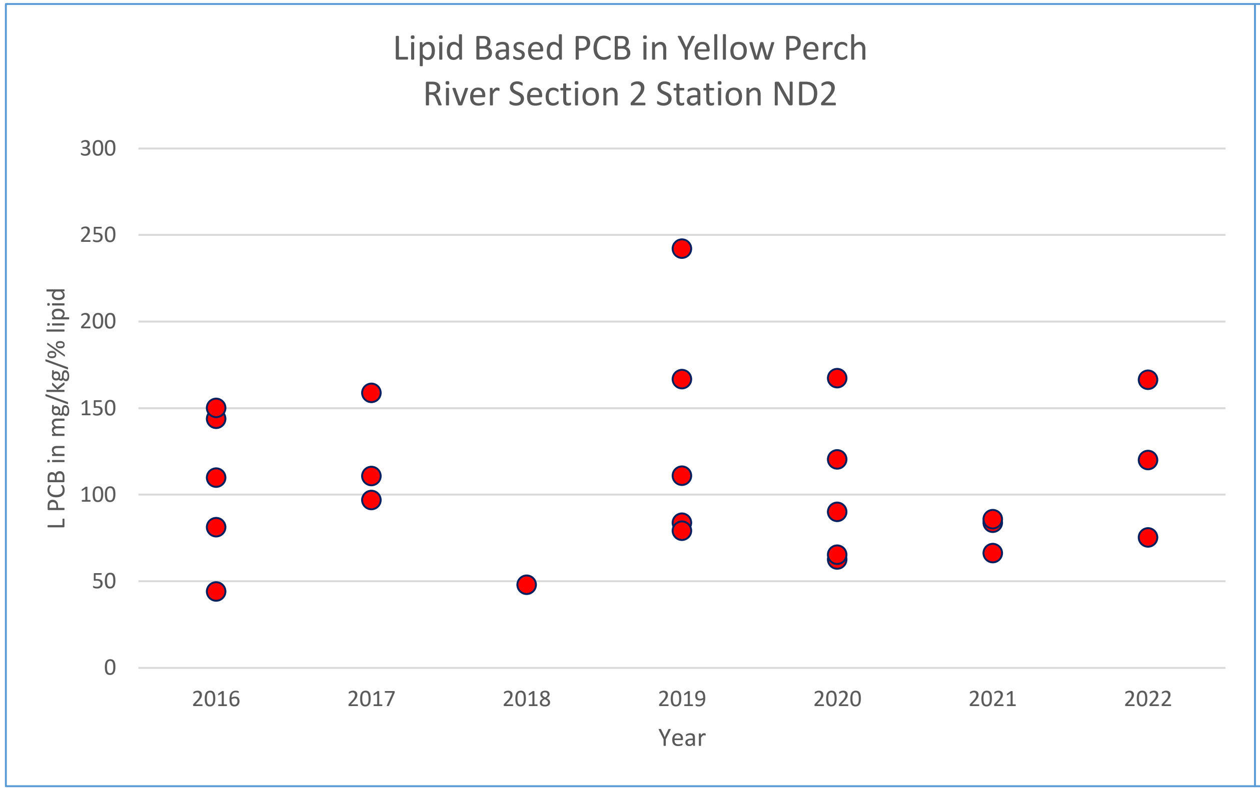
ND2 Yellow Perch Data

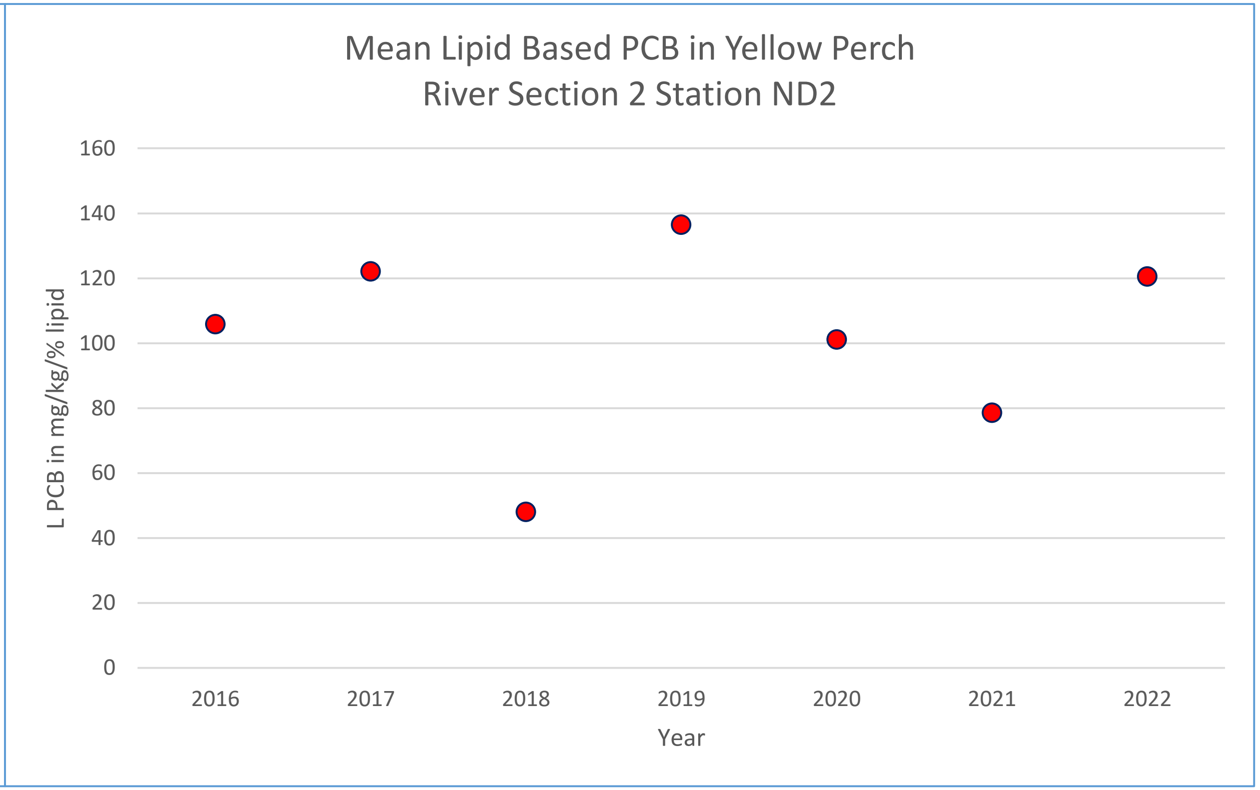
ND2 Yellow Perch PCB



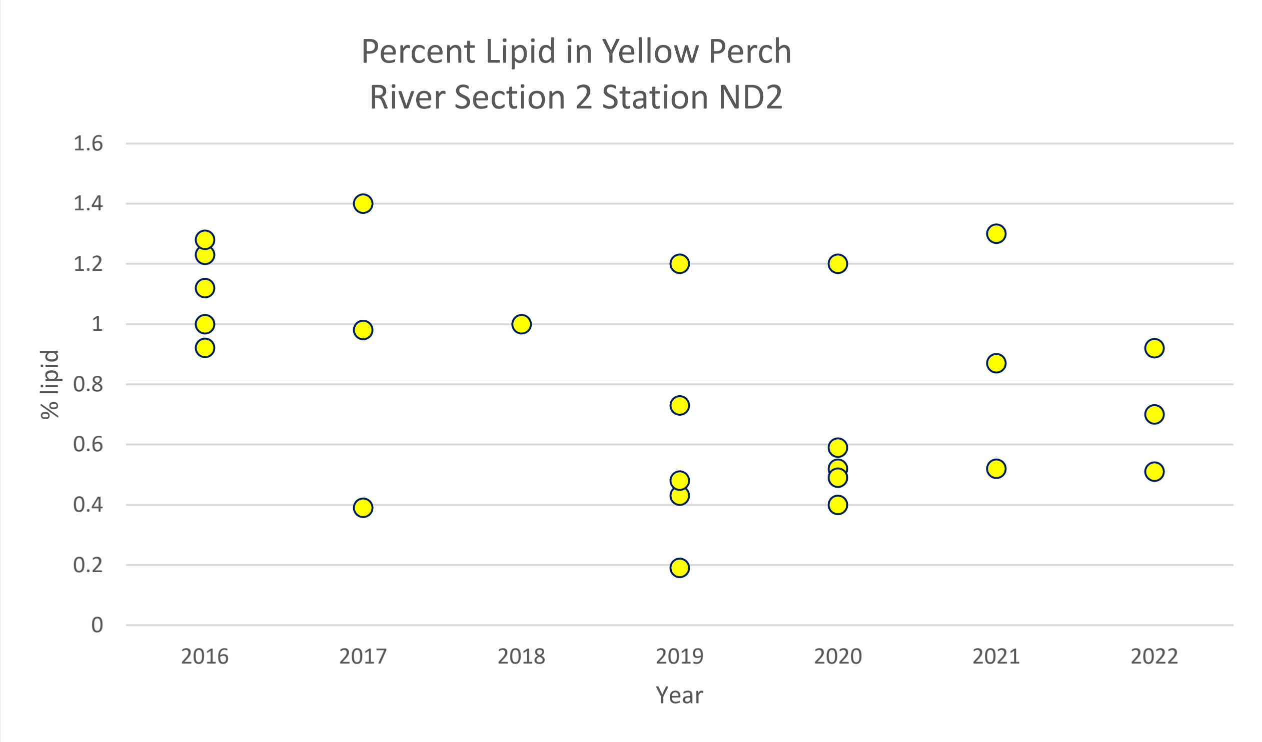


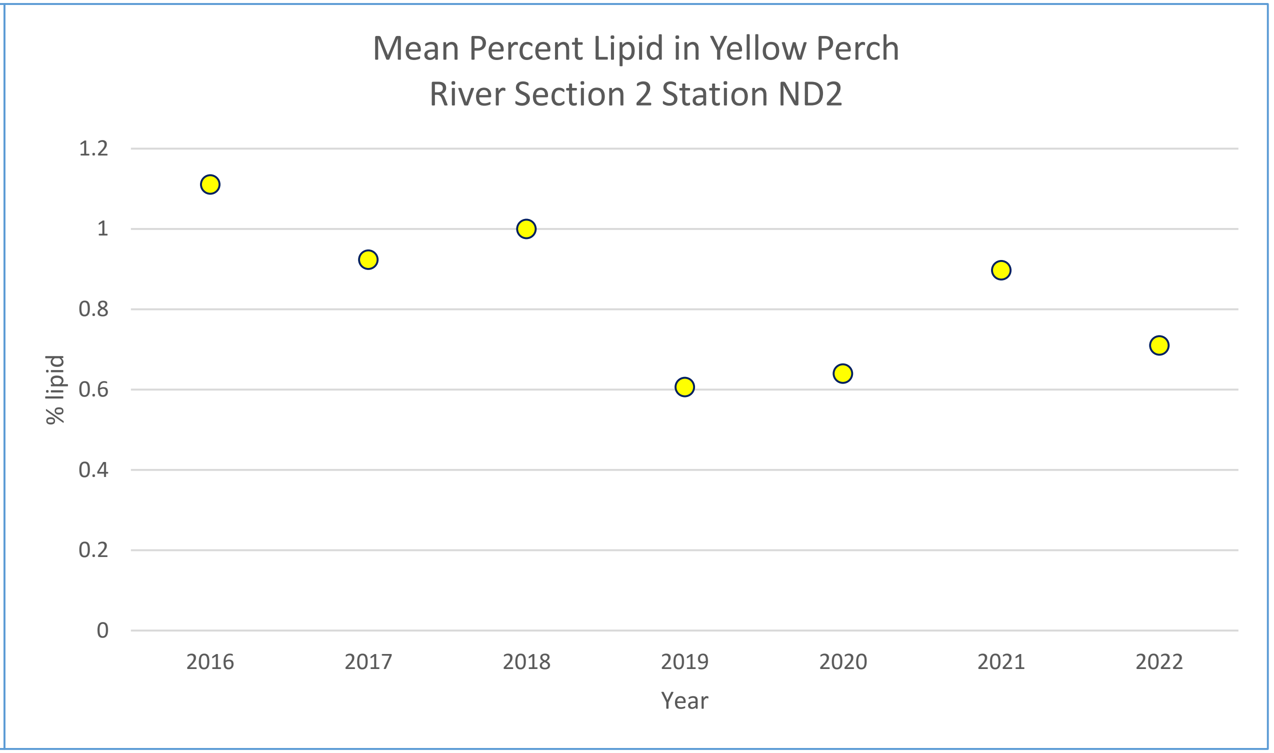
ND2 Yellow Perch Lipid Based PCB



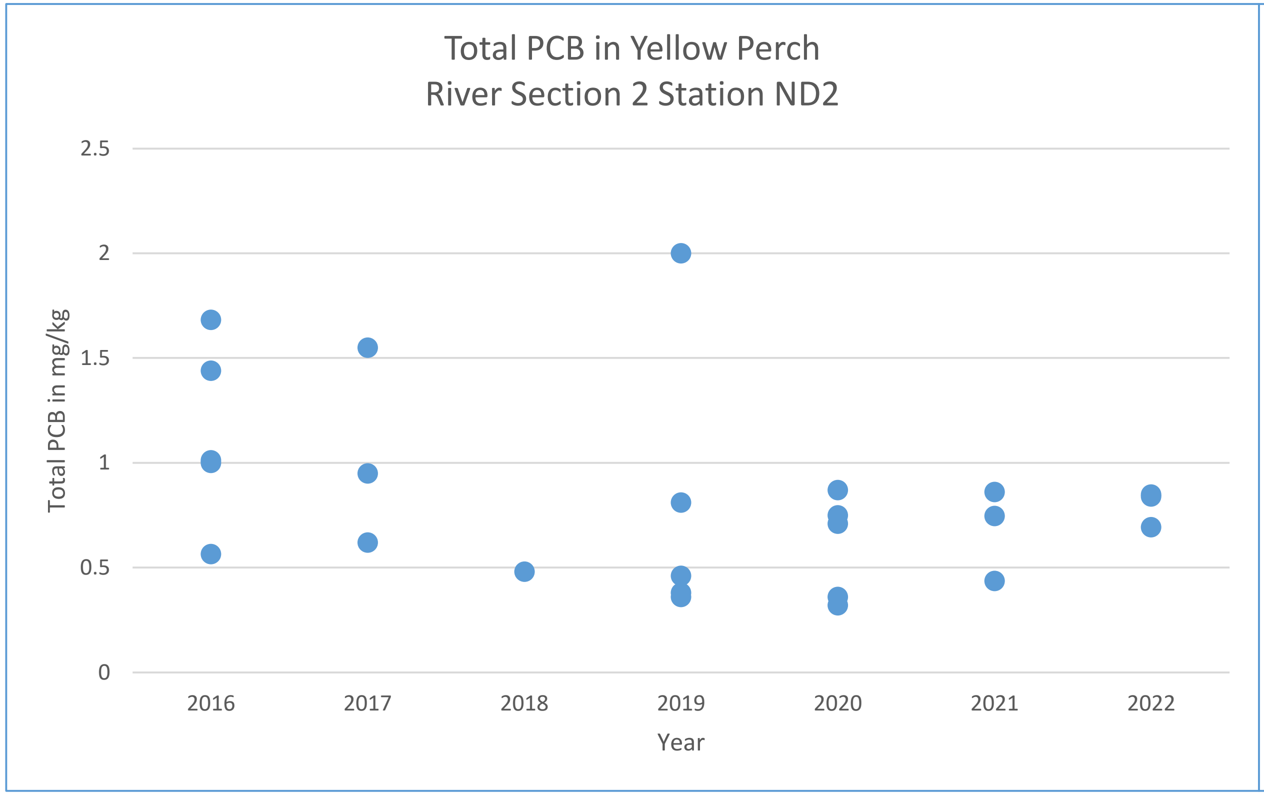


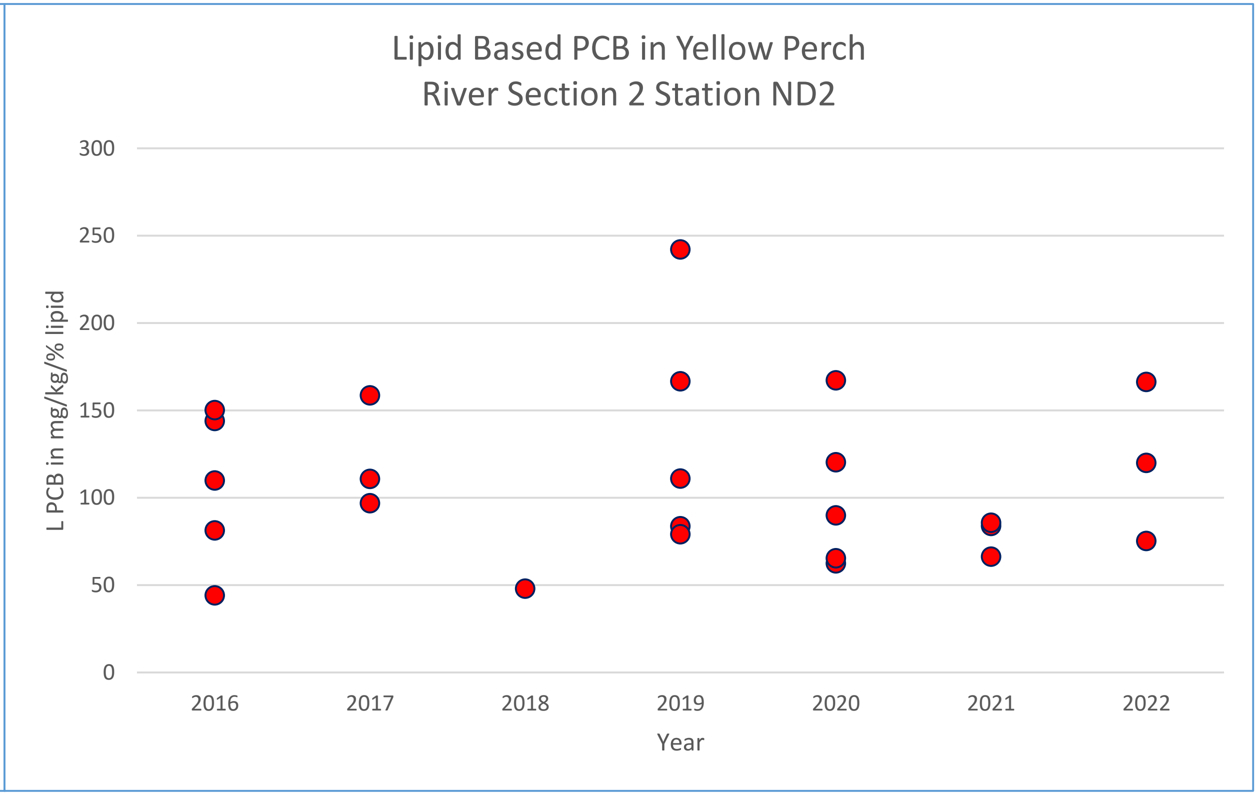
ND2 Yellow Perch Percent Lipid



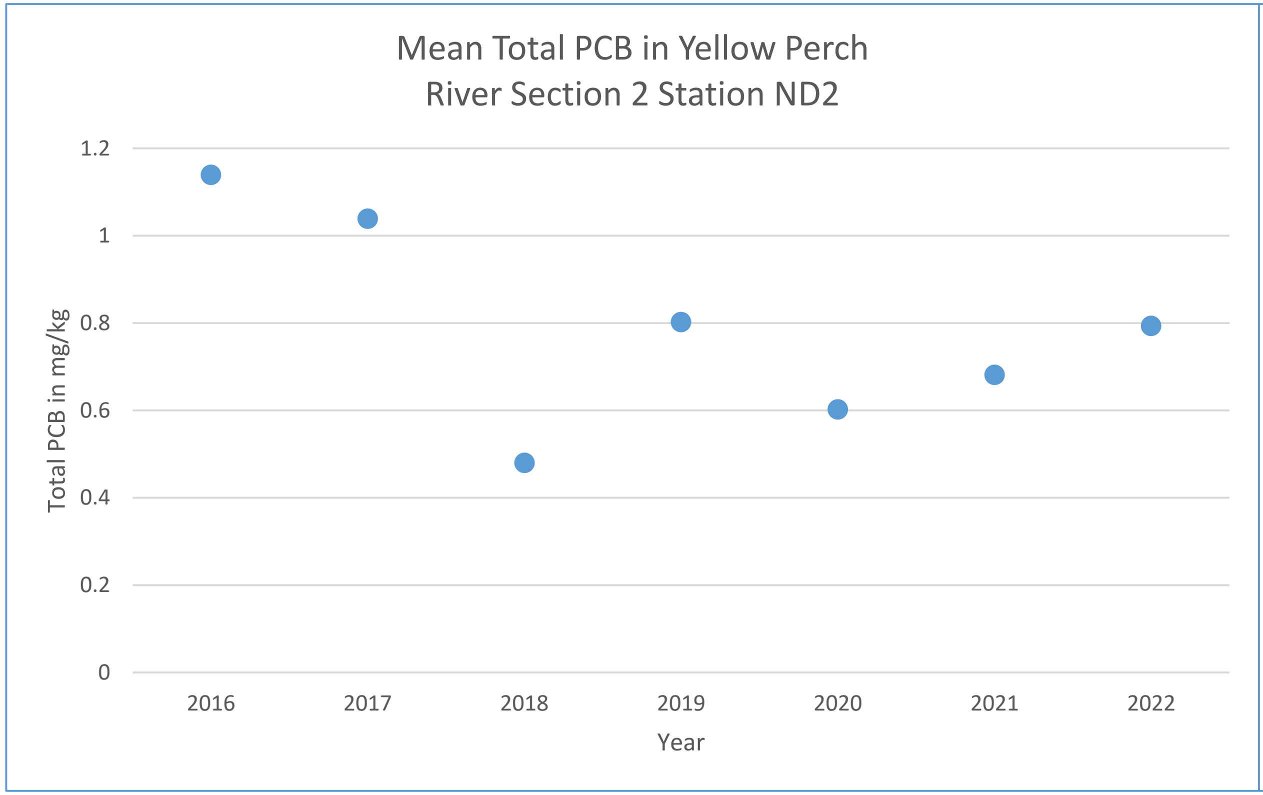


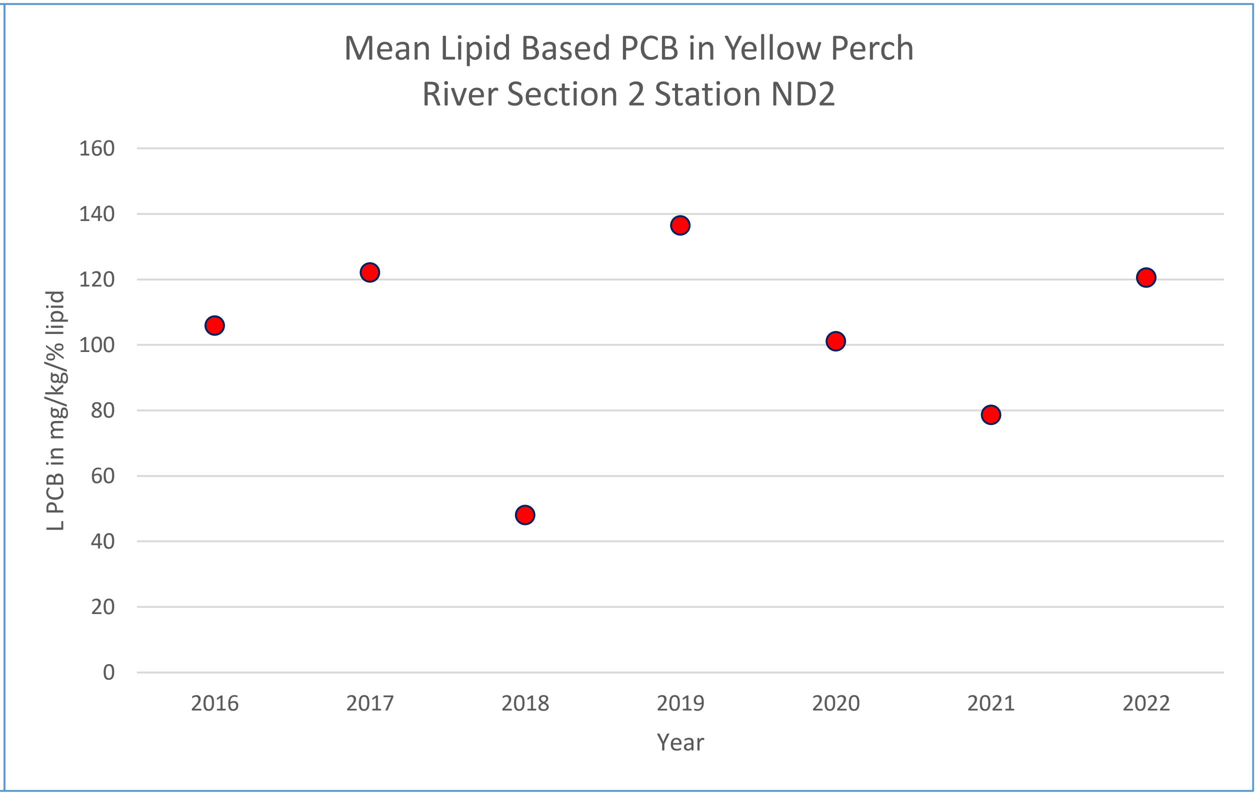
ND2 Yellow Perch Total PCB and Lipid Based PCB





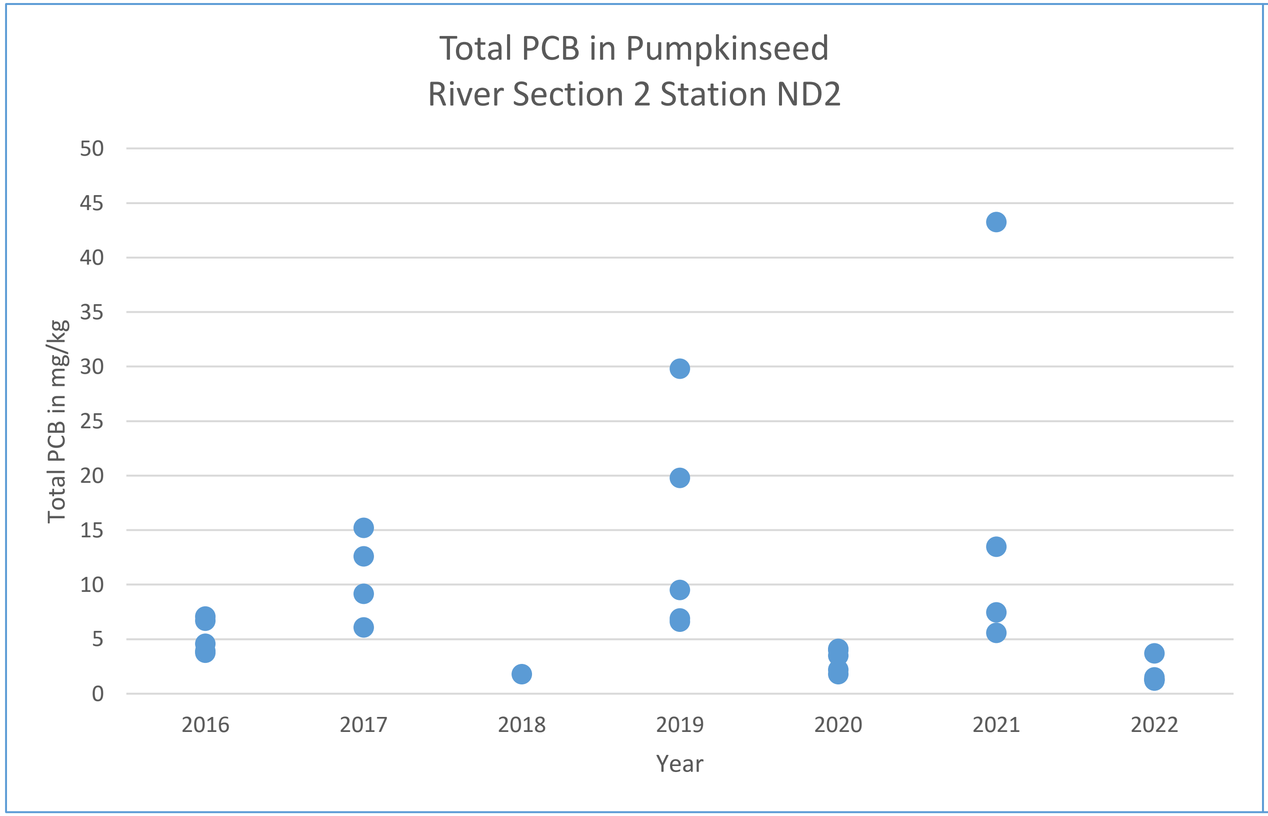
ND2 Yellow Perch Mean Total PCB and Mean Lipid Based PCB

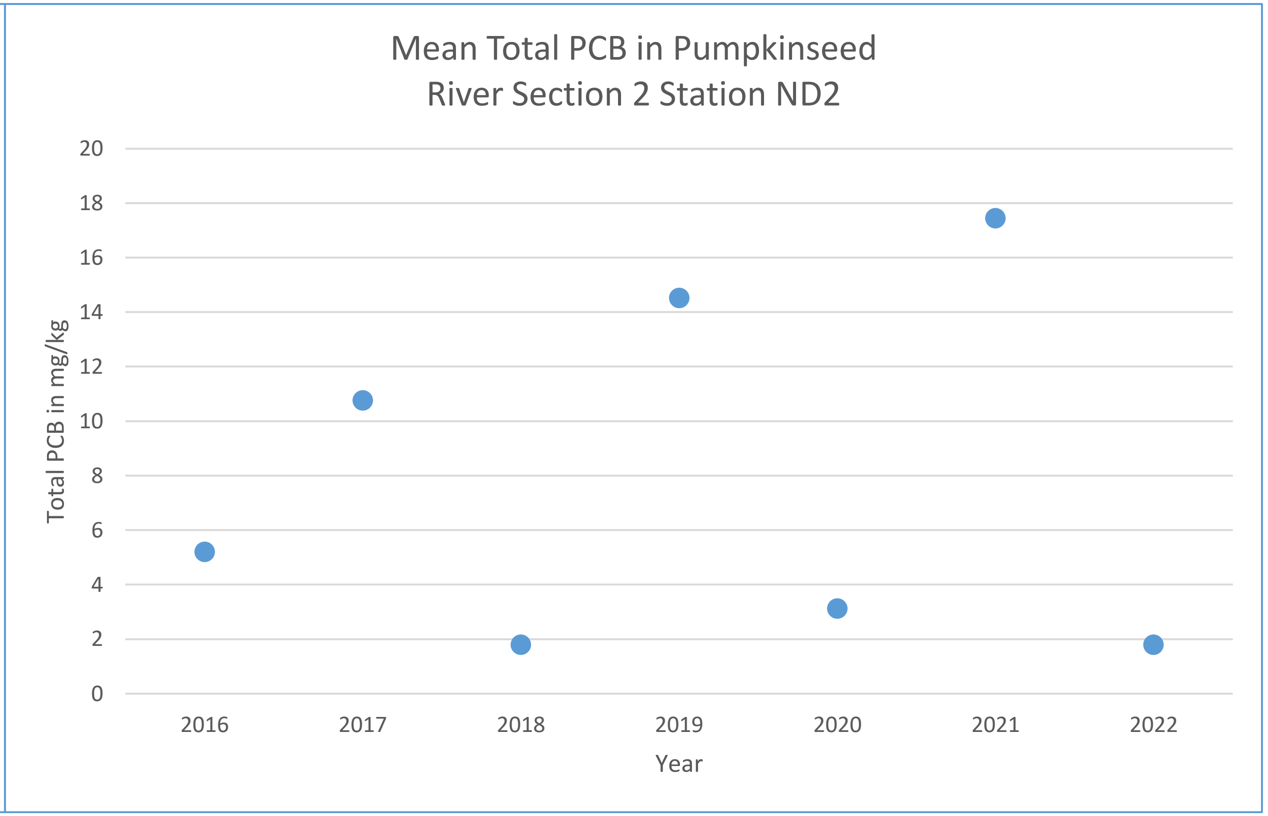




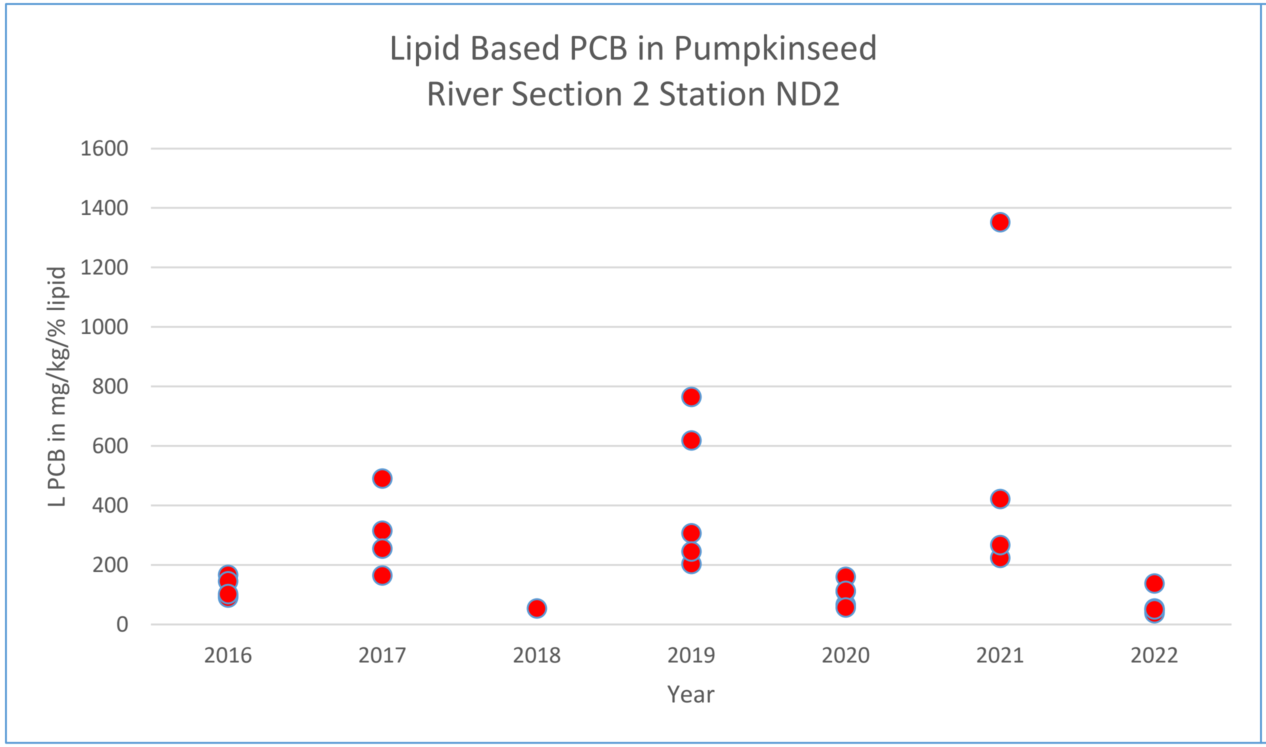
ND2 Pumpkinseed Data

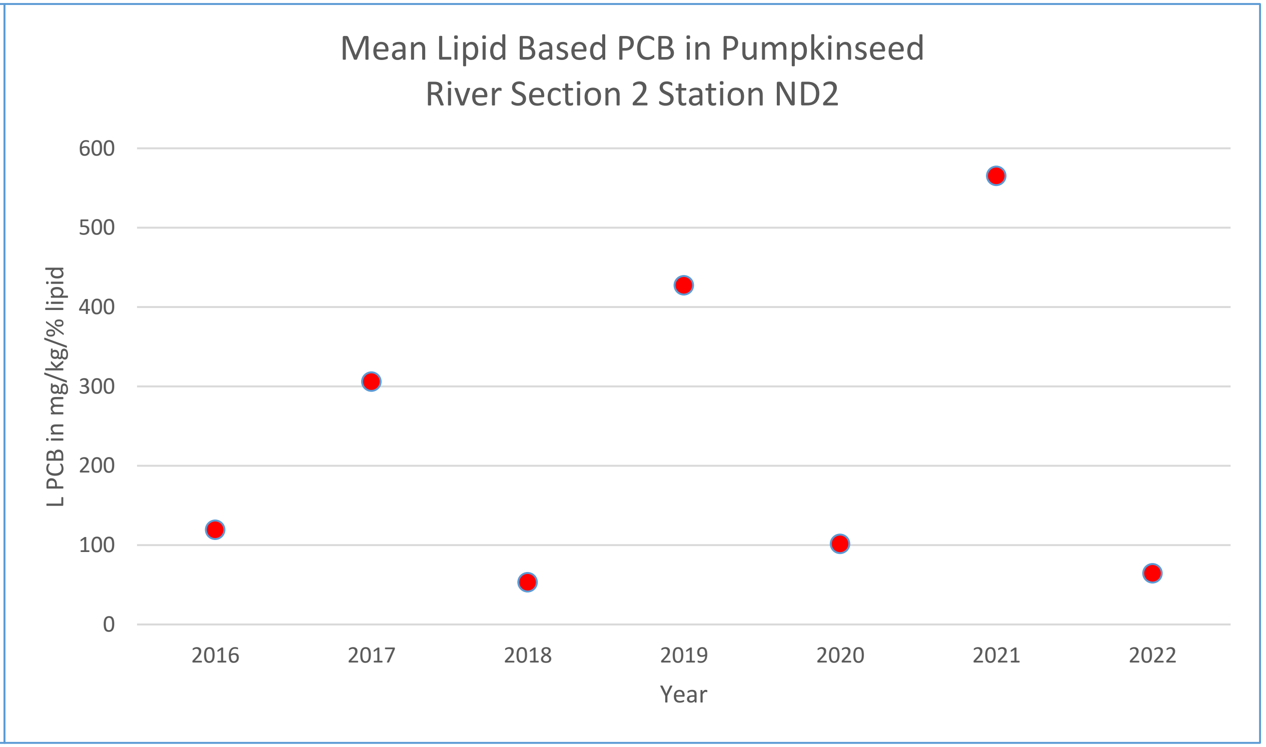
ND2 Pumpkinseed Total PCB



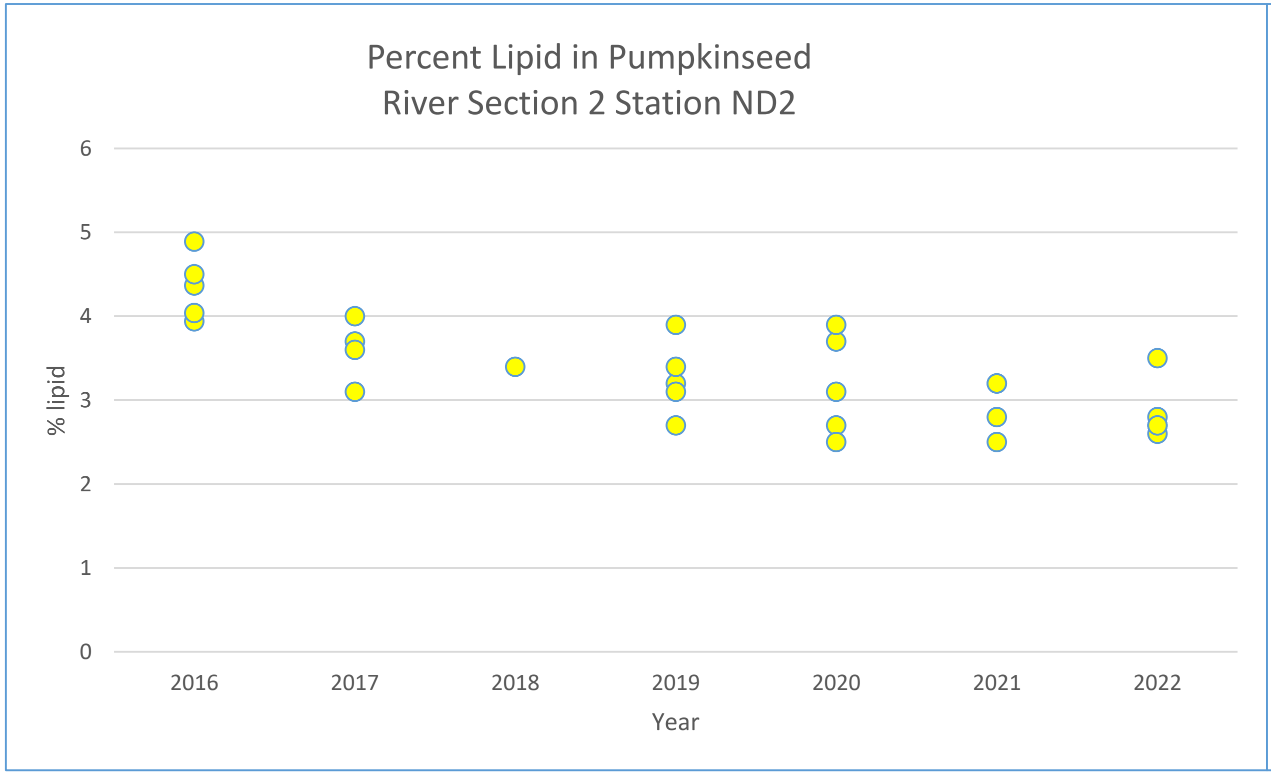


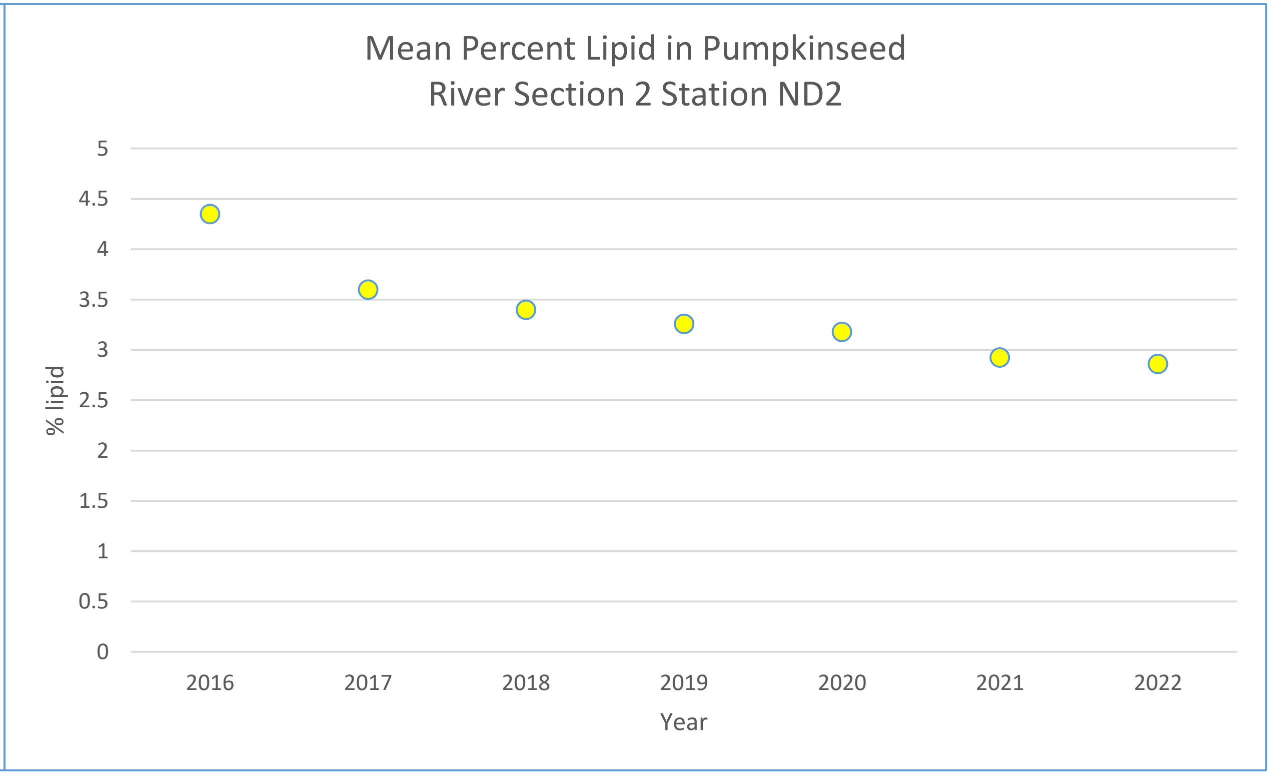
ND2 Pumpkinseed Lipid Based PCB



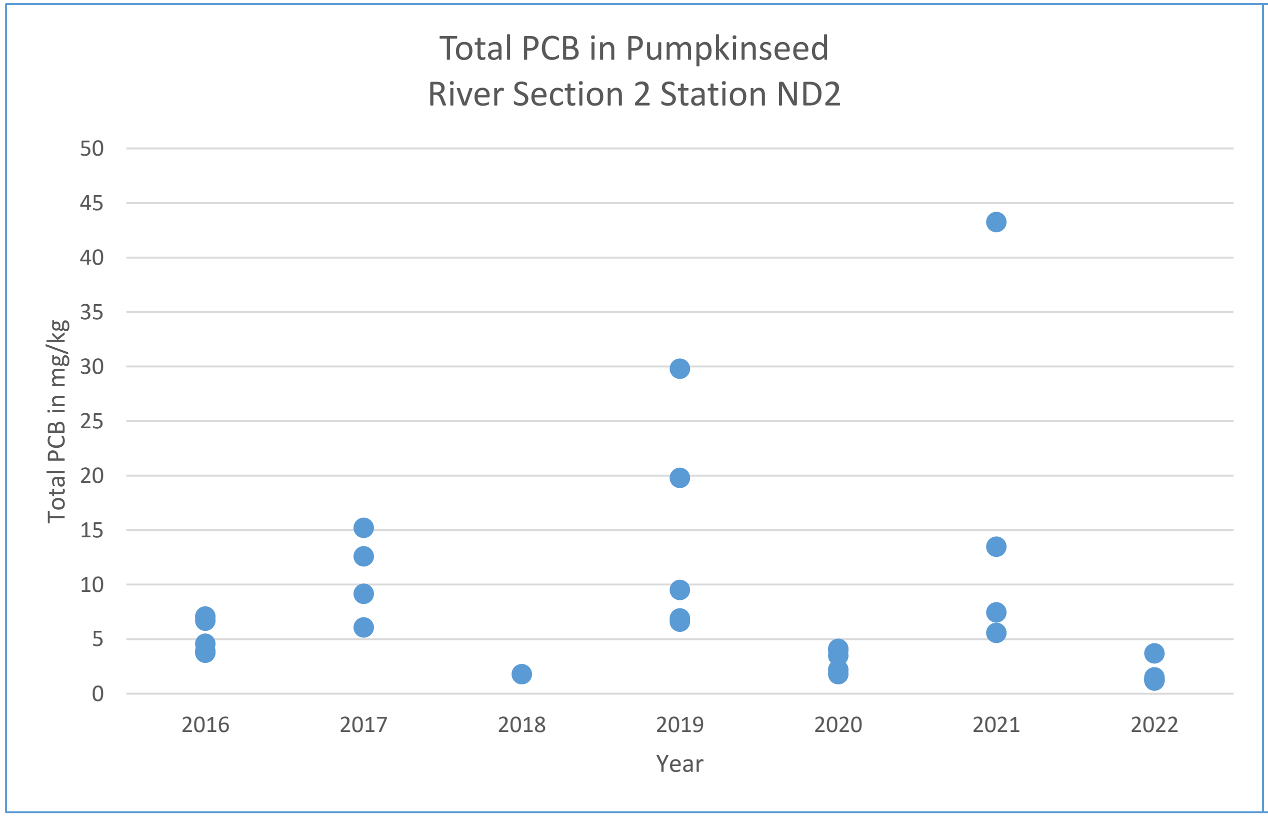


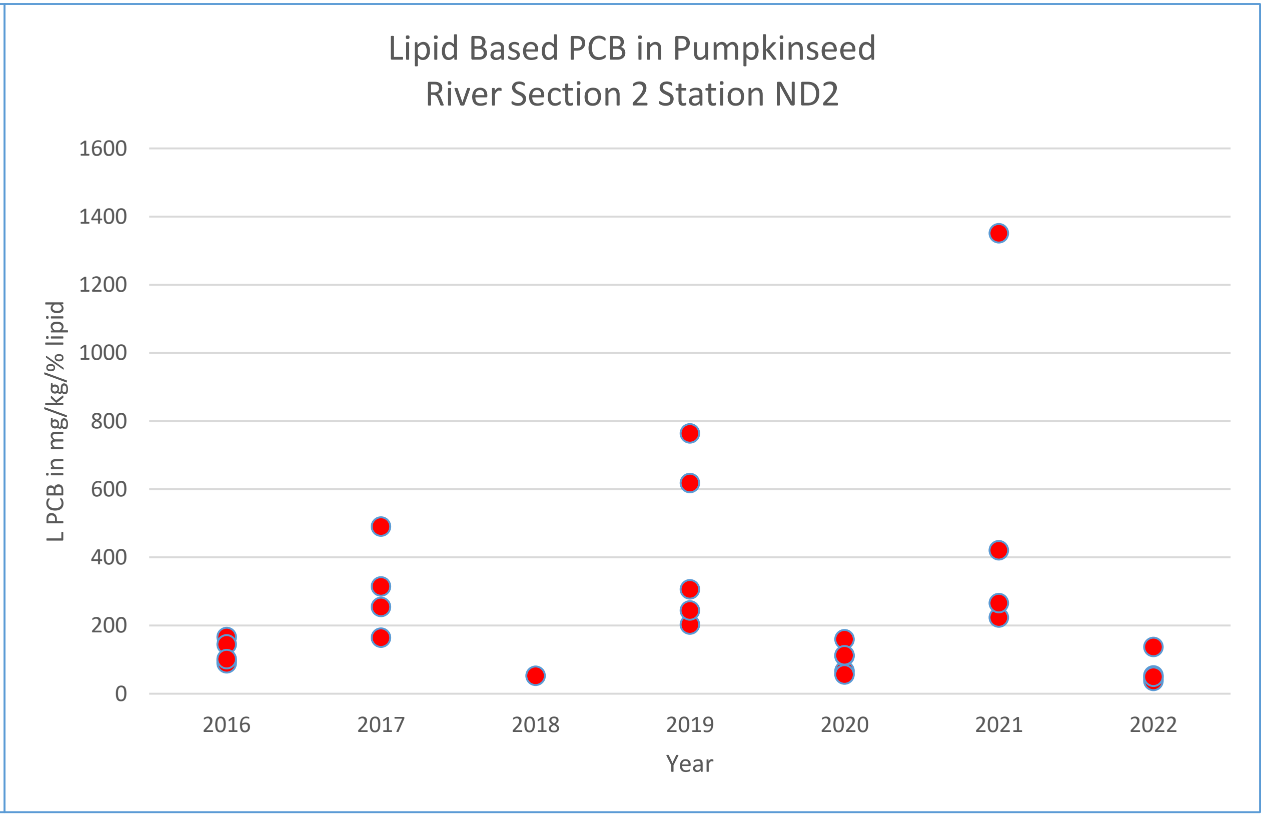
ND2 Pumpkinseed Percent Lipid



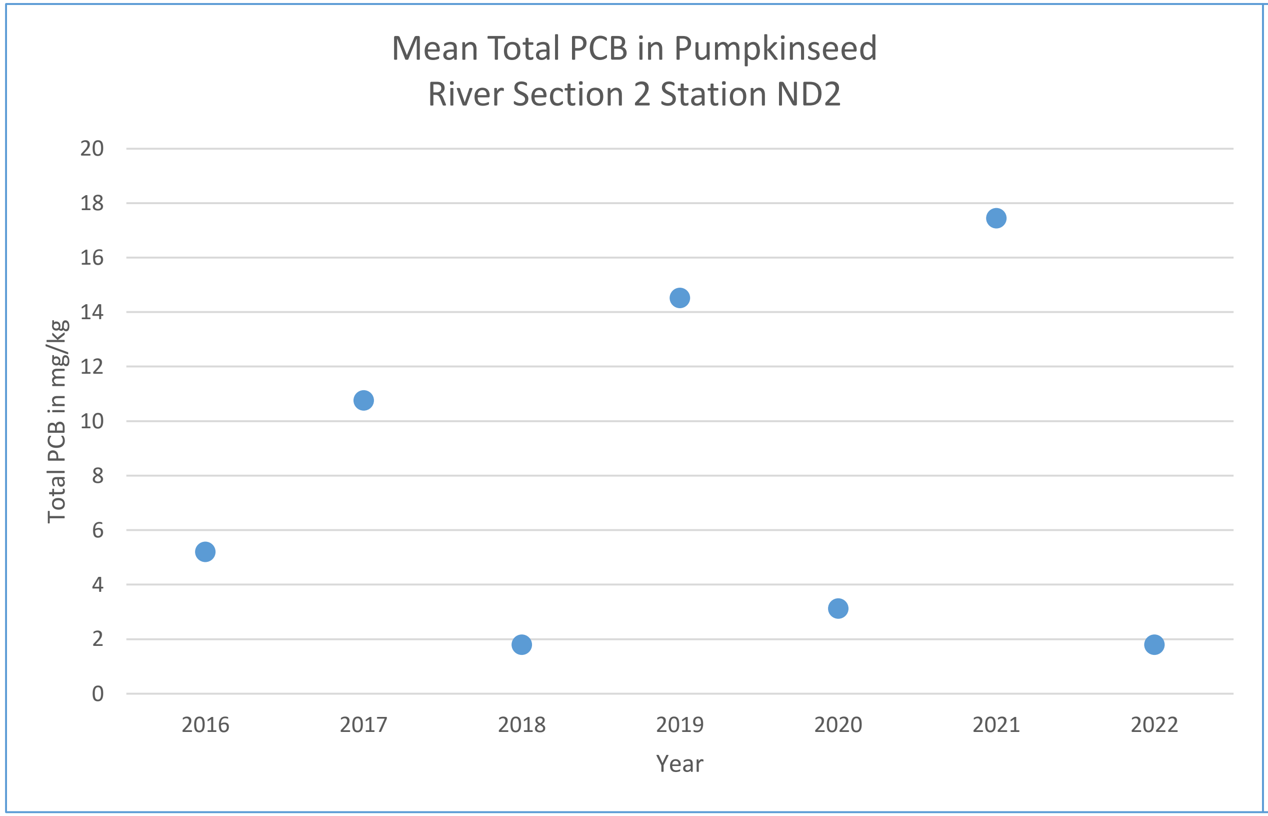


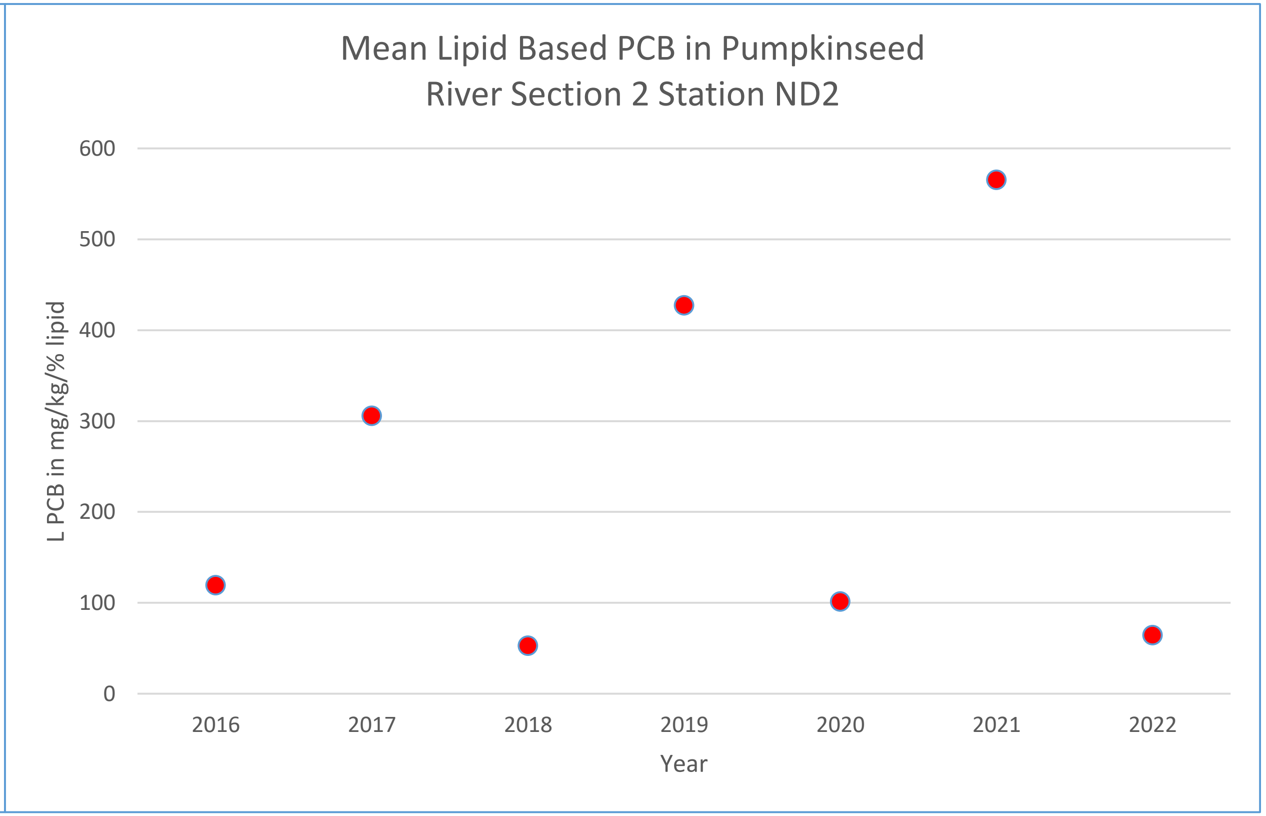
ND2 Pumpkinseed Total PCB and Lipid Based PCB





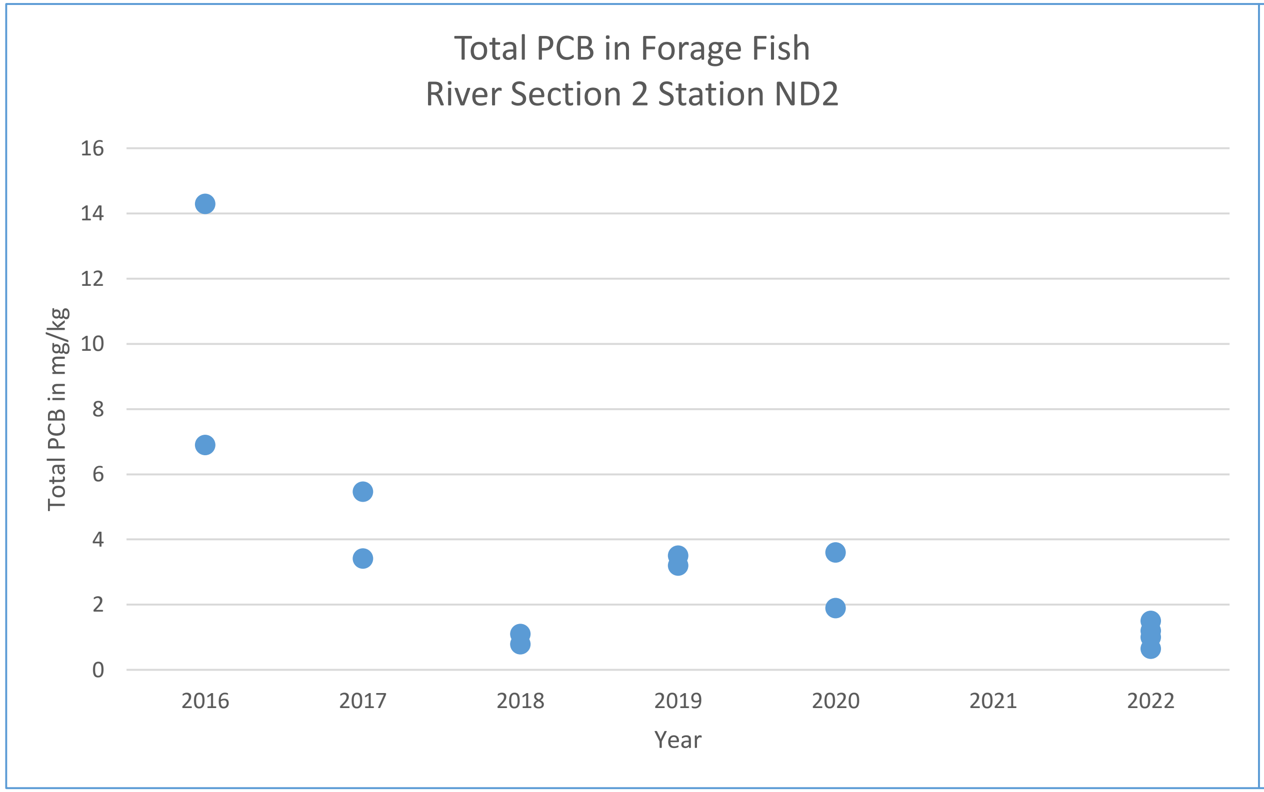
ND2 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

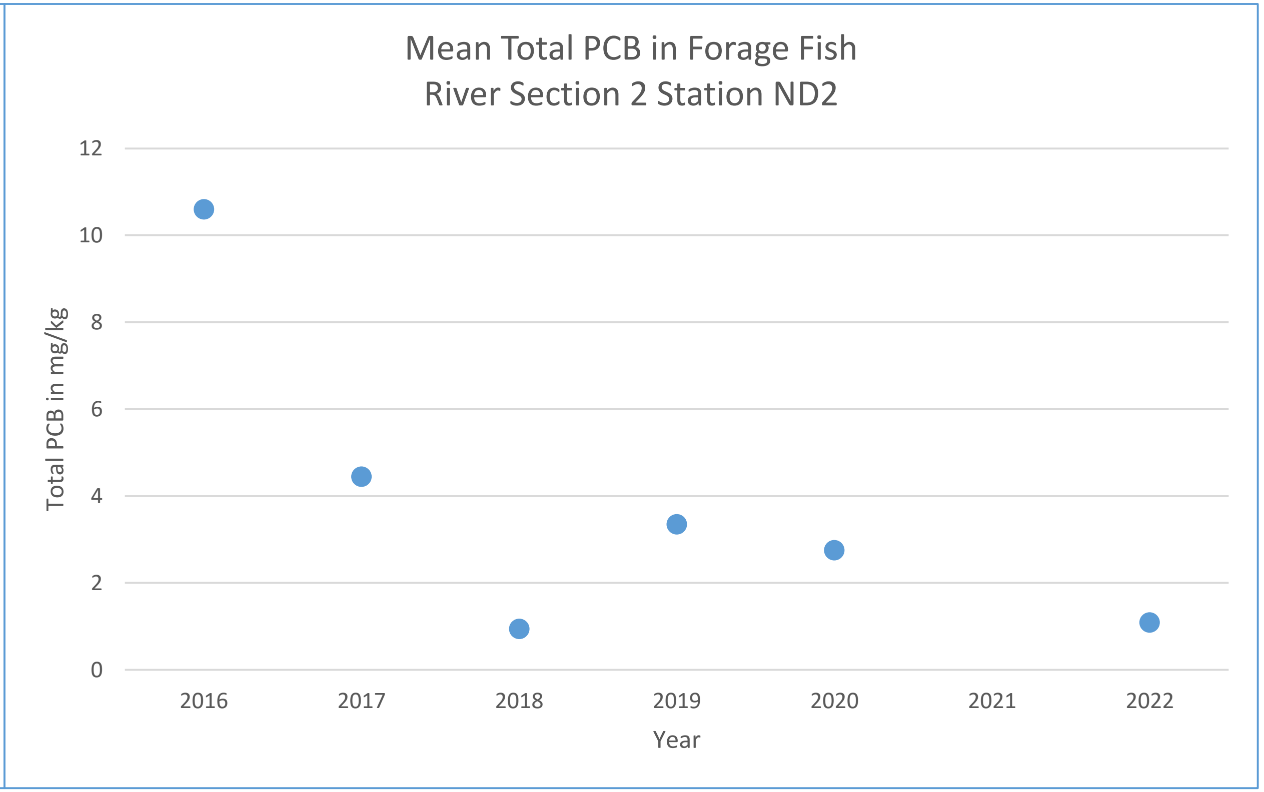




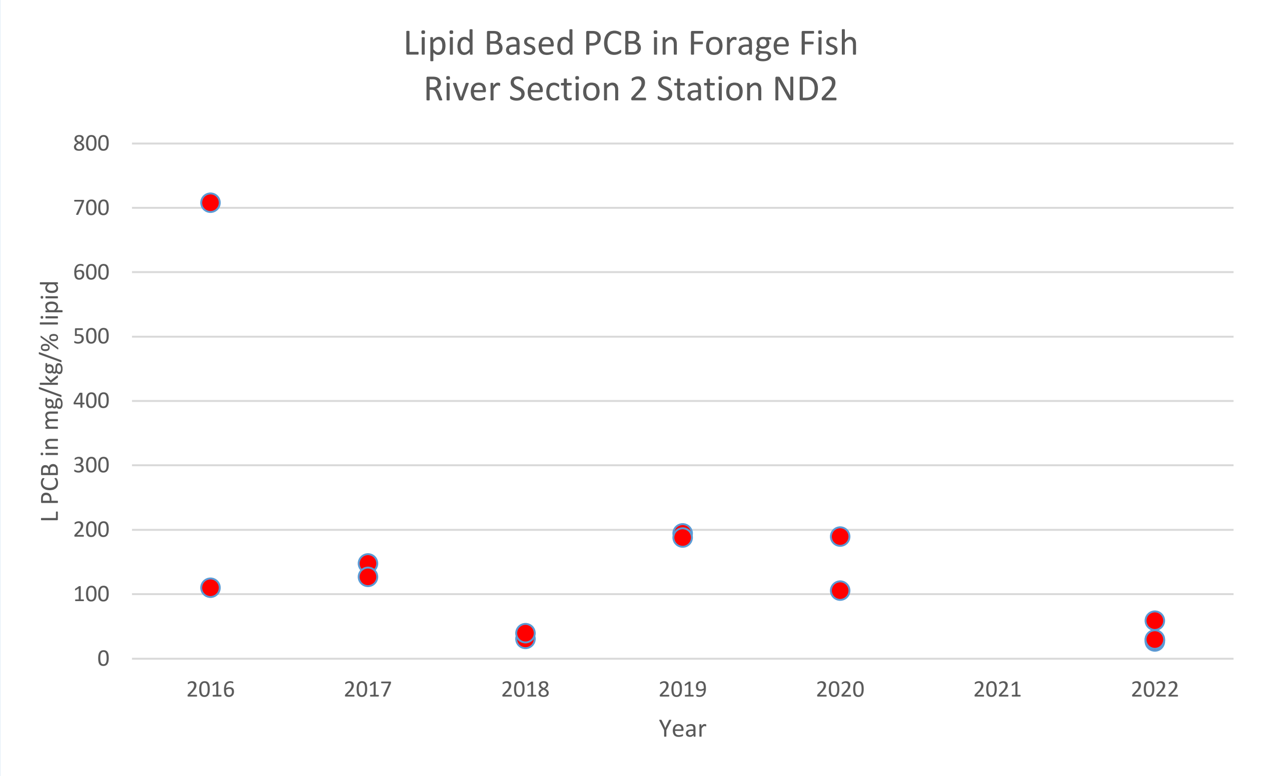
ND2 Forage Fish Data

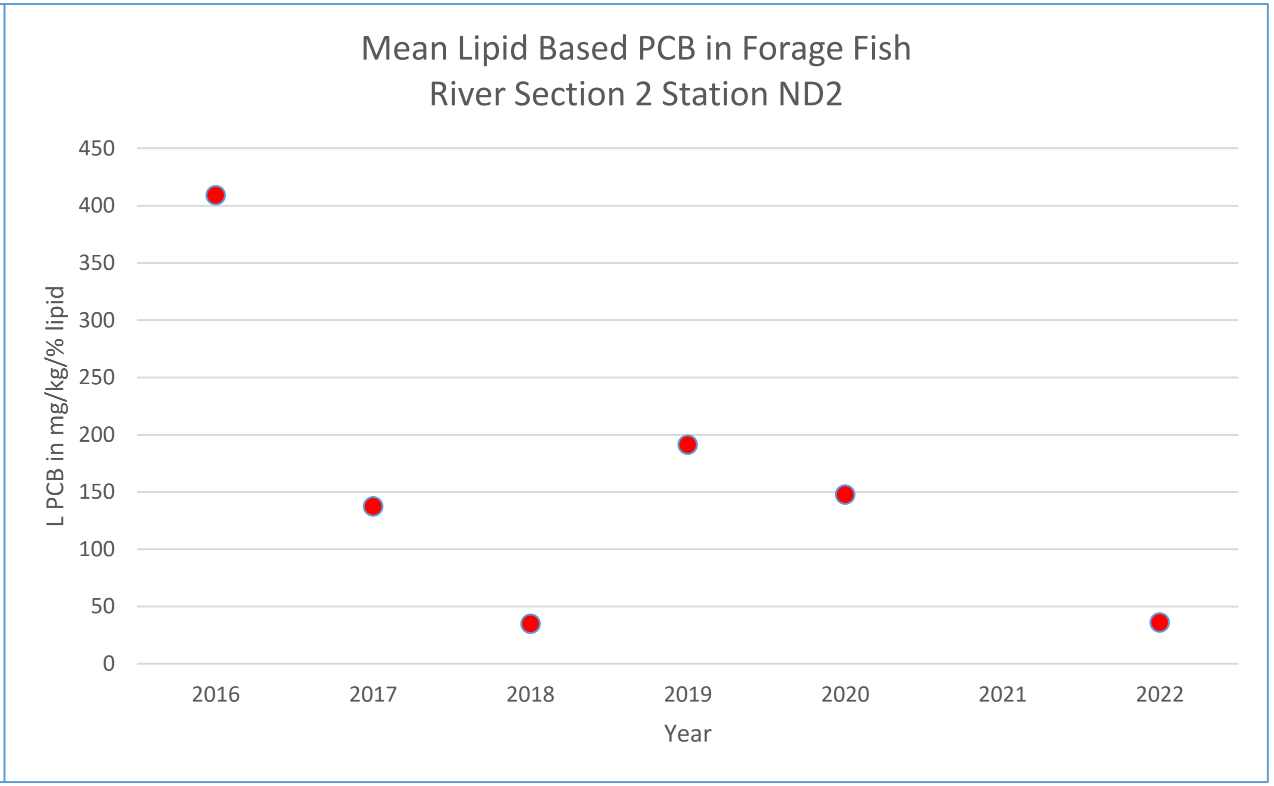
ND2 Forage Fish Total PCB



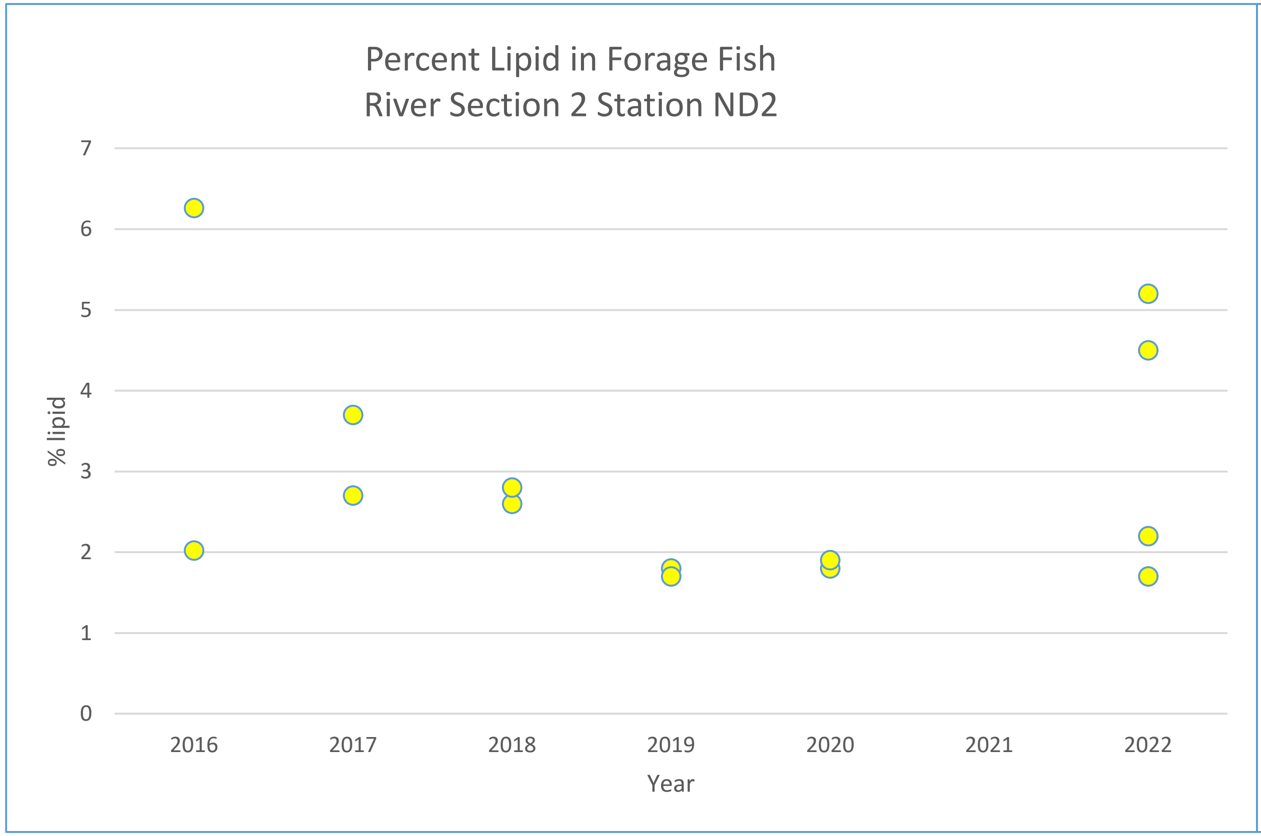


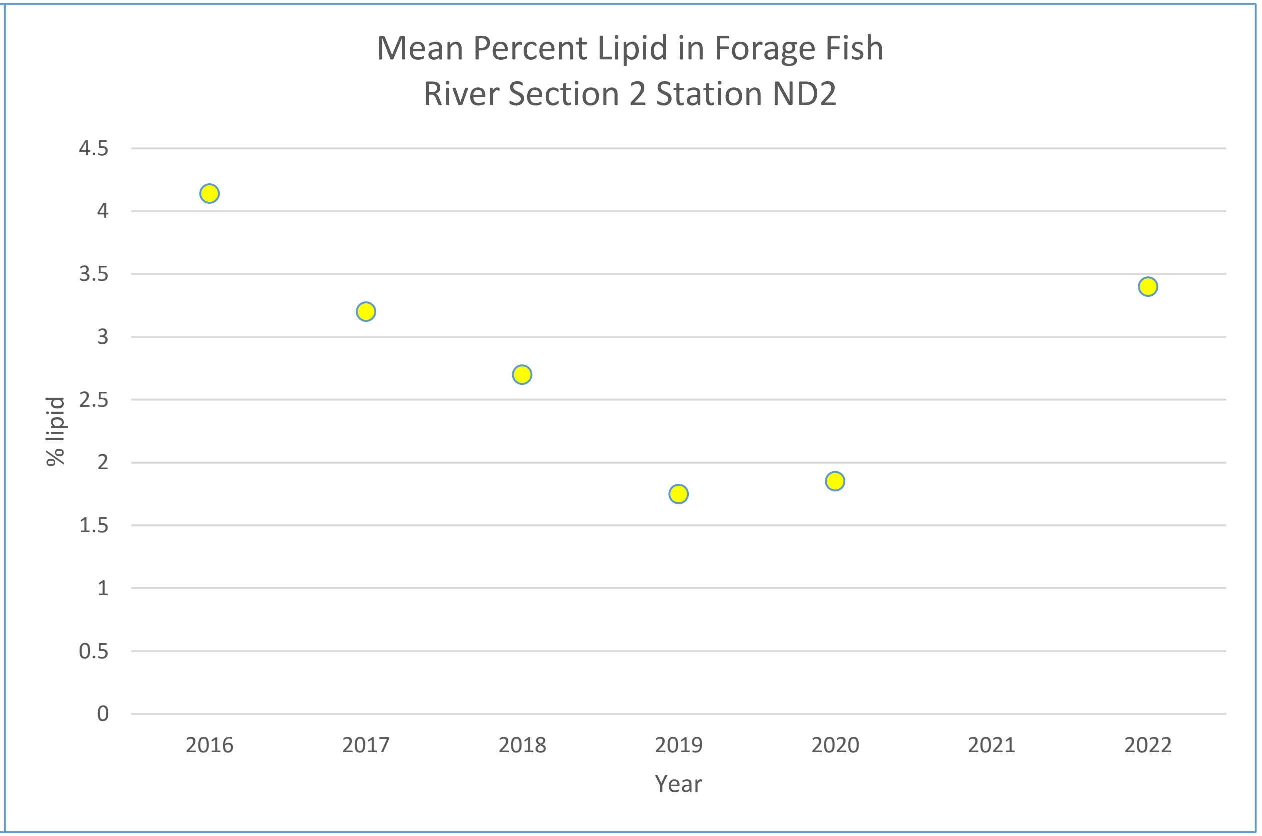
ND2 Forage Fish Lipid Based PCB



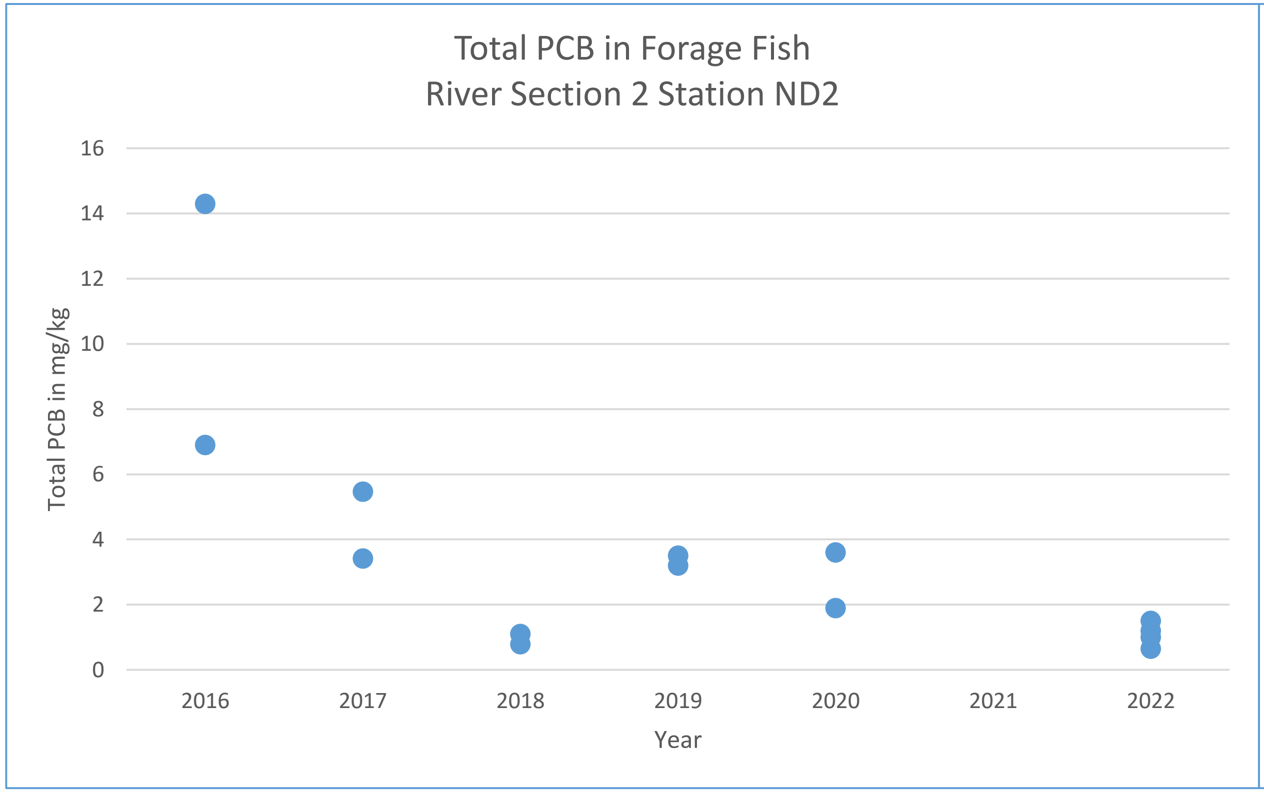


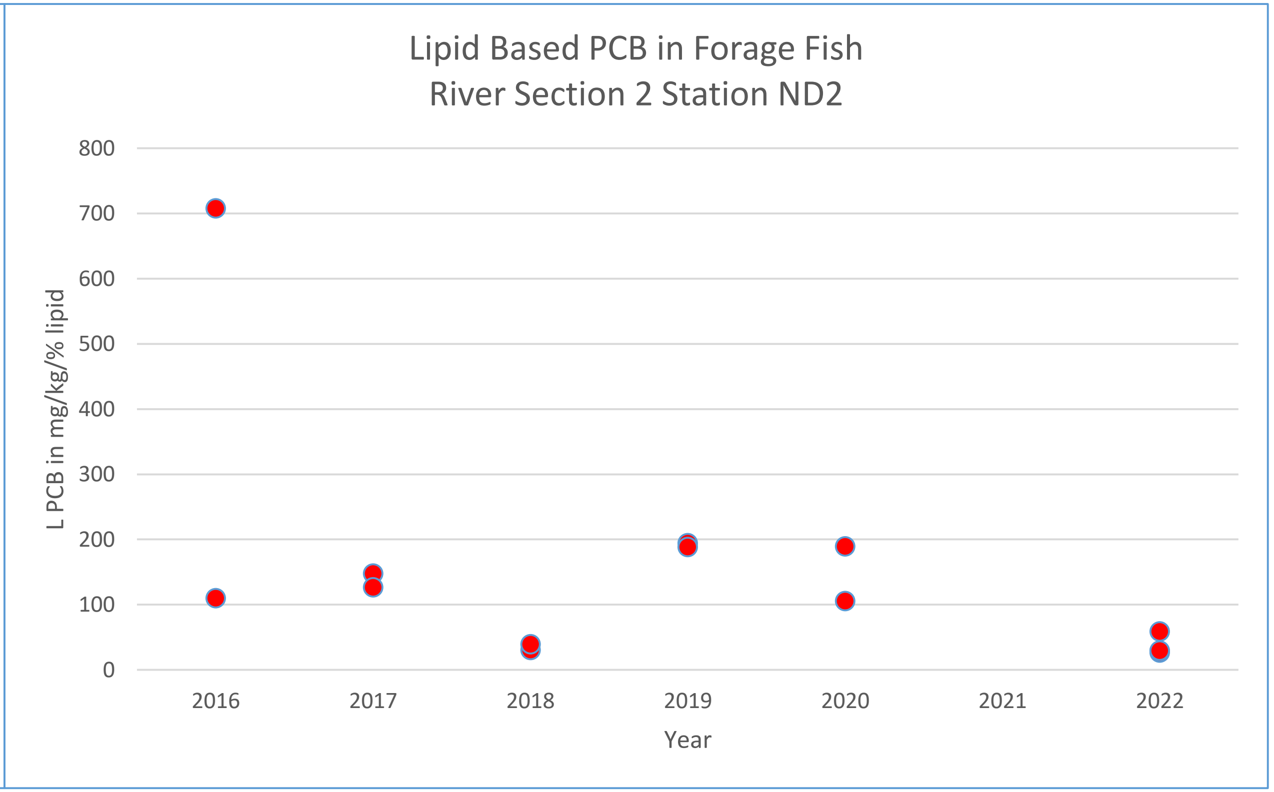
ND2 Forage Fish Percent Lipid



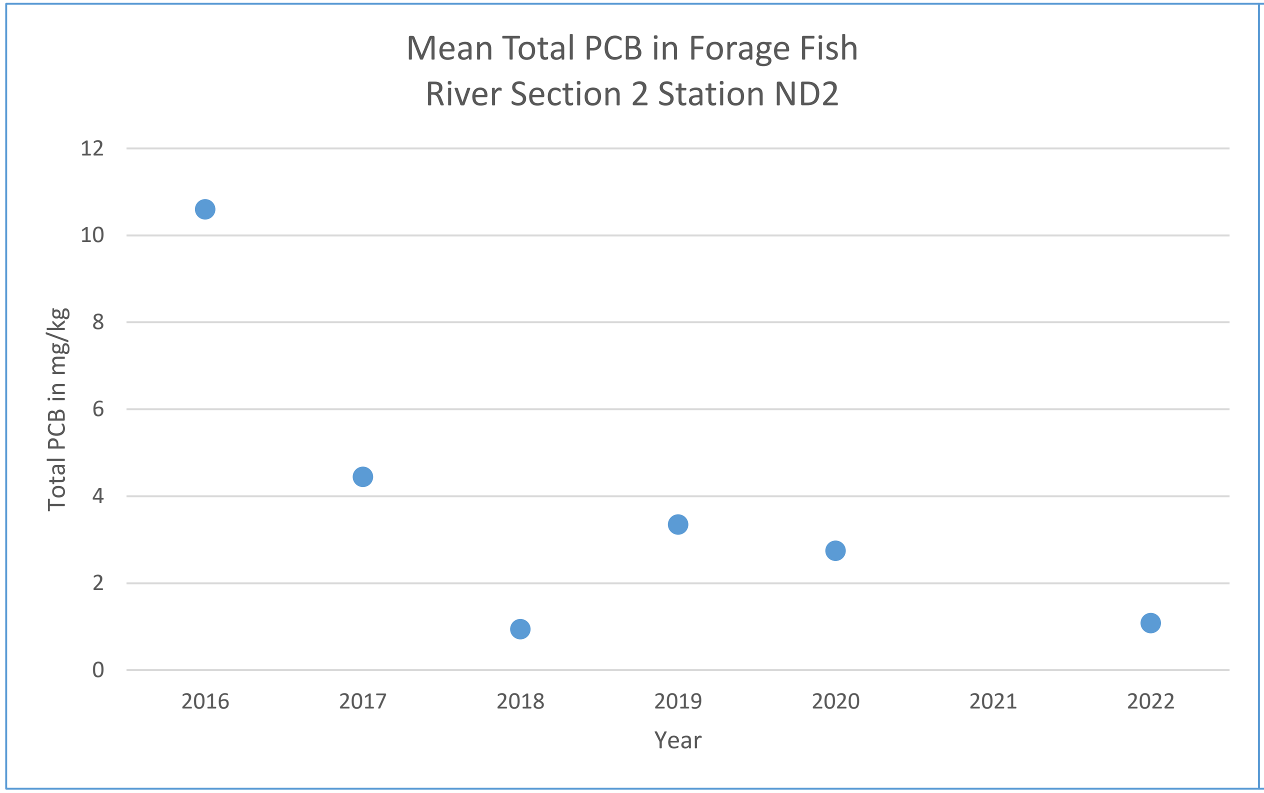


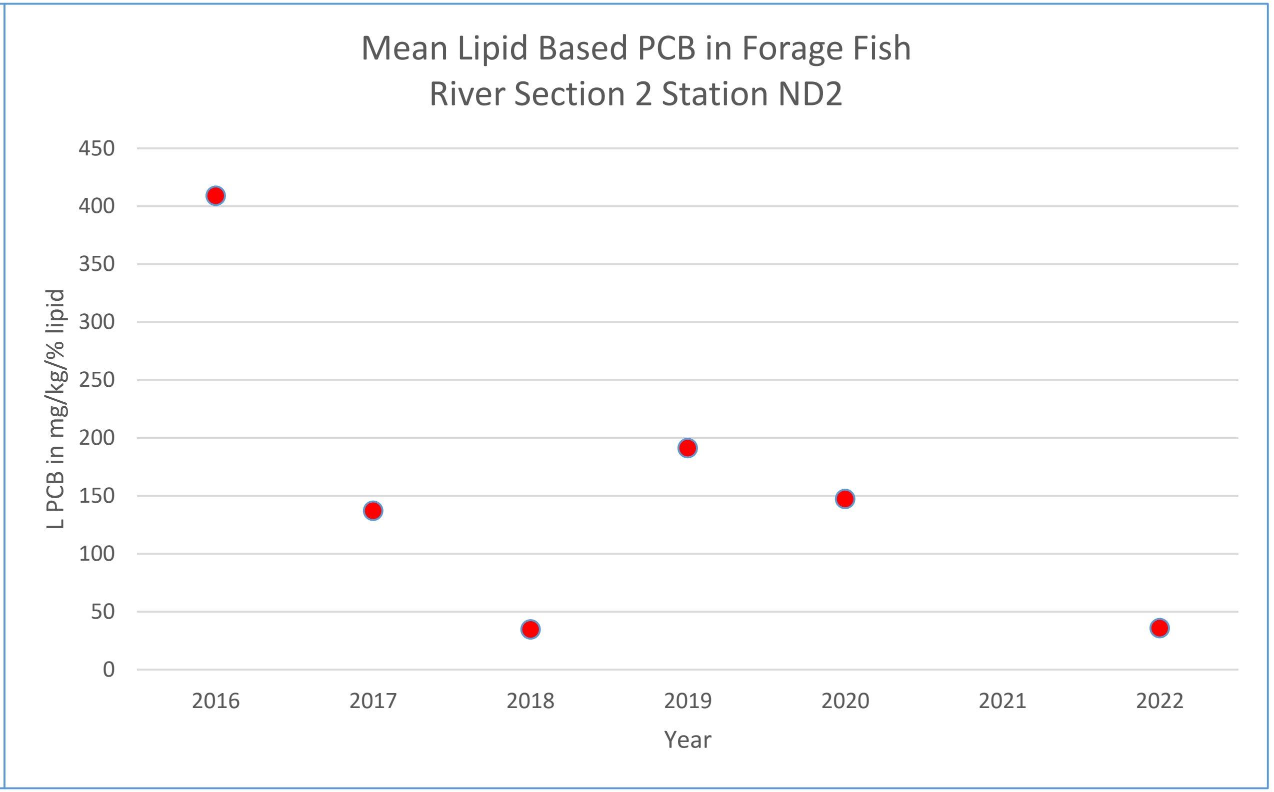
ND2 Forage Fish Total PCB and Lipid Based PCB





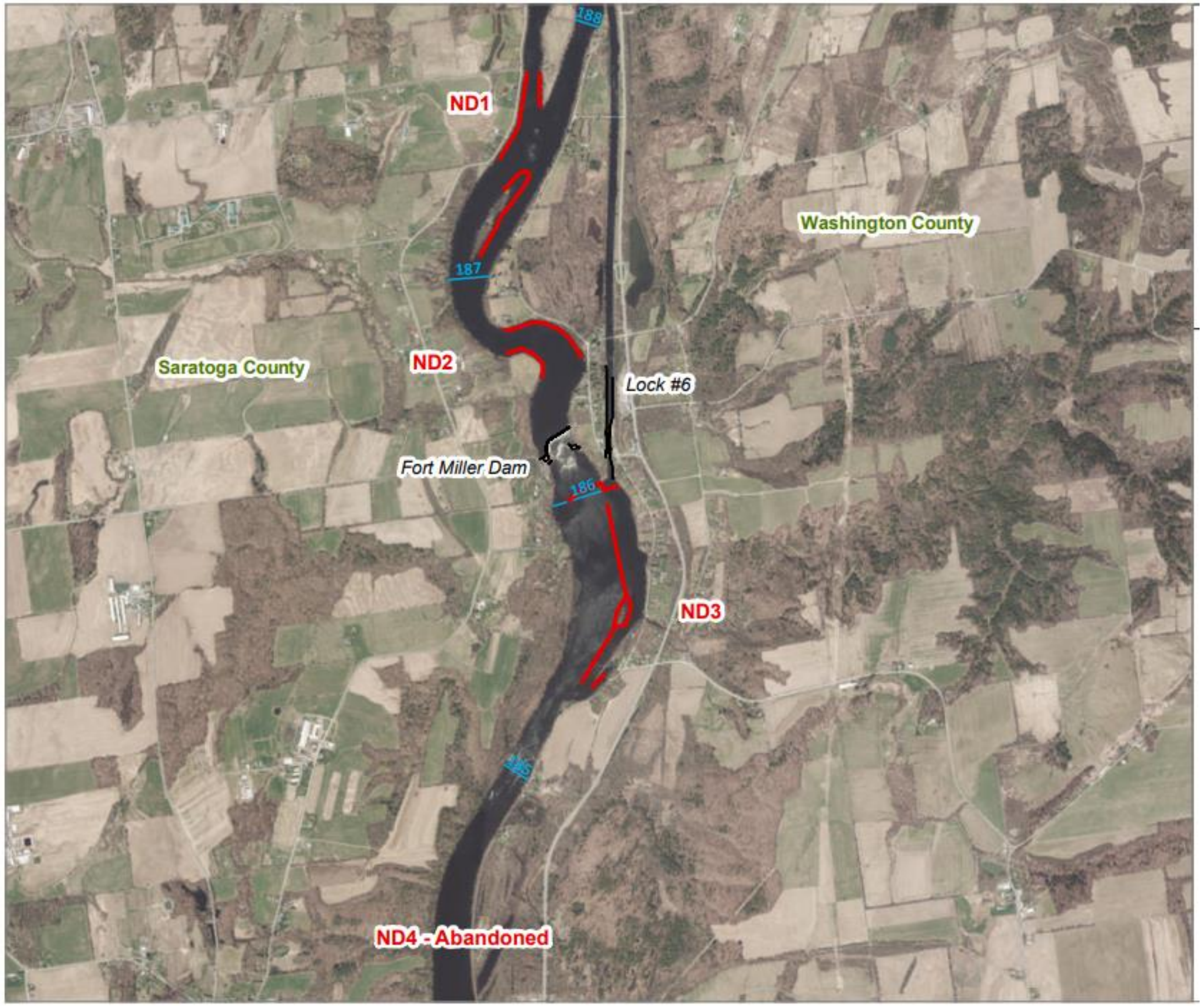
ND2 Forage Fish Mean Total PCB and Mean Lipid Based PCB





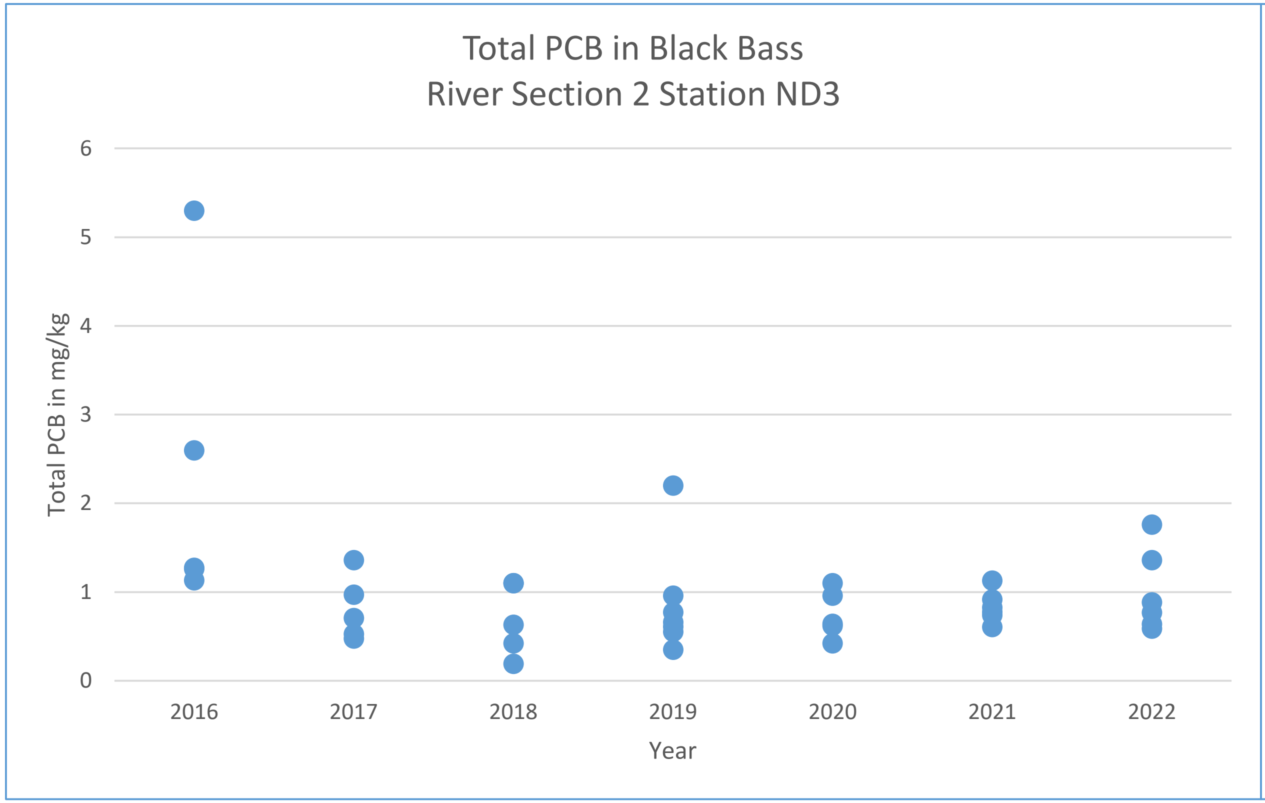
Station ND3

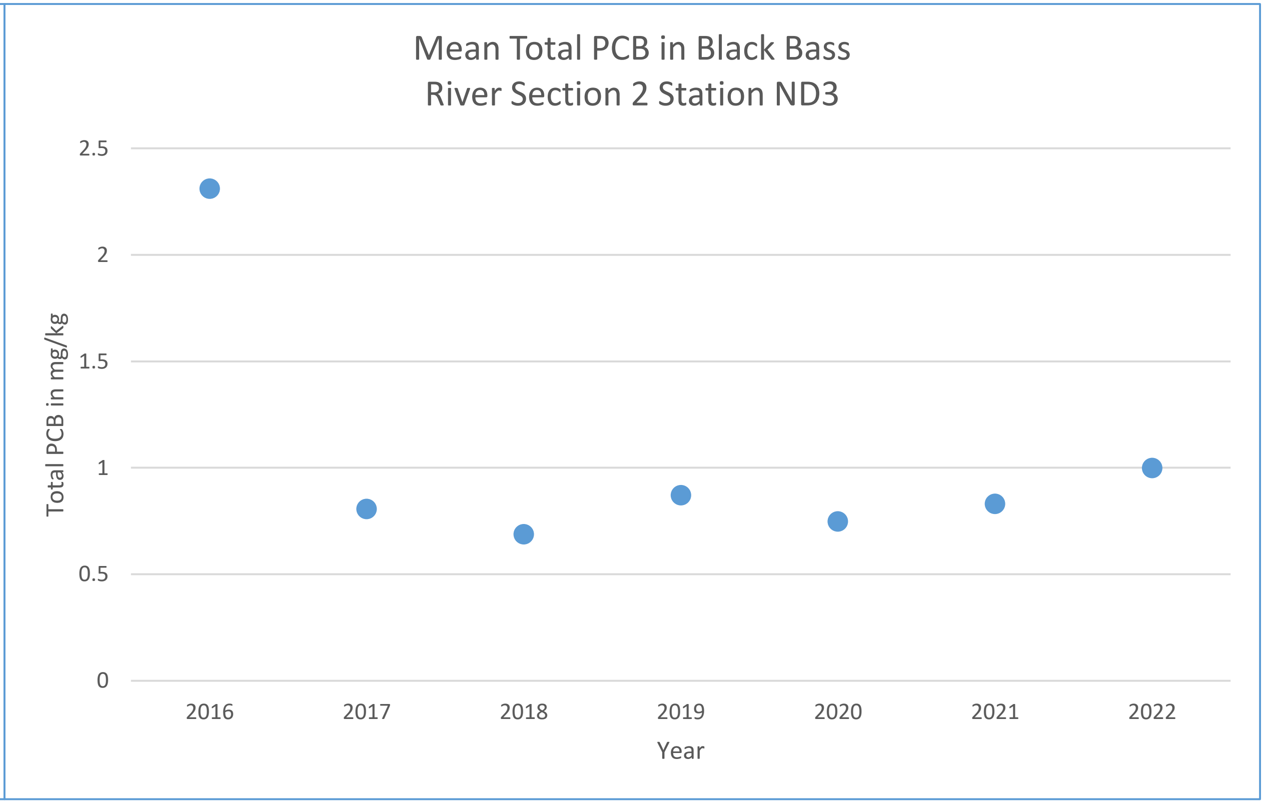
Stations ND1, ND2, and ND3



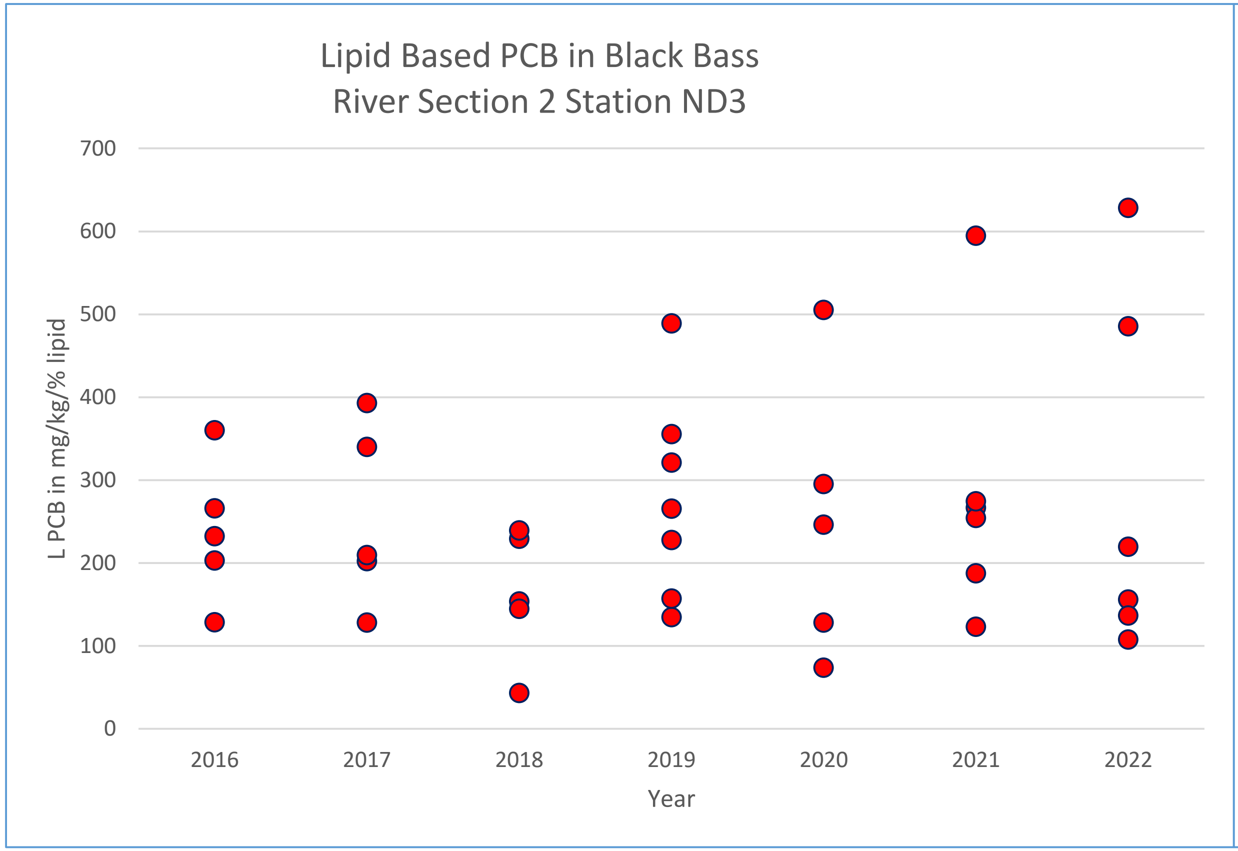
ND3 Black Bass Data

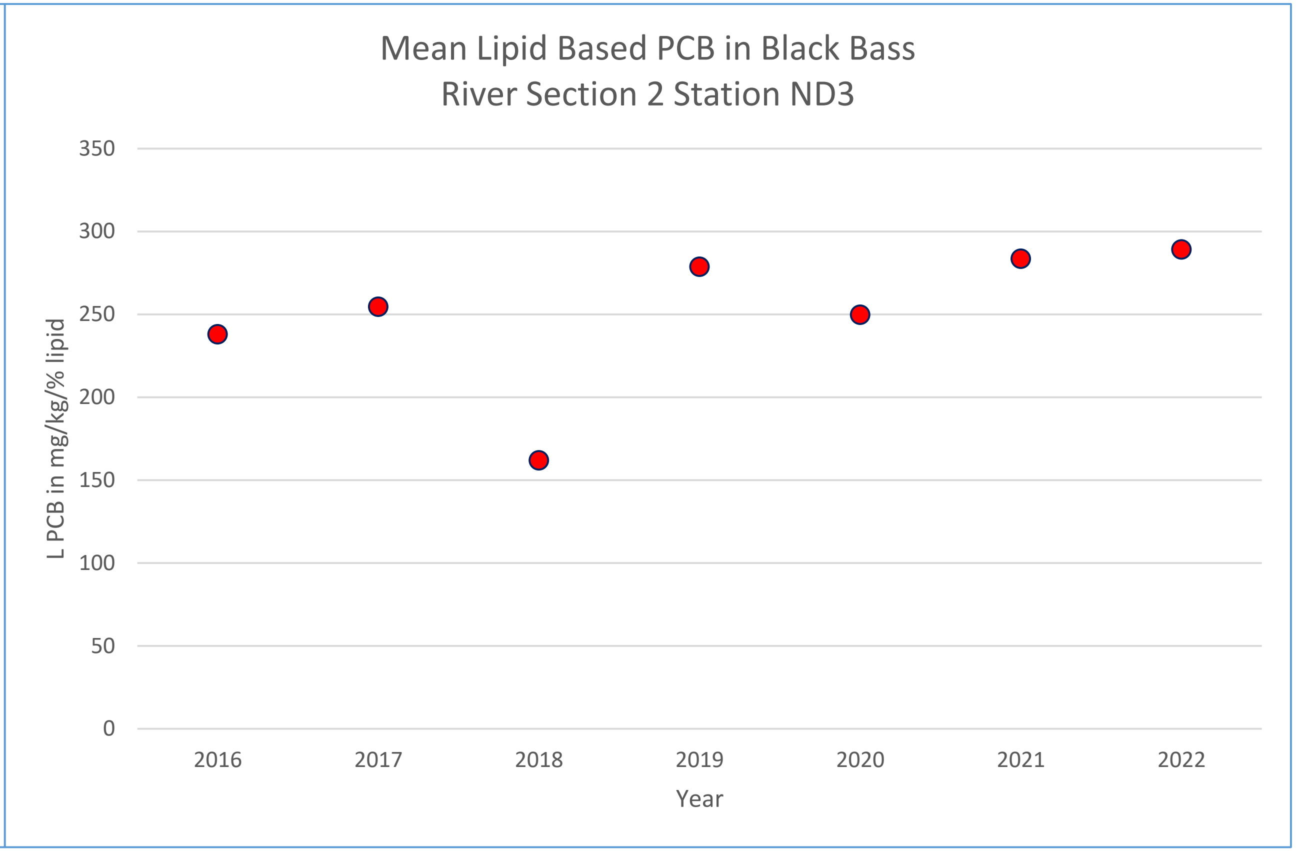
ND3 Black Bass Total PCB



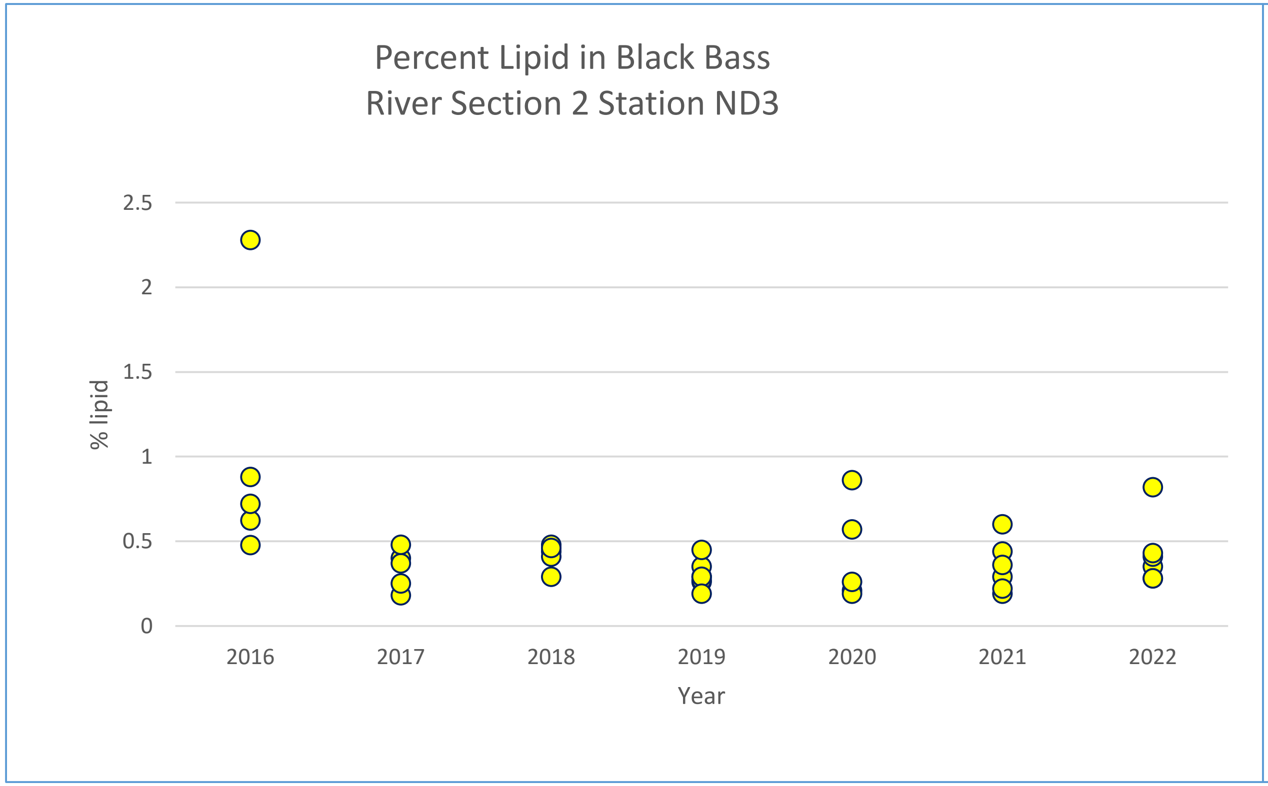


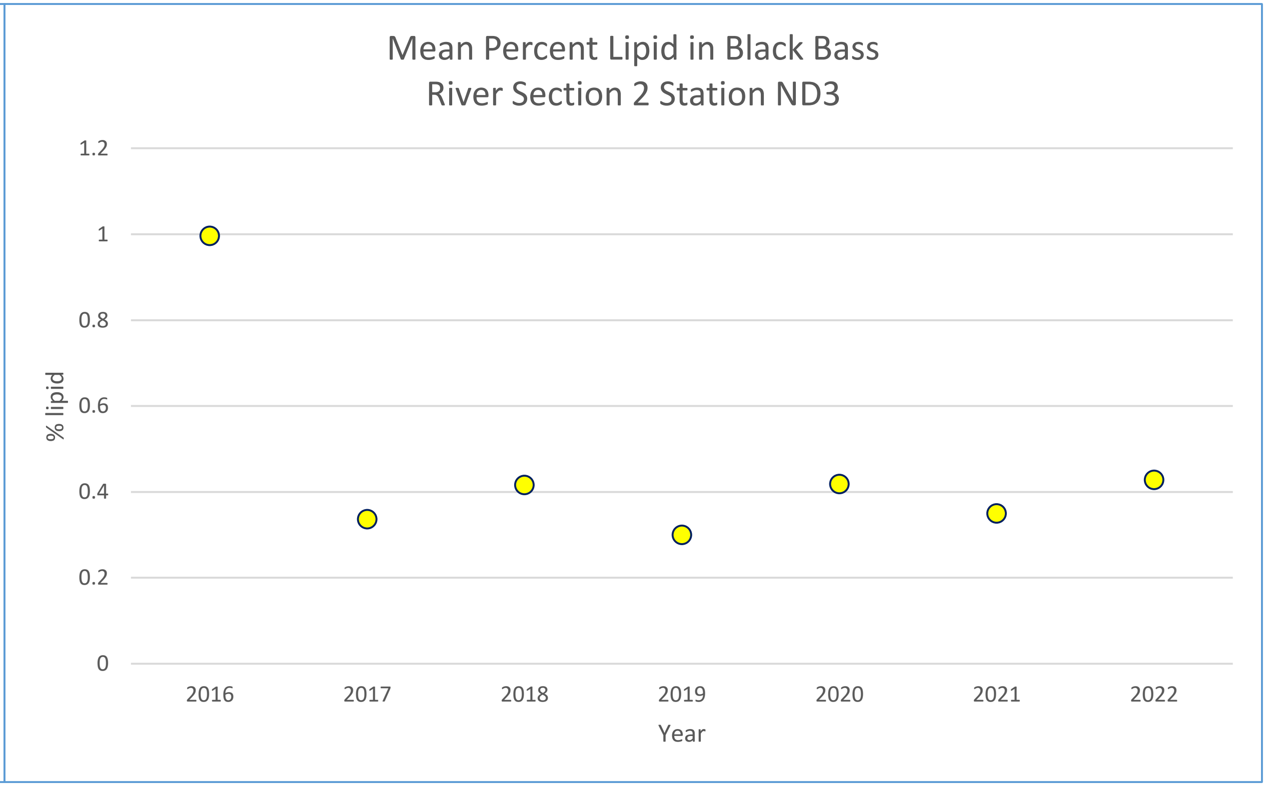
ND3 Black Bass Lipid Based PCB



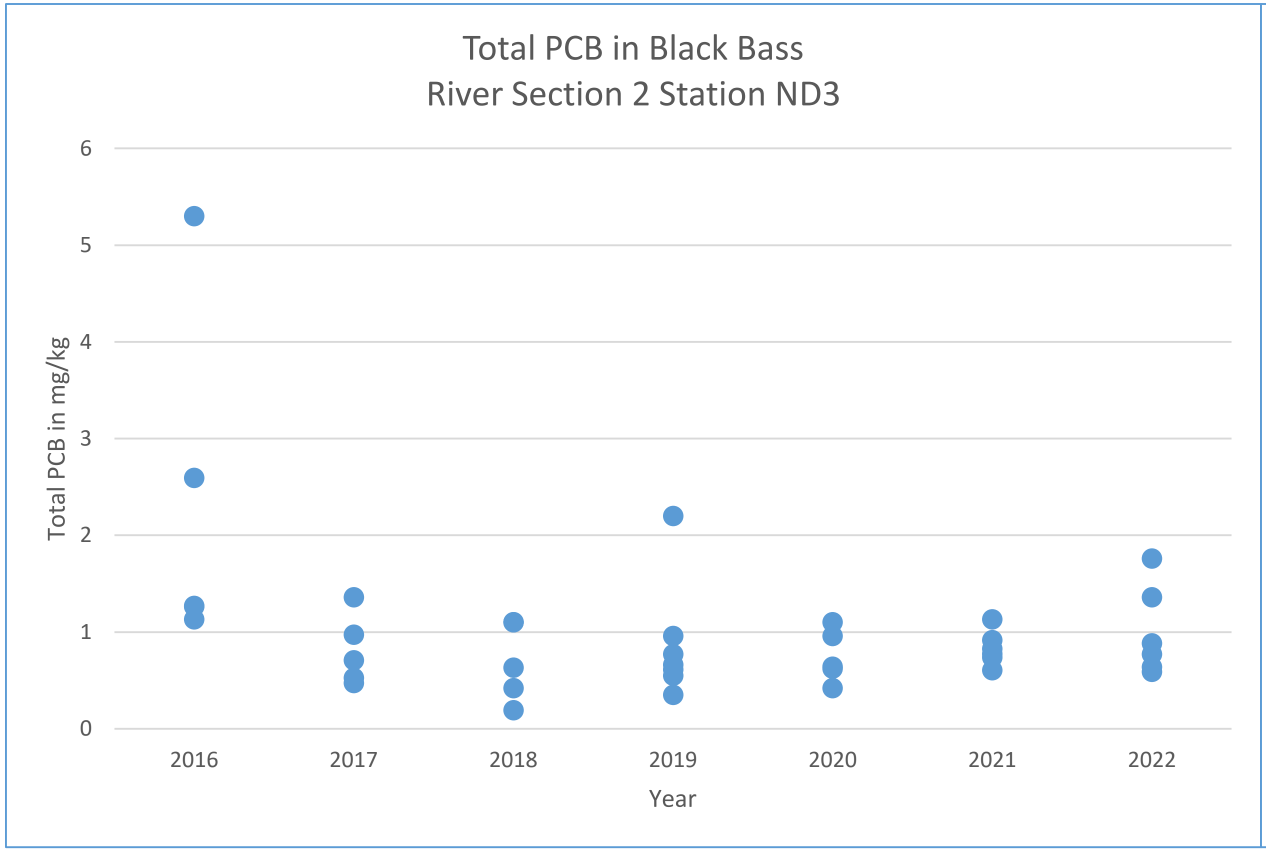


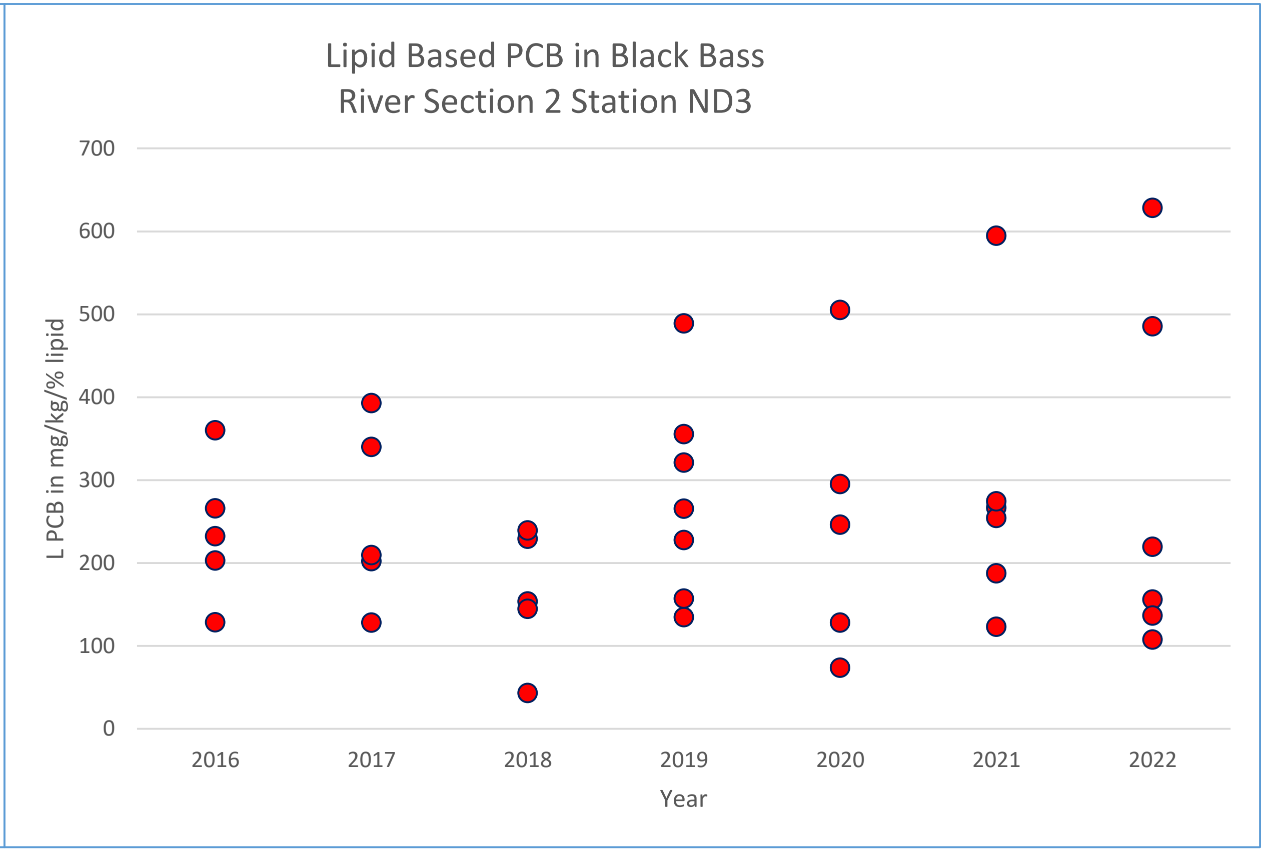
ND3 Black Bass Percent Lipid



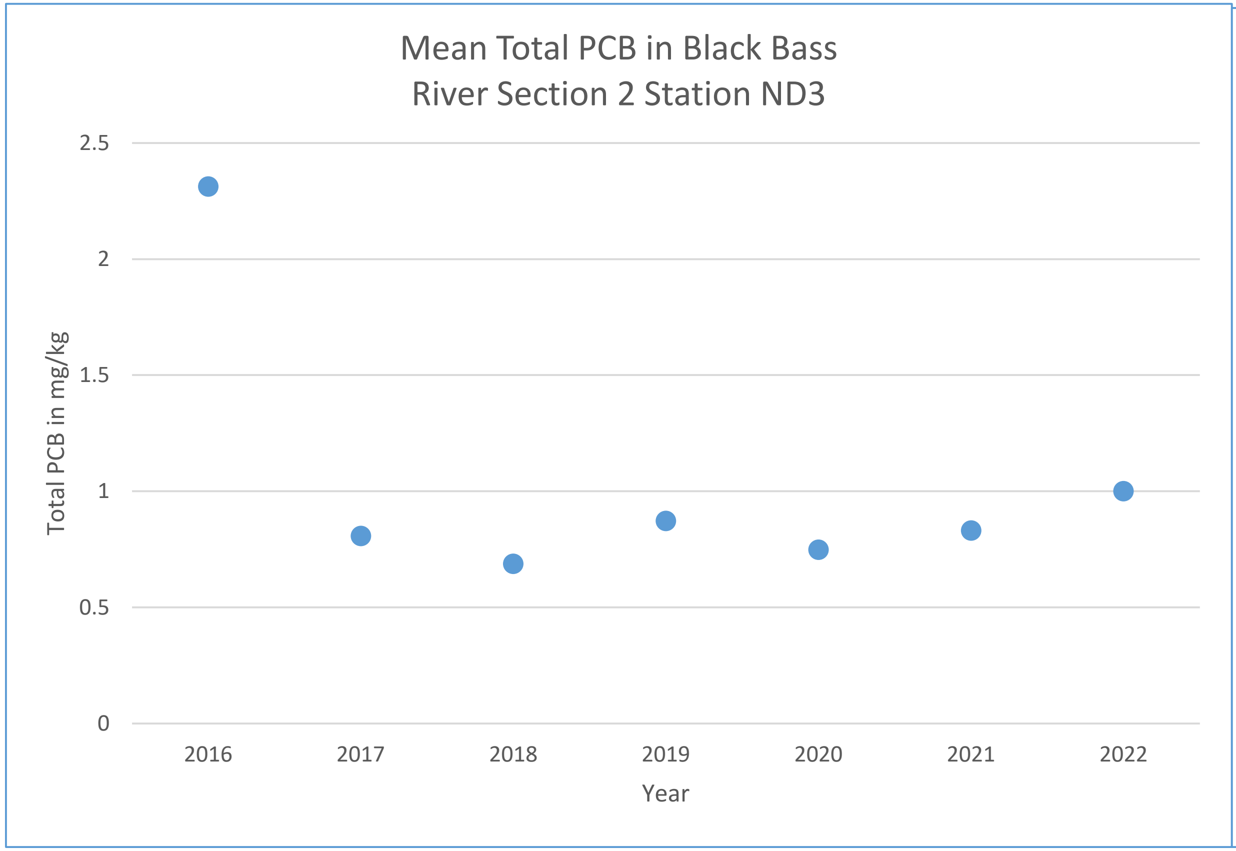


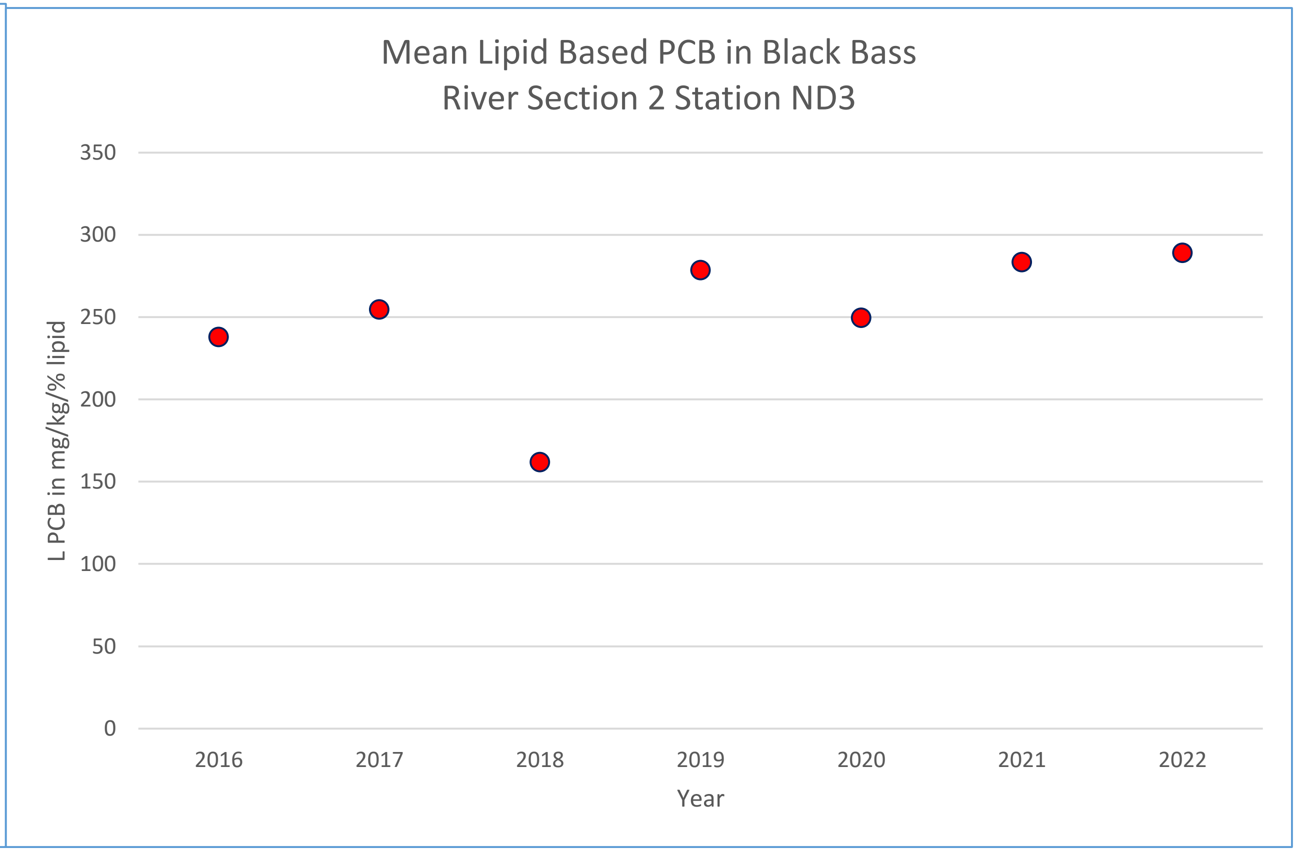
ND3 Black Bass Total PCB and Lipid Based PCB





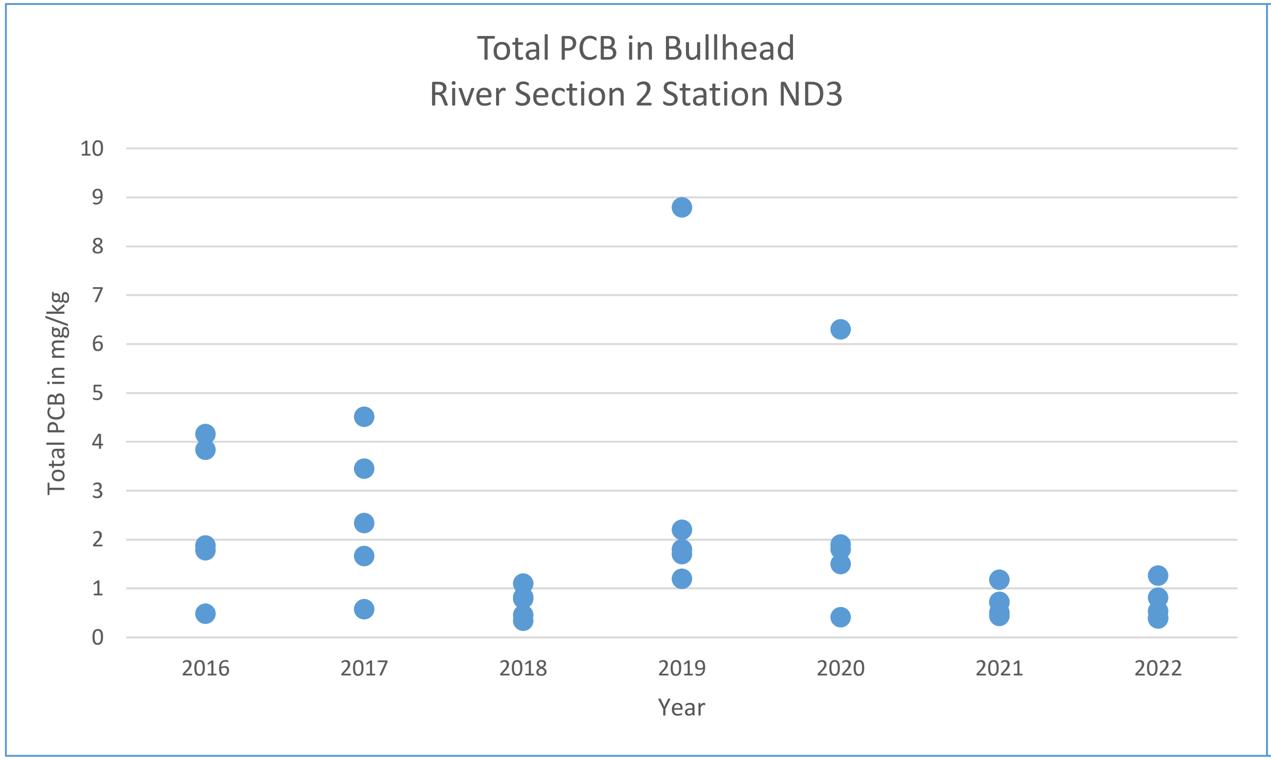
ND3 Black Bass Mean Total PCB and Mean Lipid Based PCB

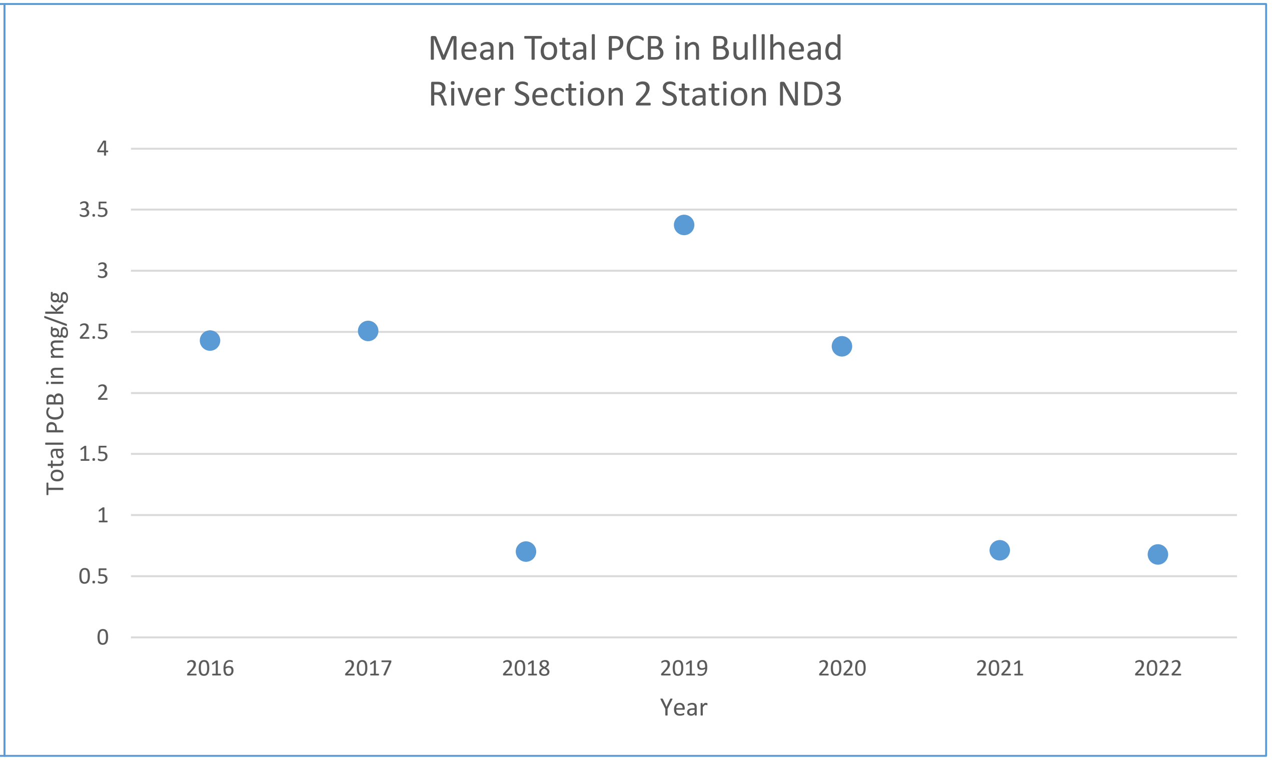




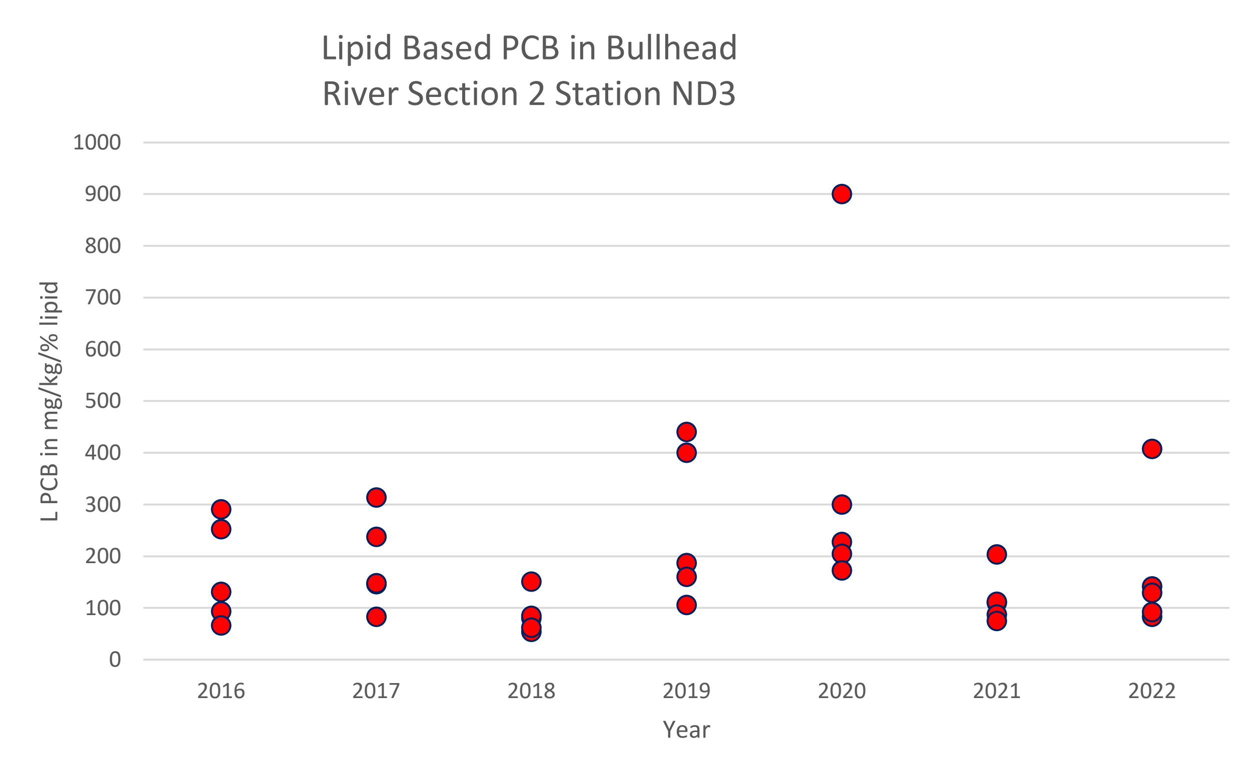
ND3 Bullhead Data

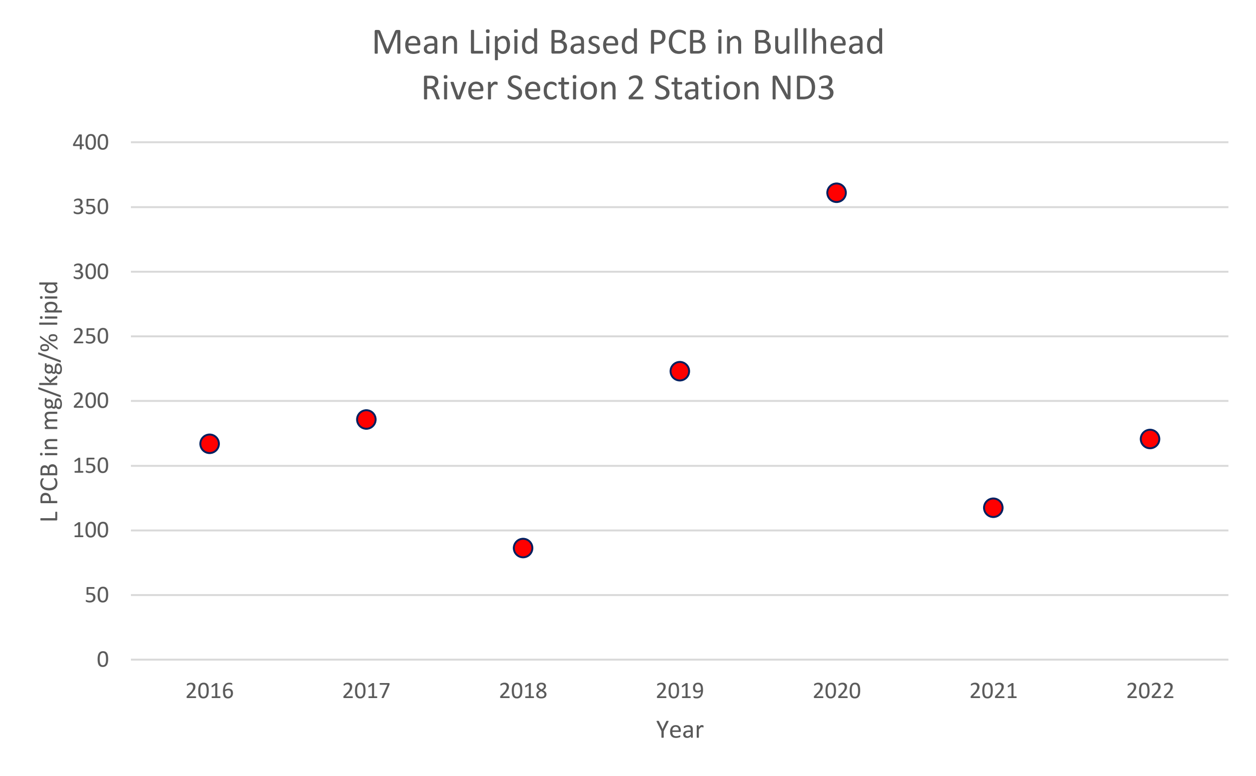
ND3 Bullhead Total PCB



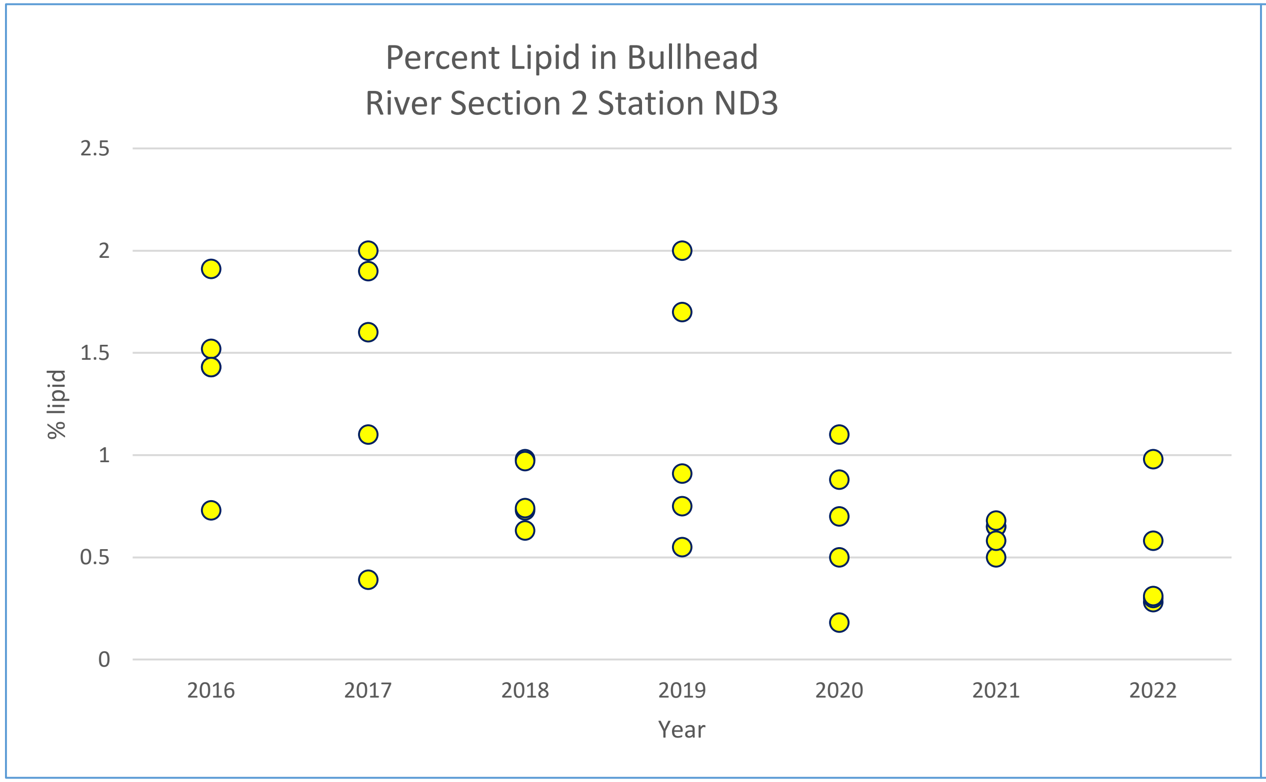


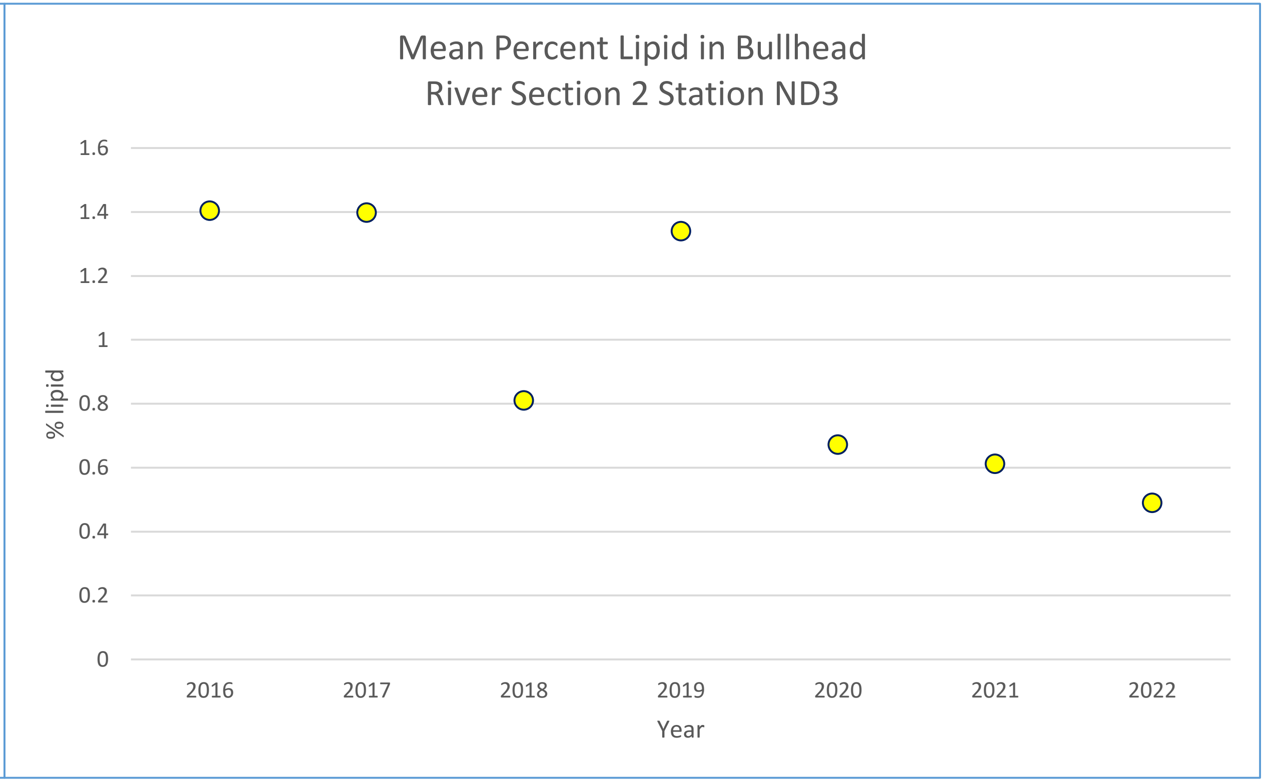
ND3 Bullhead Lipid Based PCB



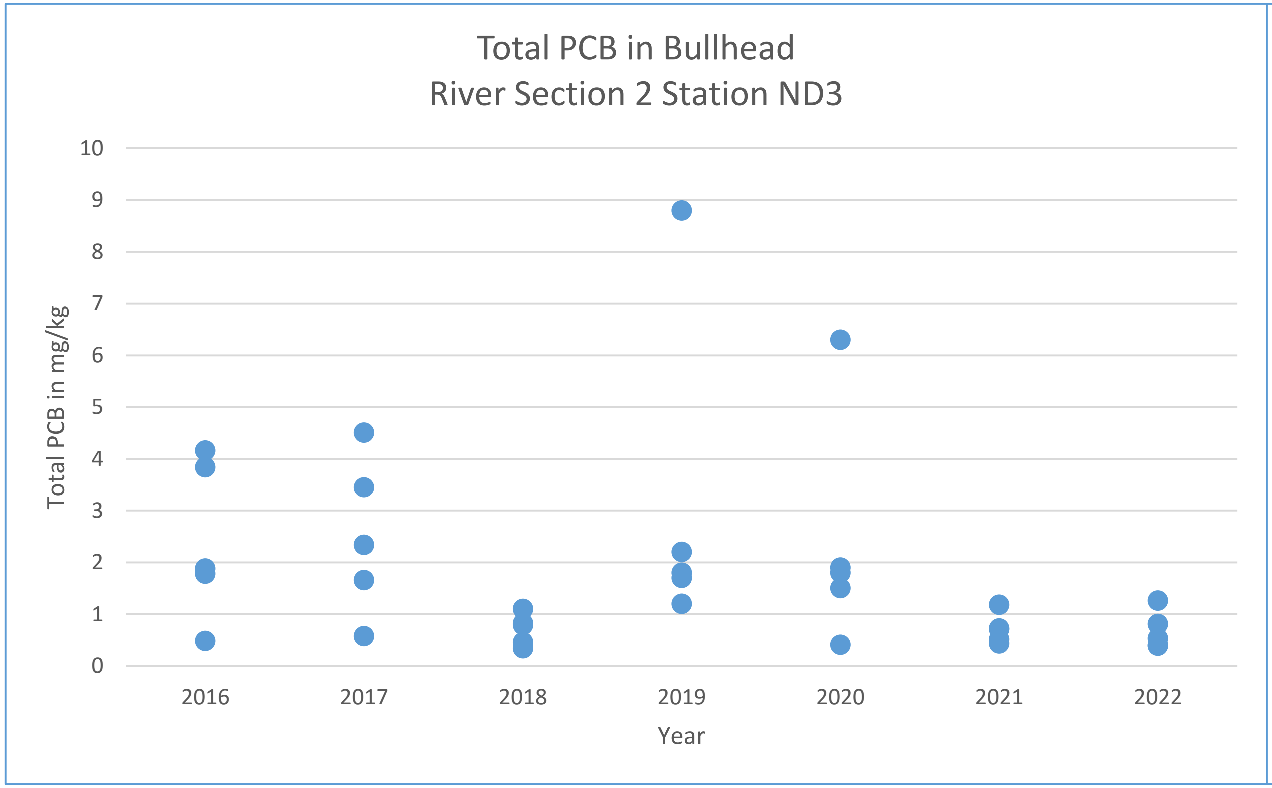


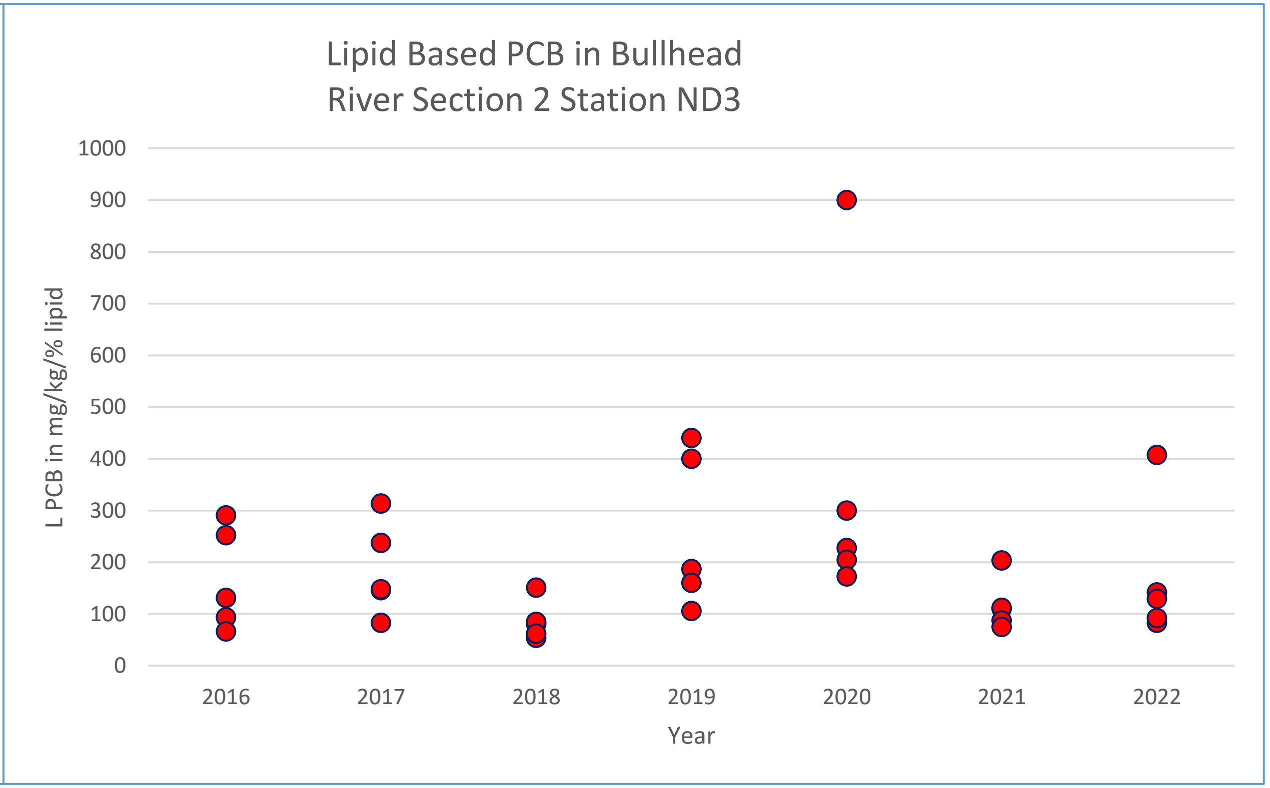
ND3 Bullhead Percent Lipid



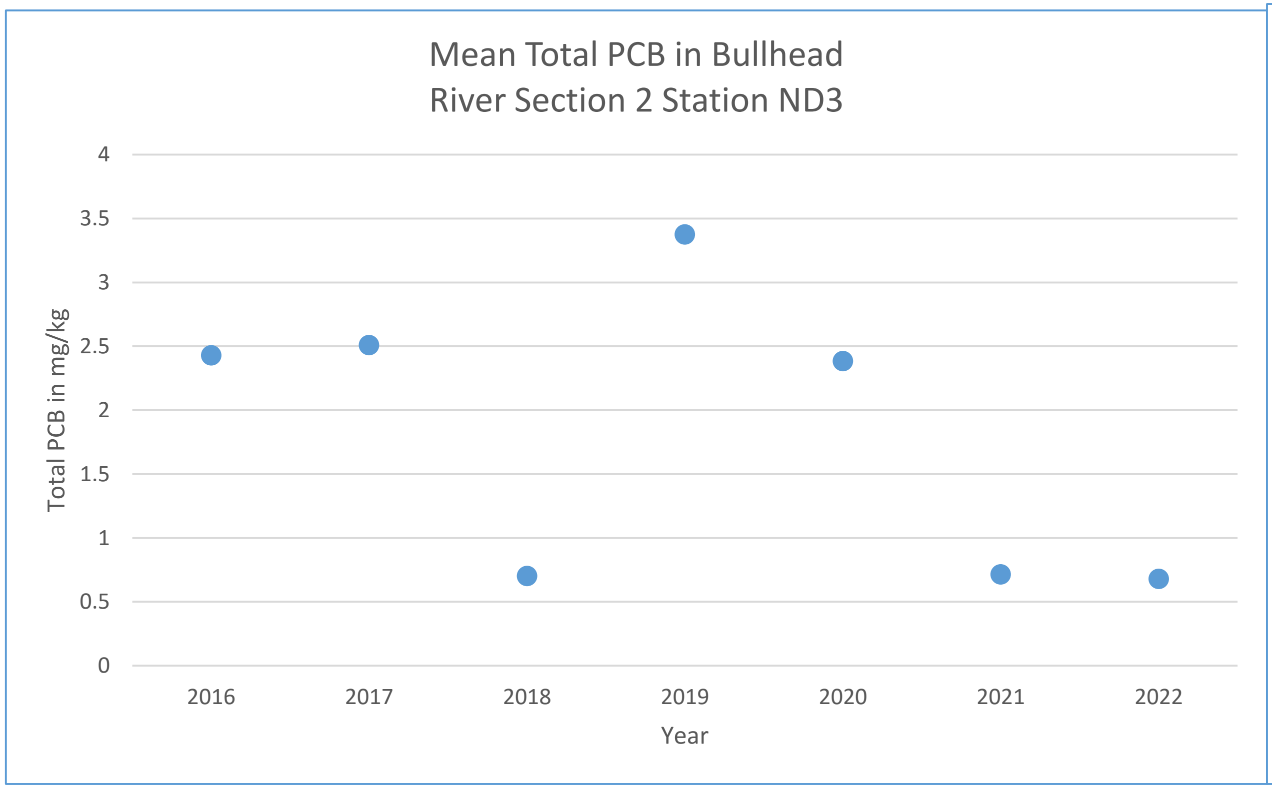


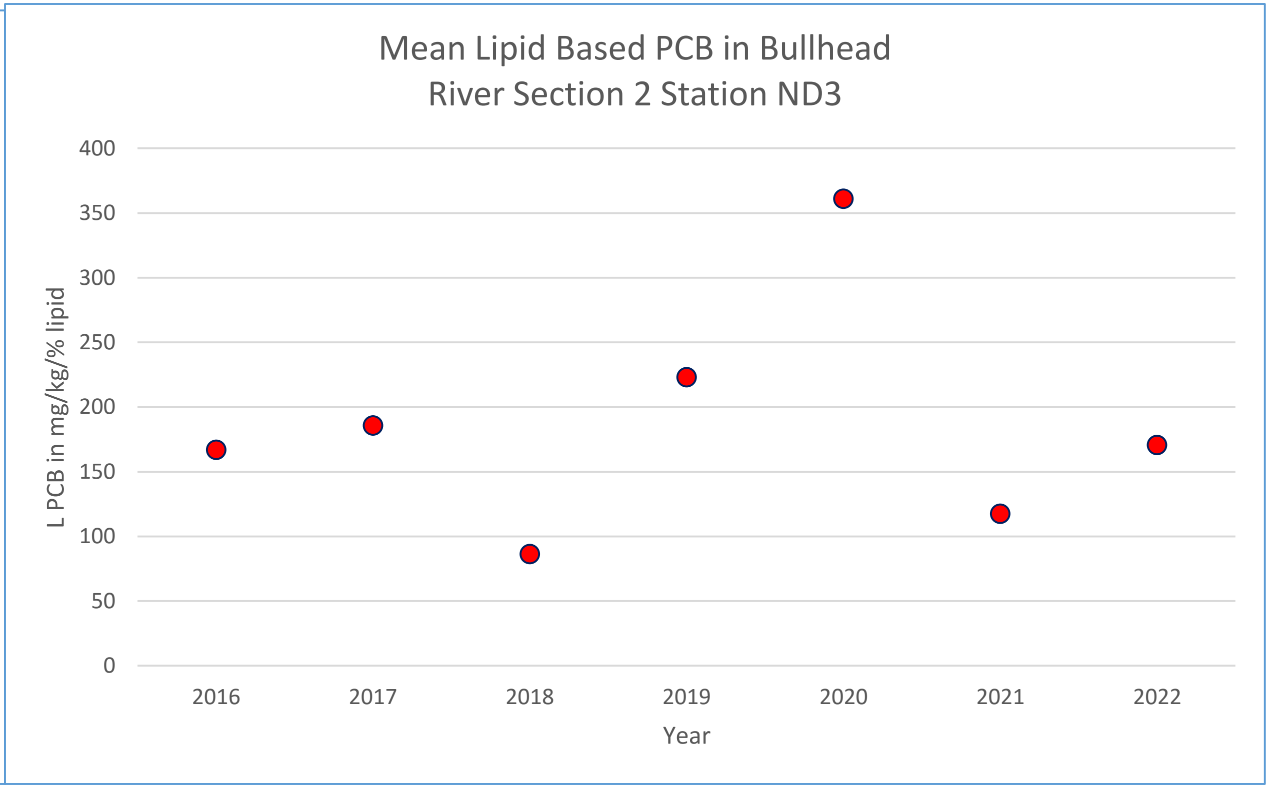
ND3 Bullhead Total PCB and Lipid Based PCB





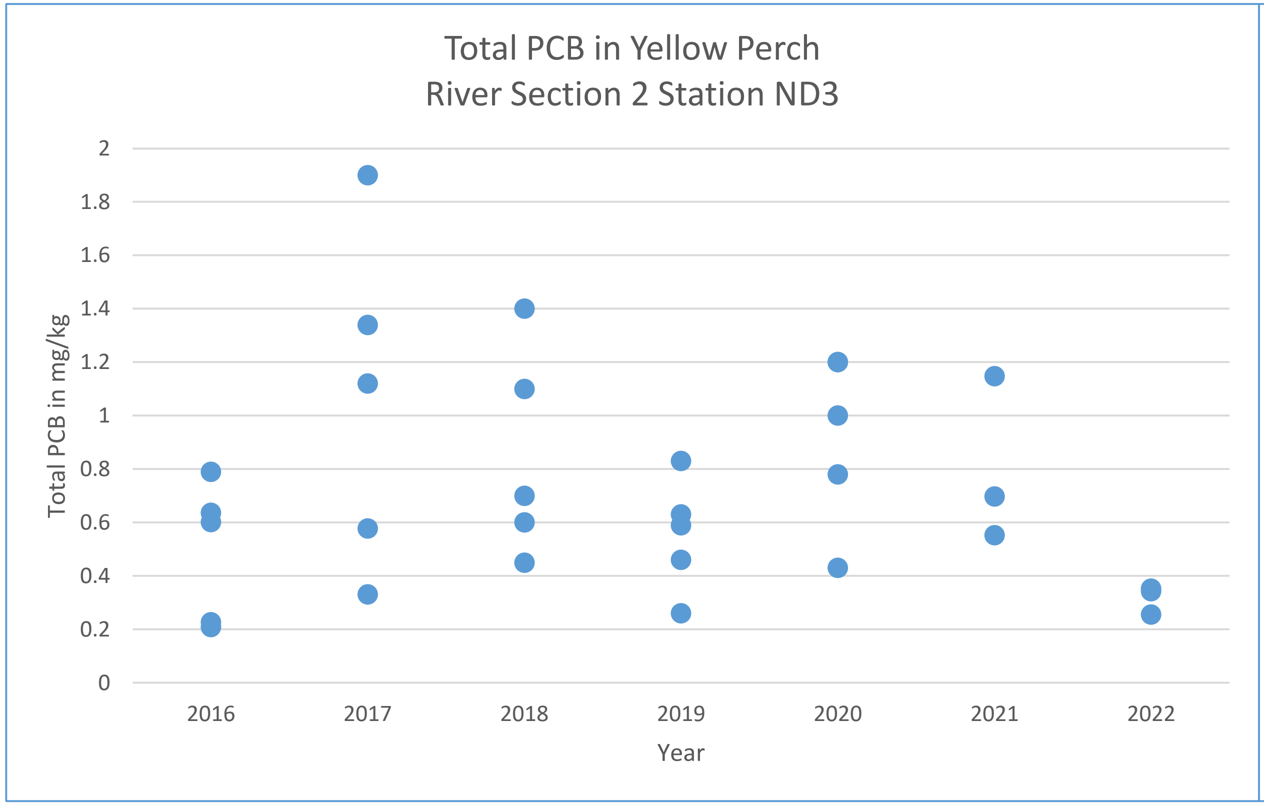
ND3 Bullhead Mean Total PCB and Mean Lipid Based PCB

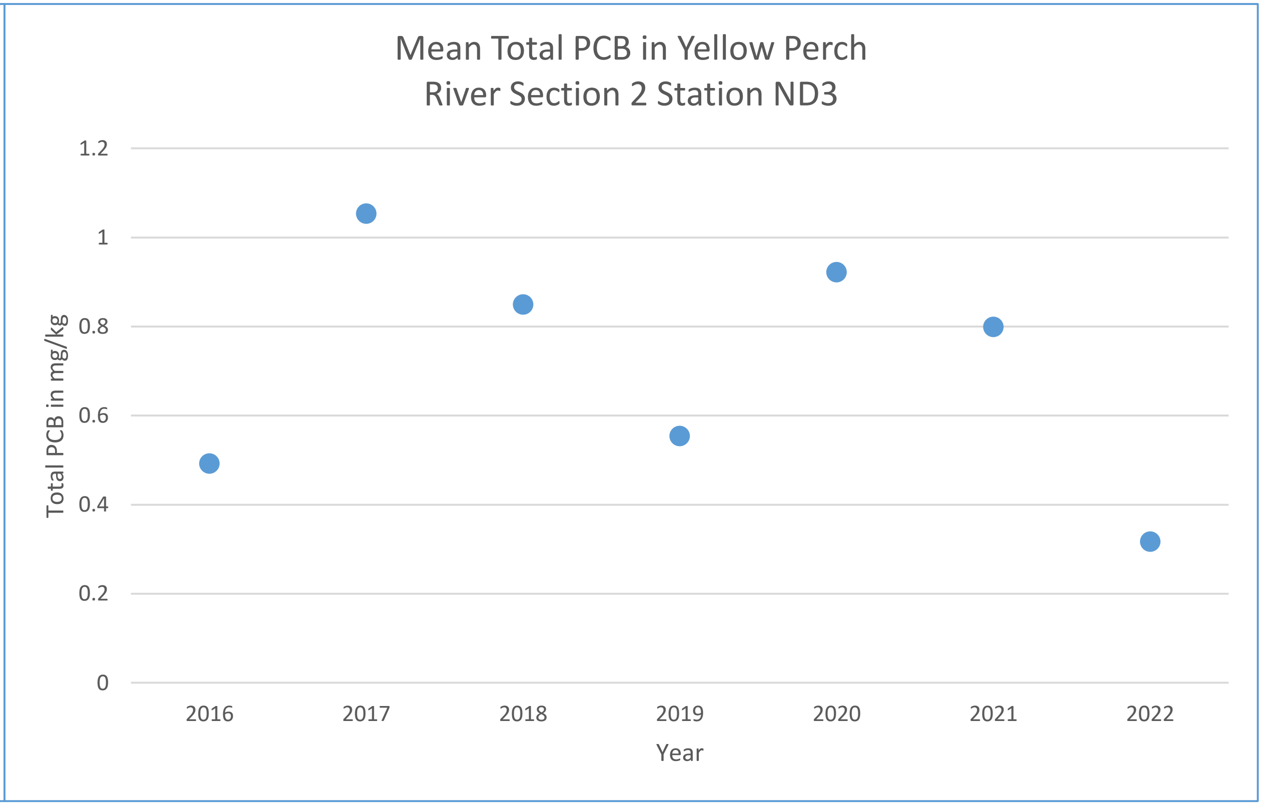




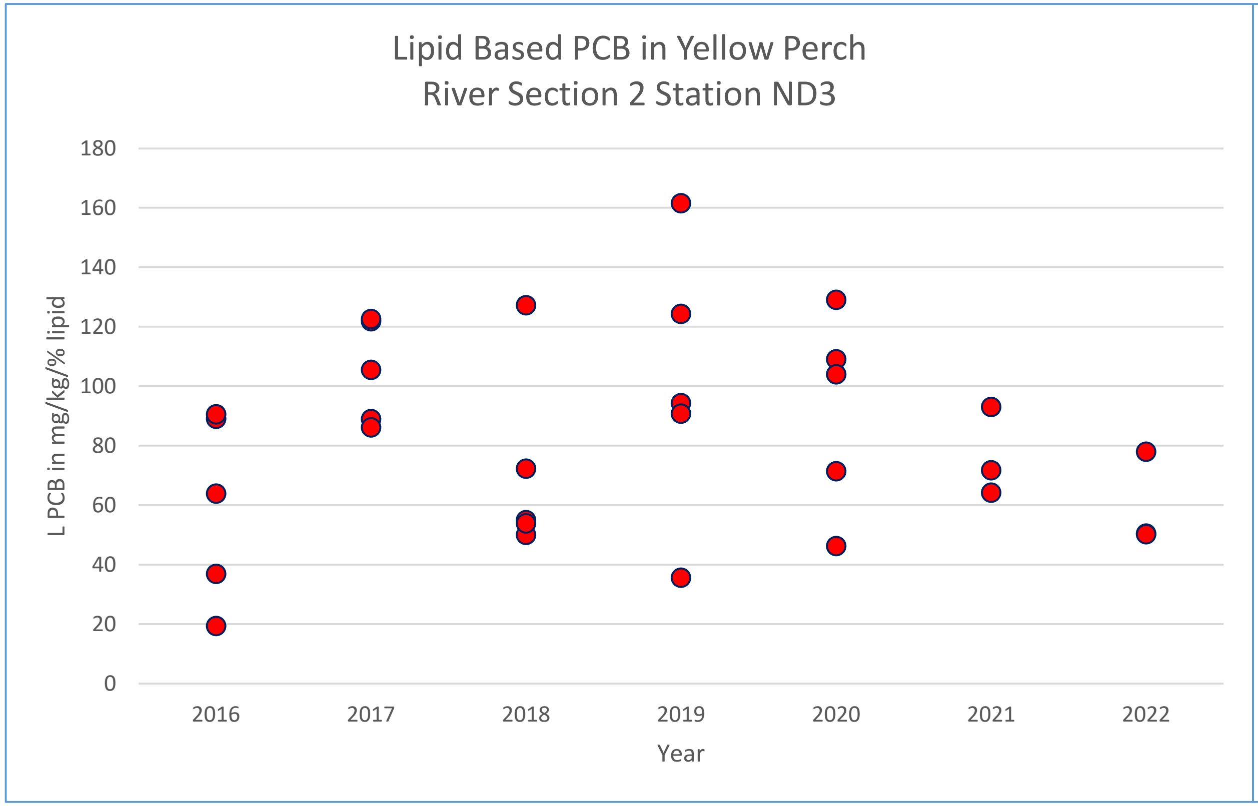
ND3 Yellow Perch Data

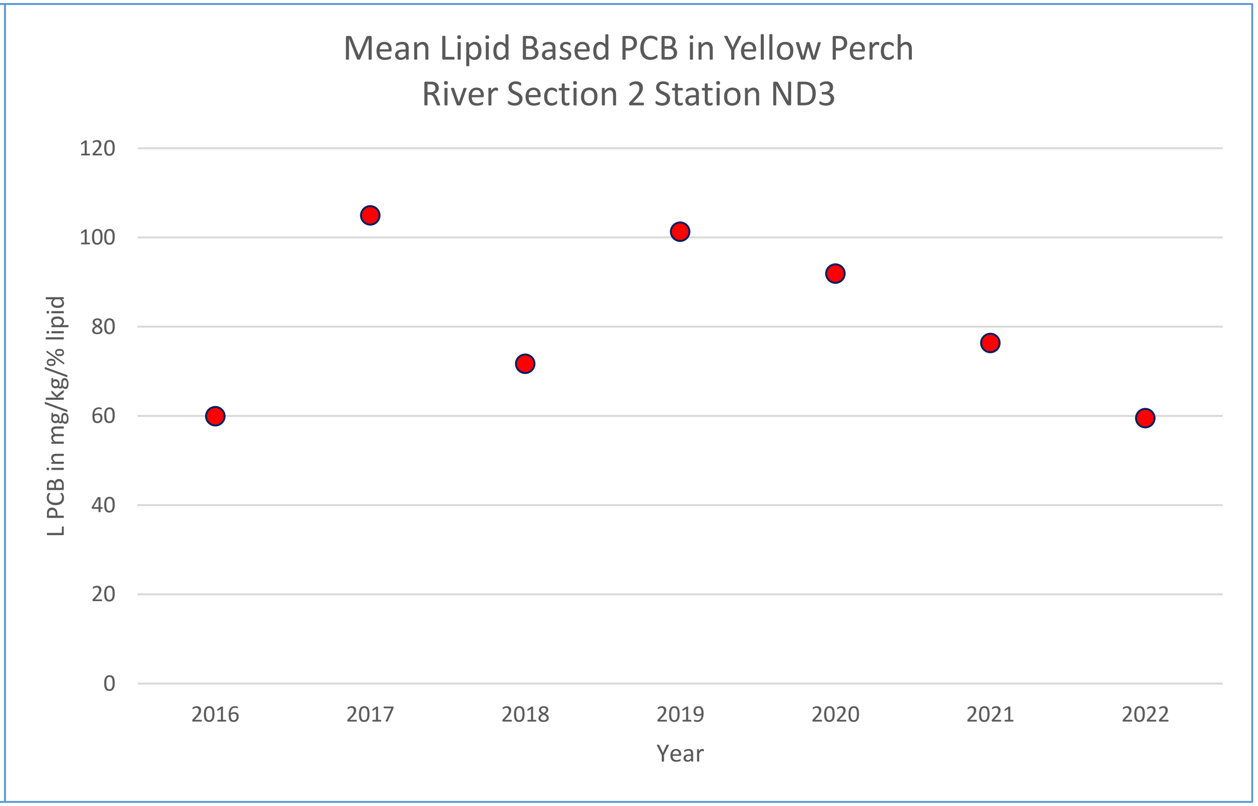
ND3 Yellow Perch Total PCB



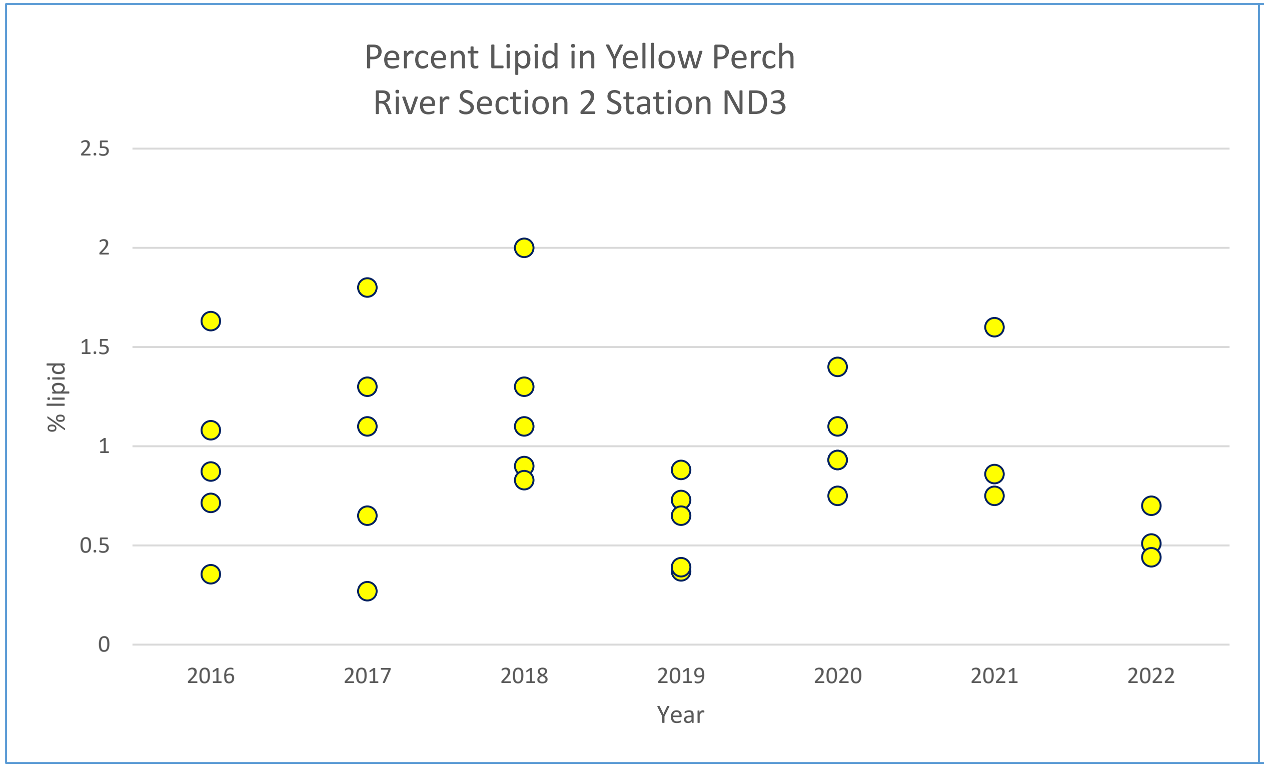


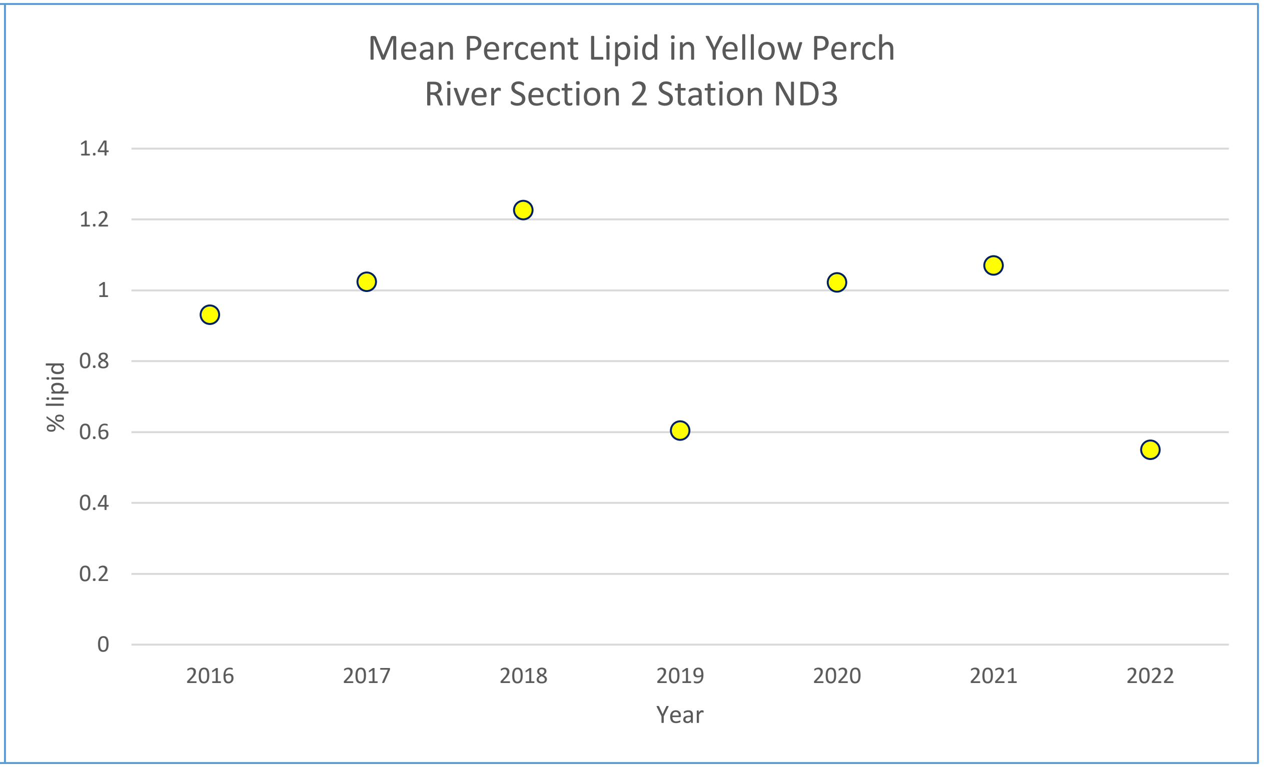
ND3 Yellow Perch Lipid Based PCB



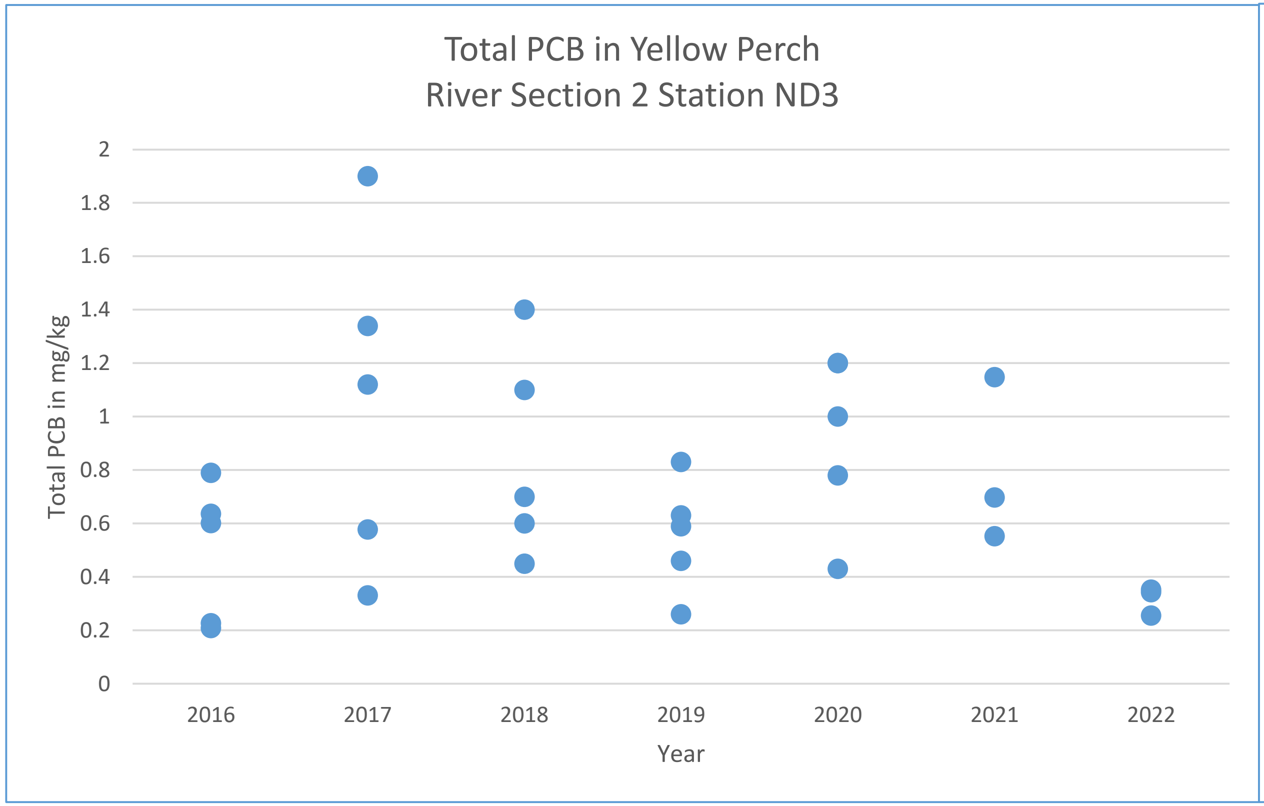


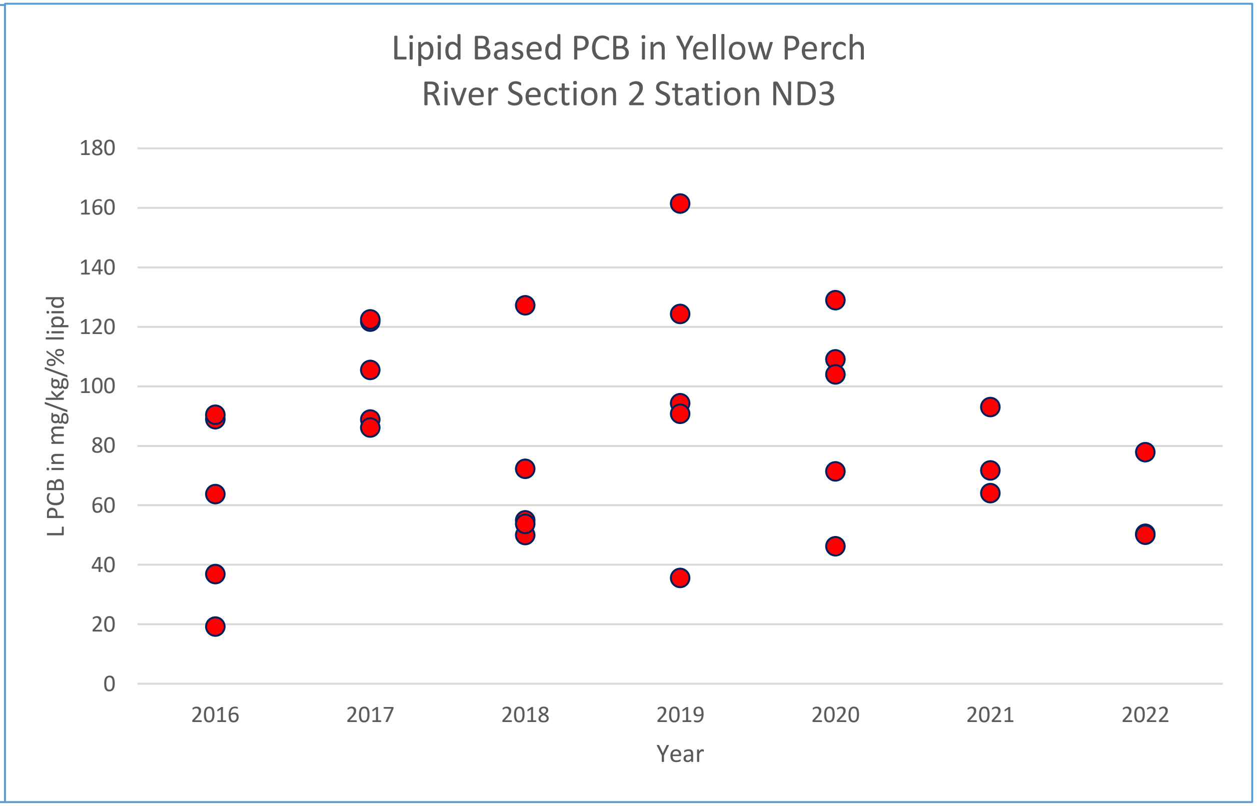
ND3 Yellow Perch Percent Lipid



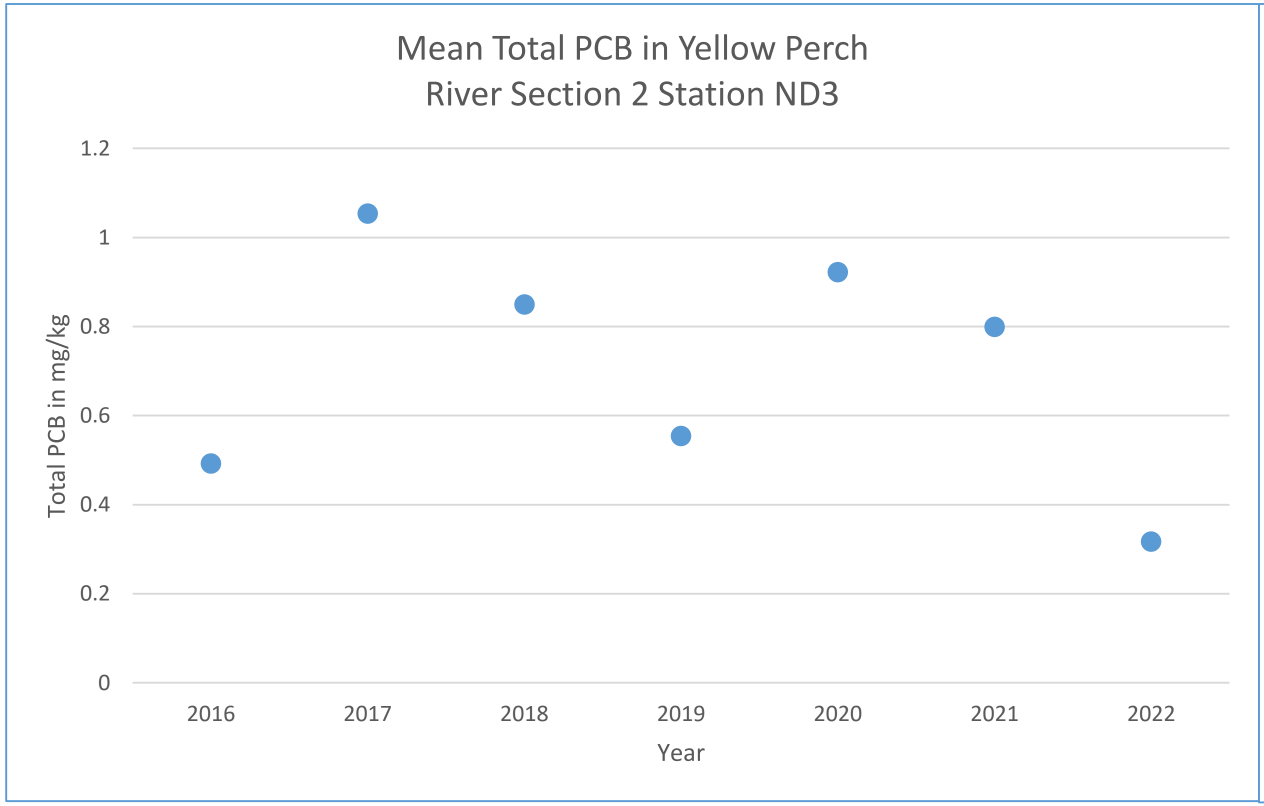


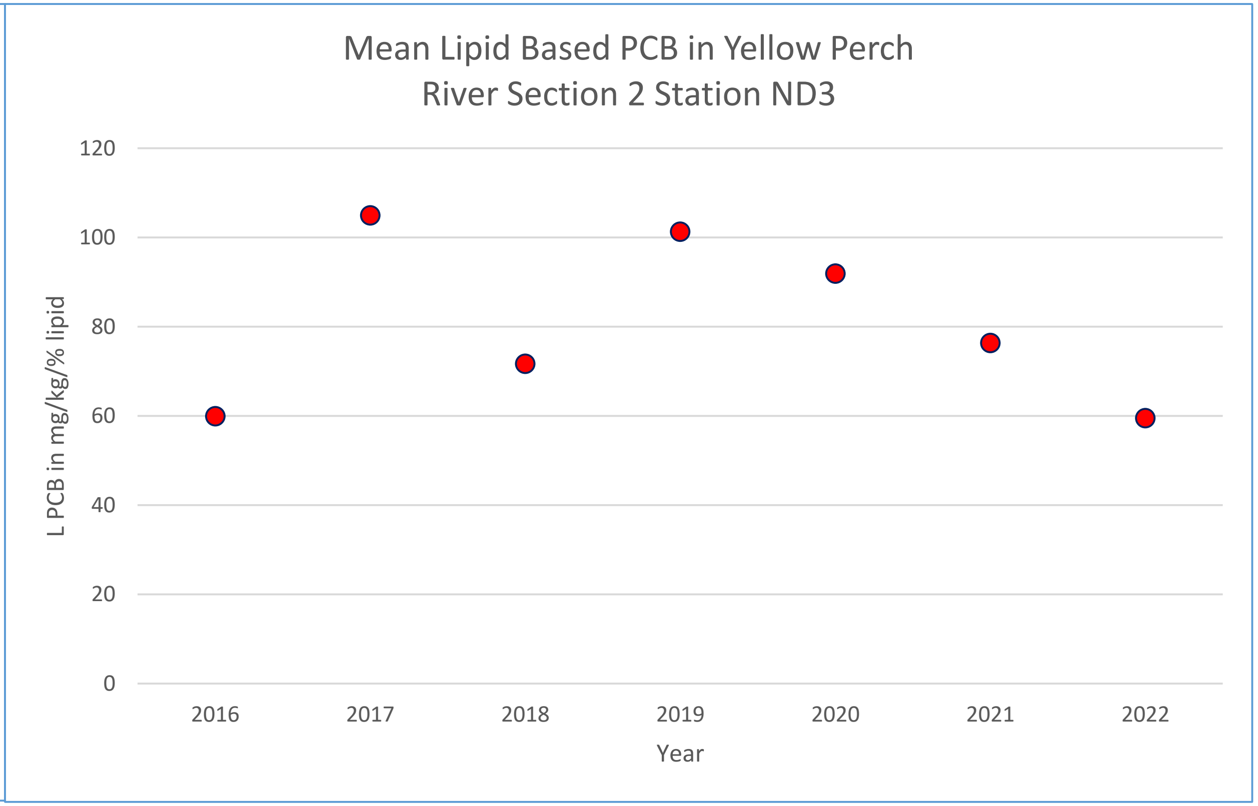
ND3 Yellow Perch Total PCB and Lipid Based PCB





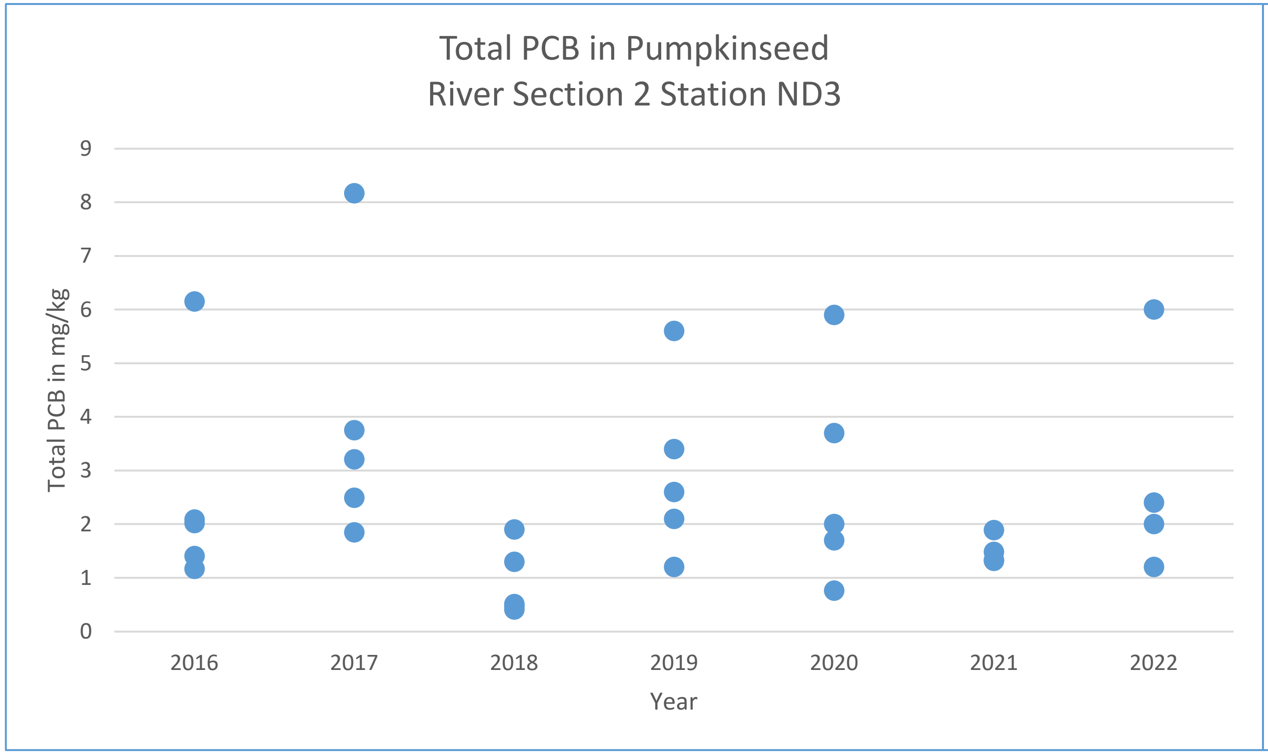
ND3 Yellow Perch Mean Total PCB and Mean Lipid Based PCB

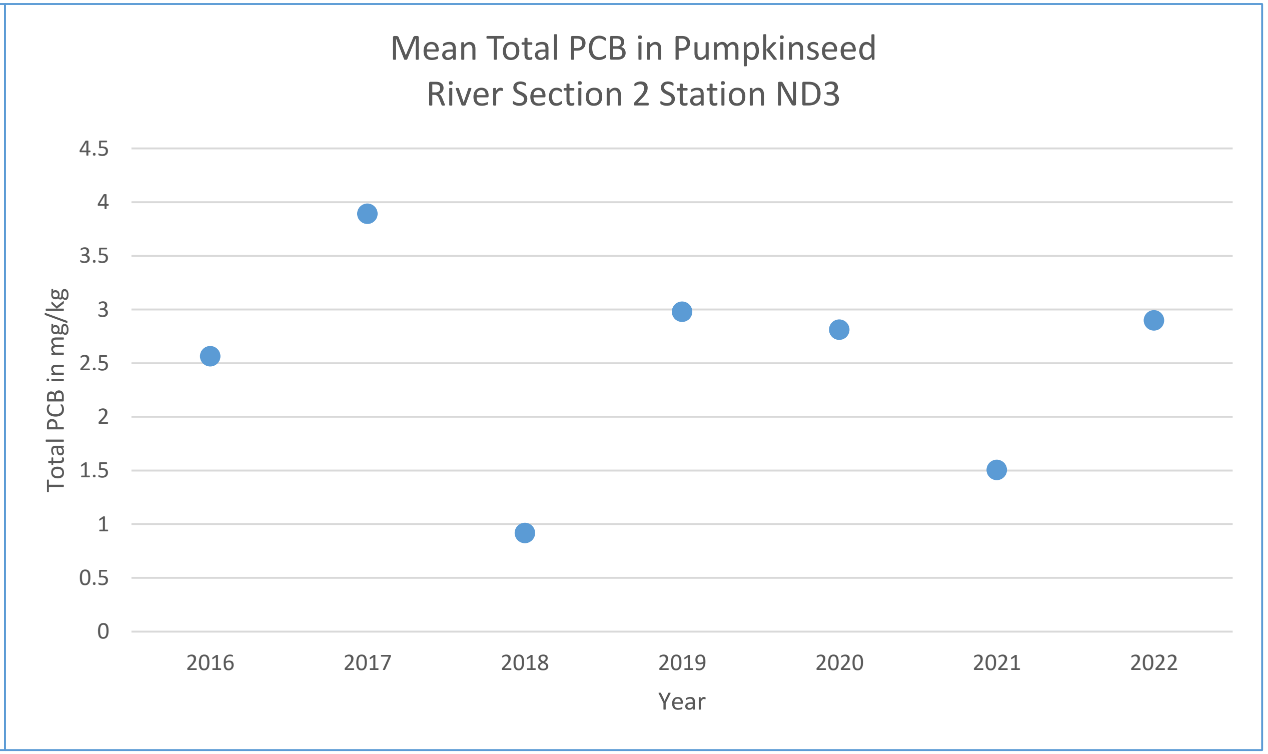




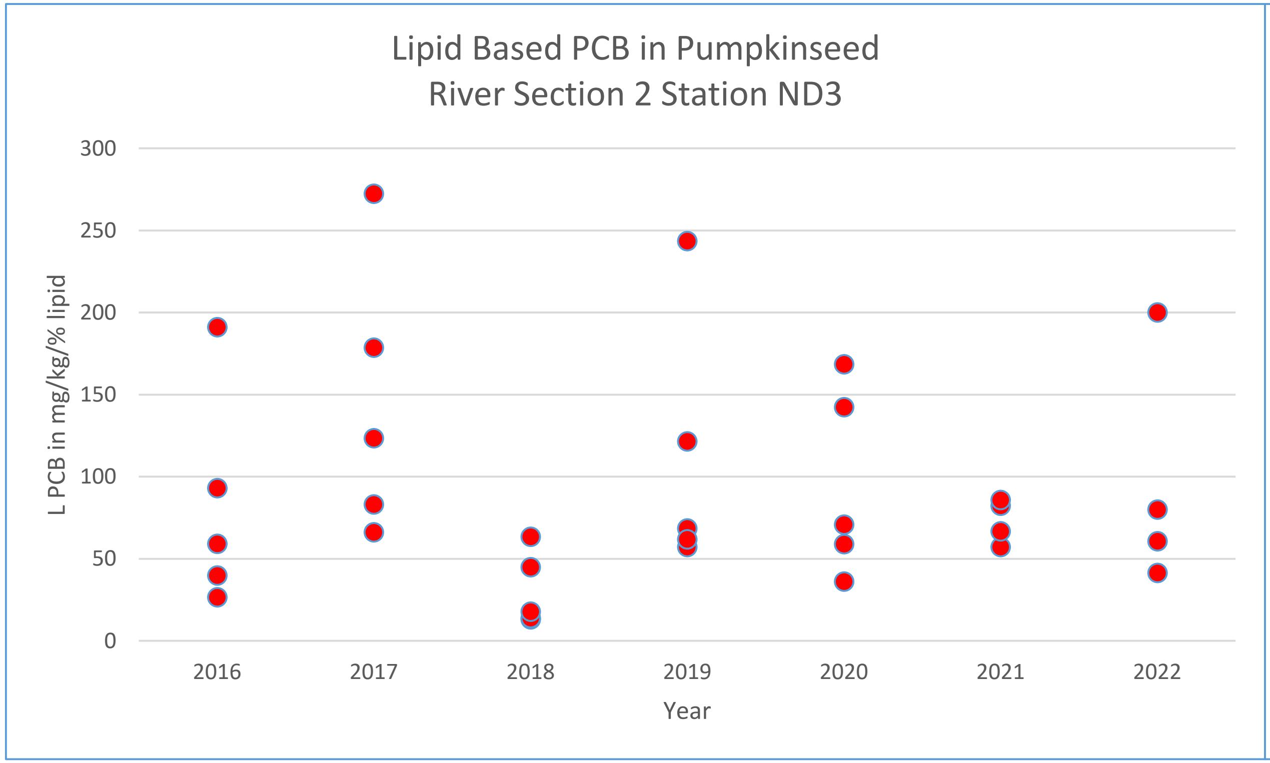
ND3 Pumpkinseed Data

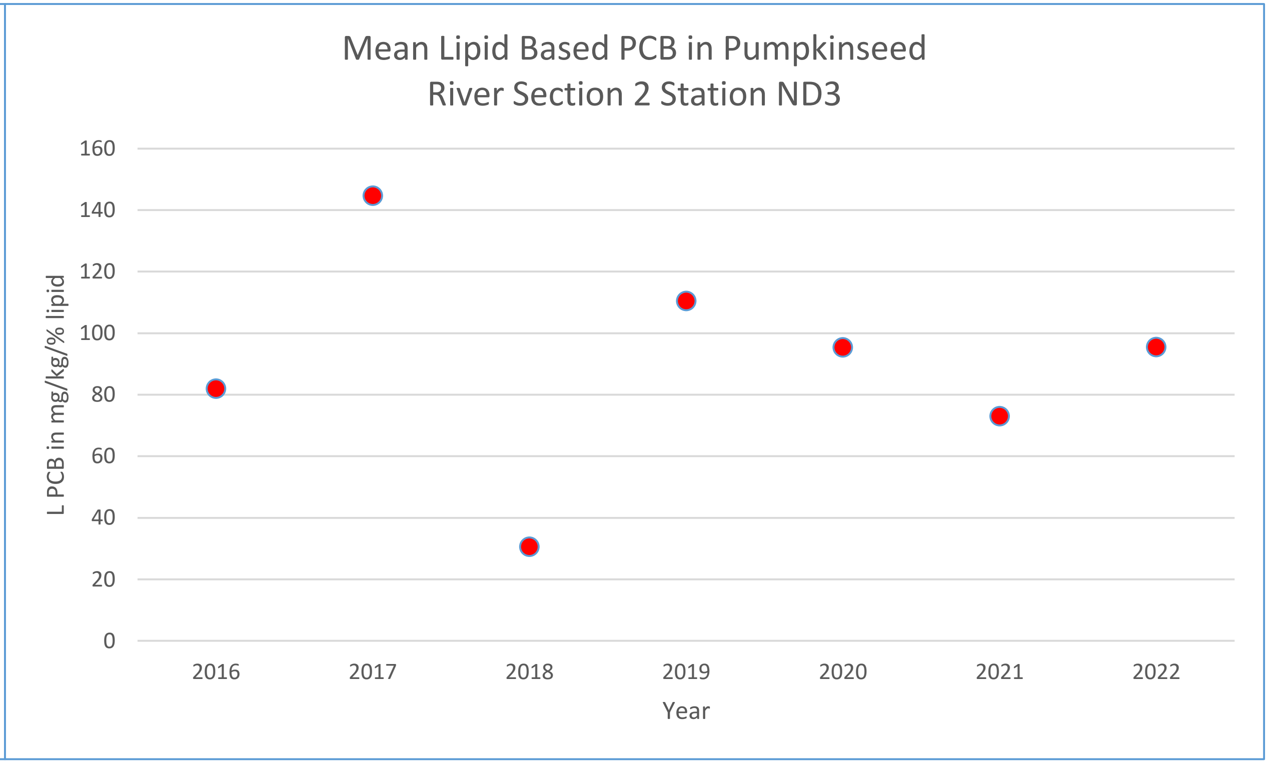
ND3 Pumpkinseed Total PCB



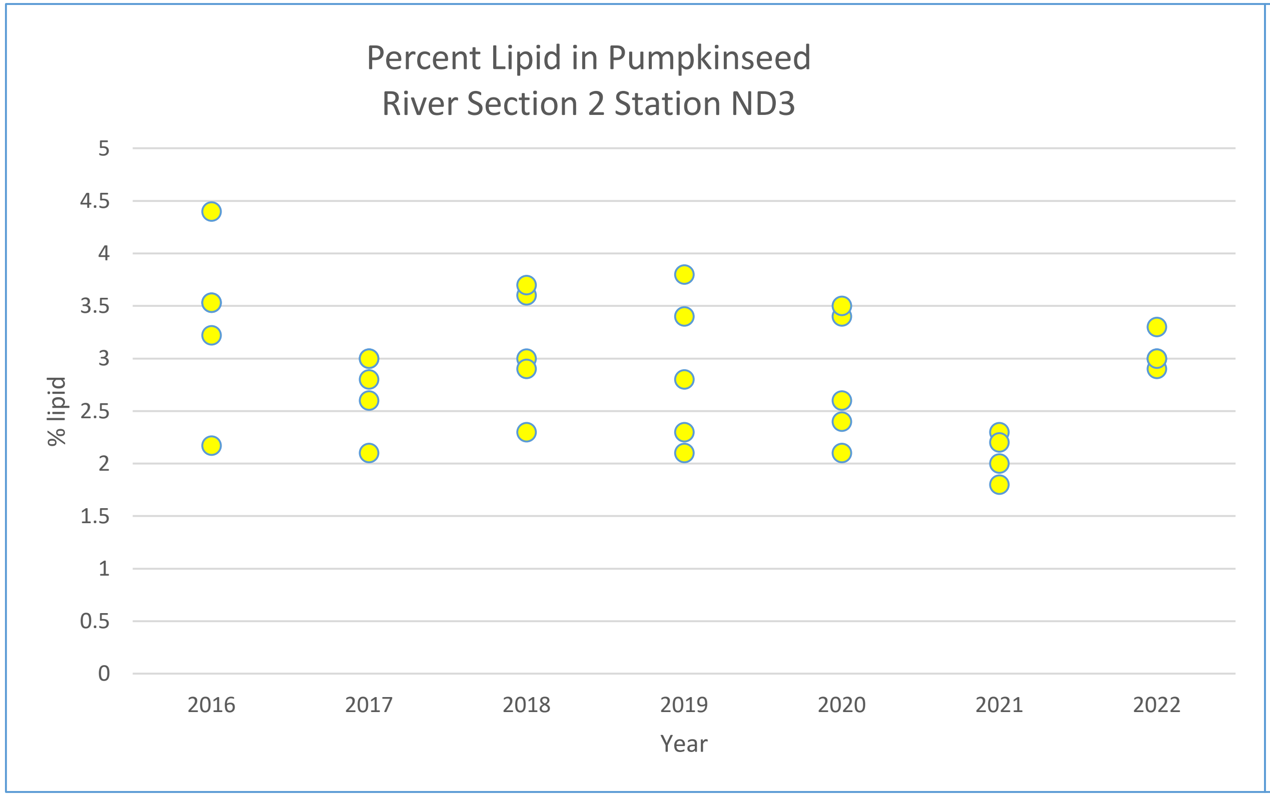


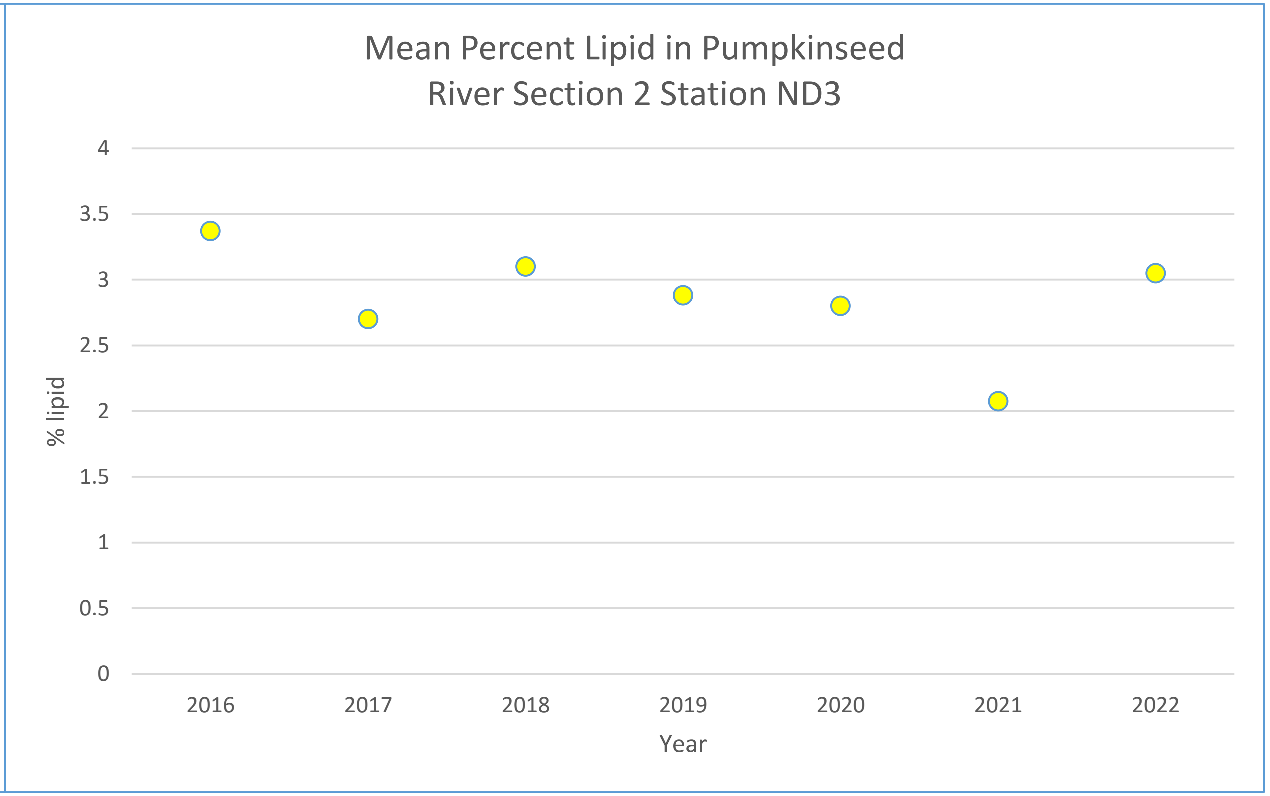
ND3 Pumpkinseed Lipid Based PCB



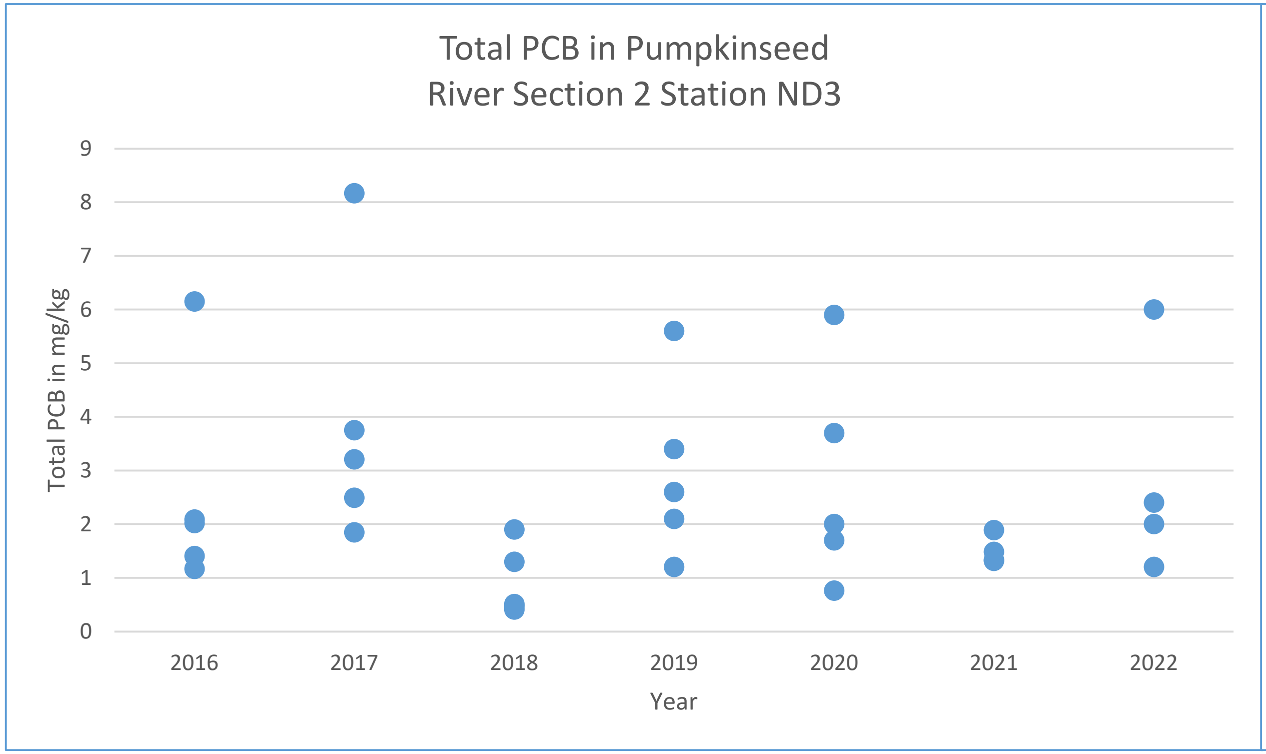


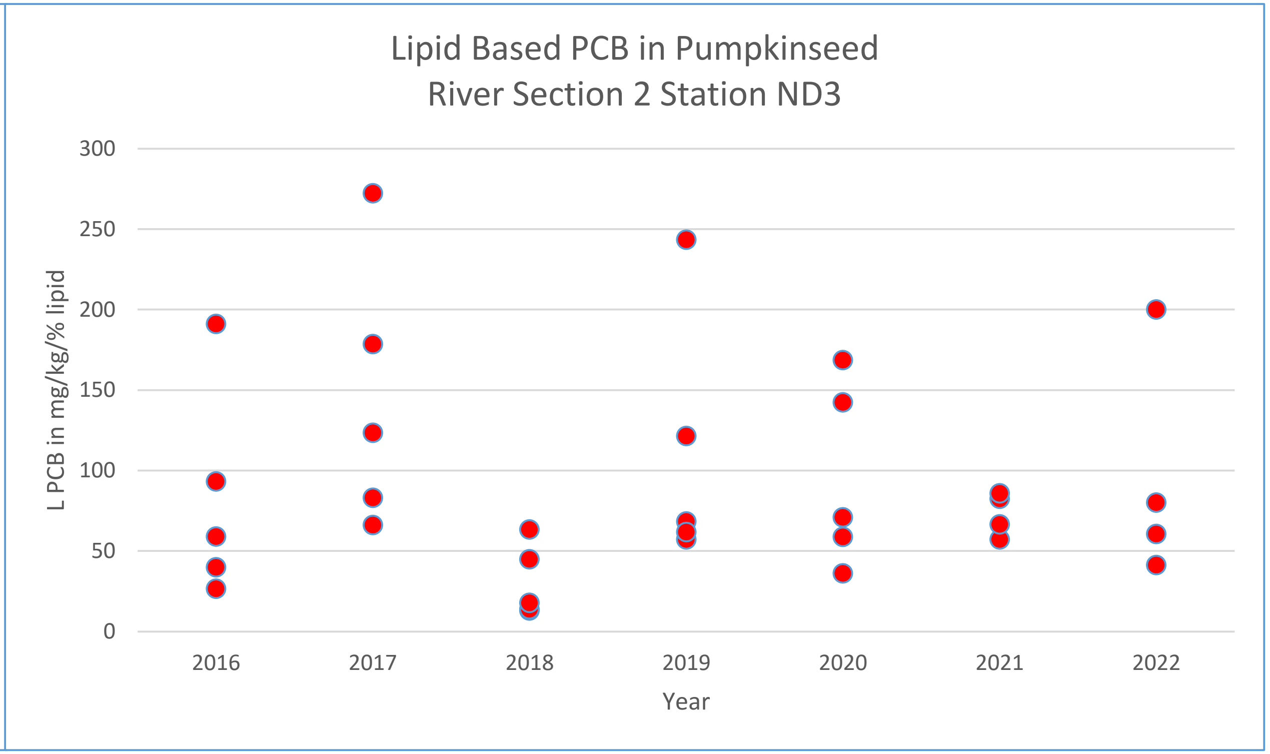
ND3 Pumpkinseed Percent Lipid



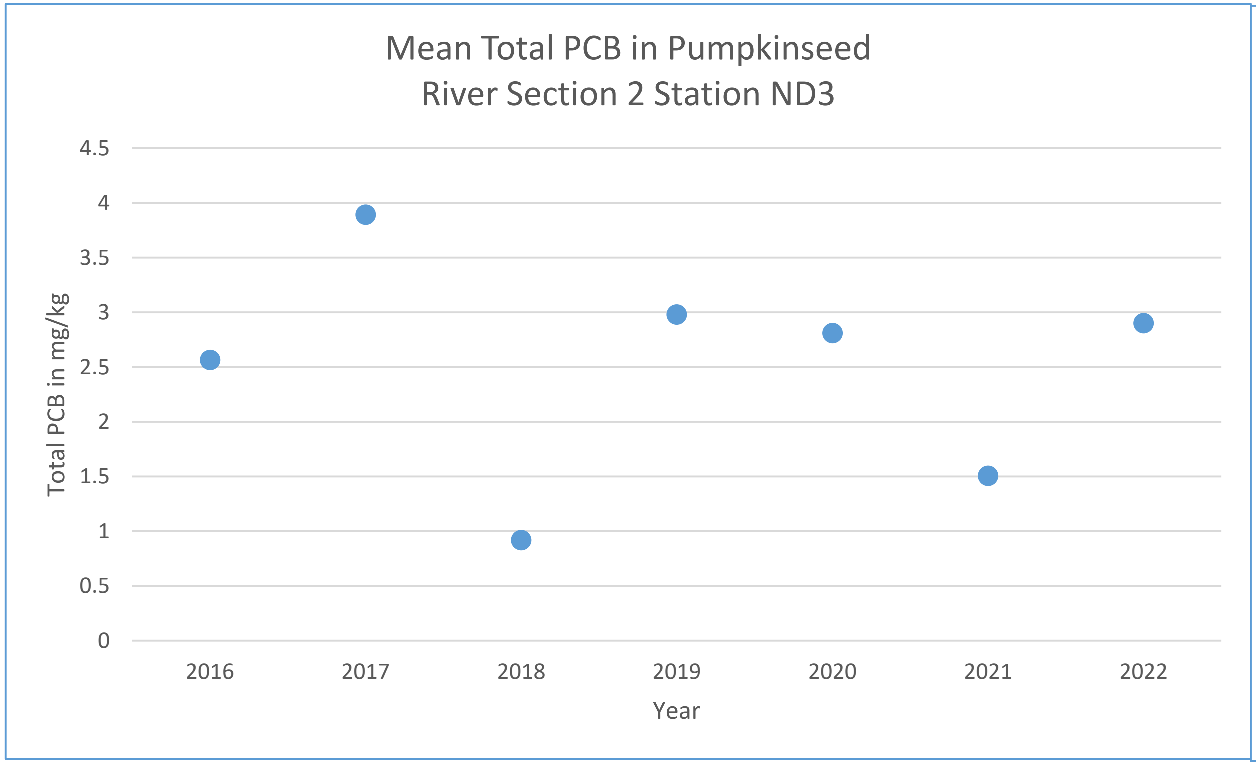


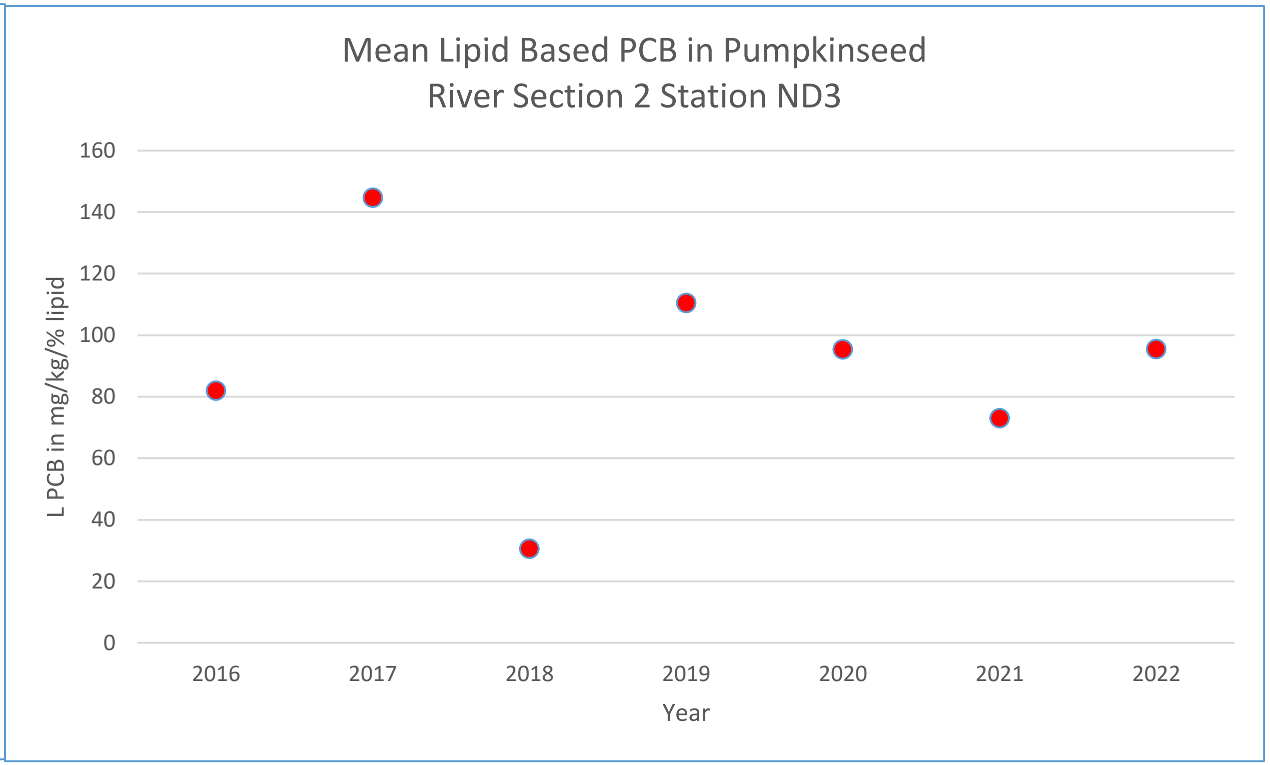
ND3 Pumpkinseed Total PCB and Lipid Based PCB





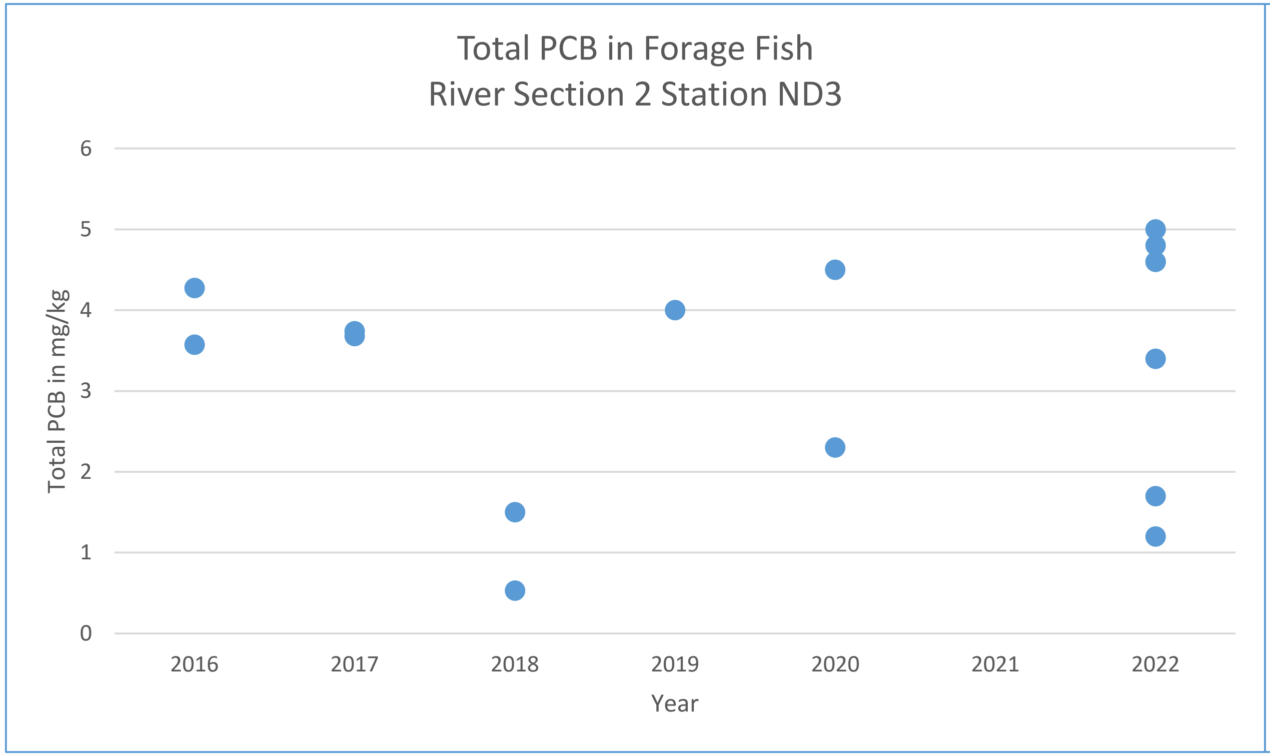
ND3 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

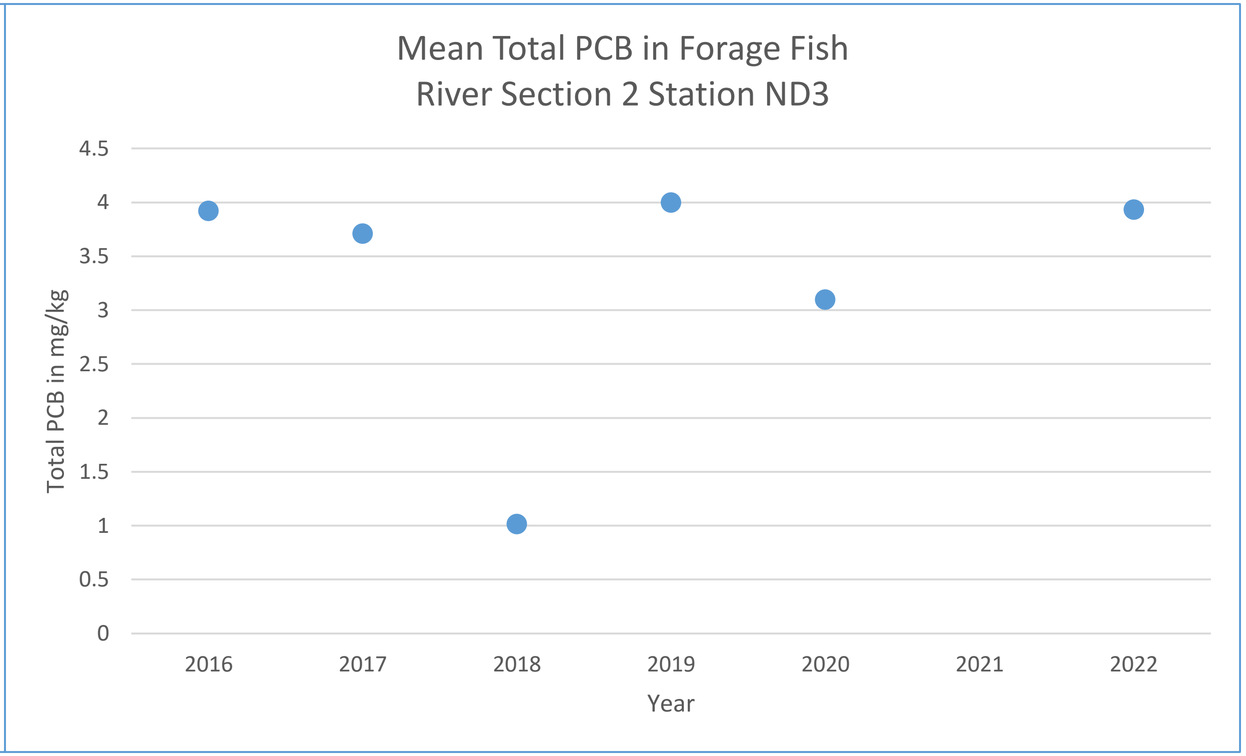




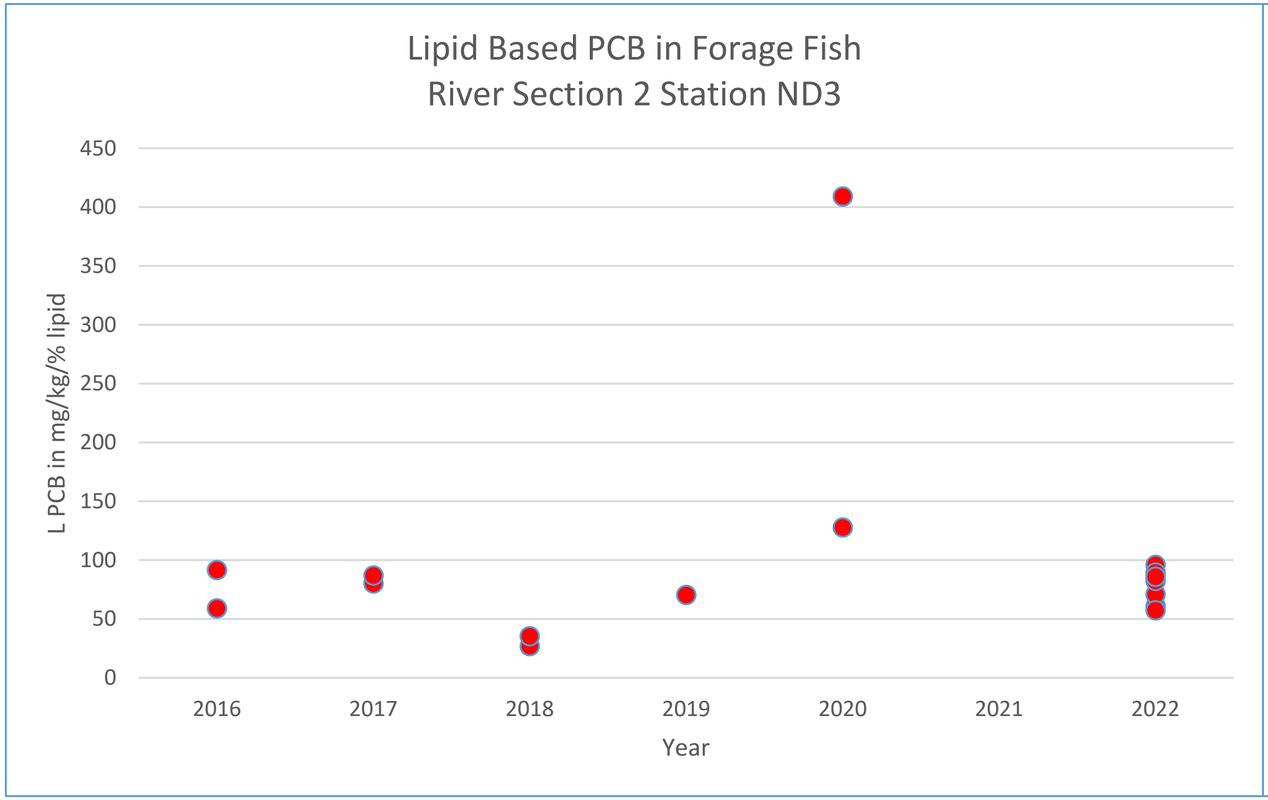
ND3 Forage Fish Data

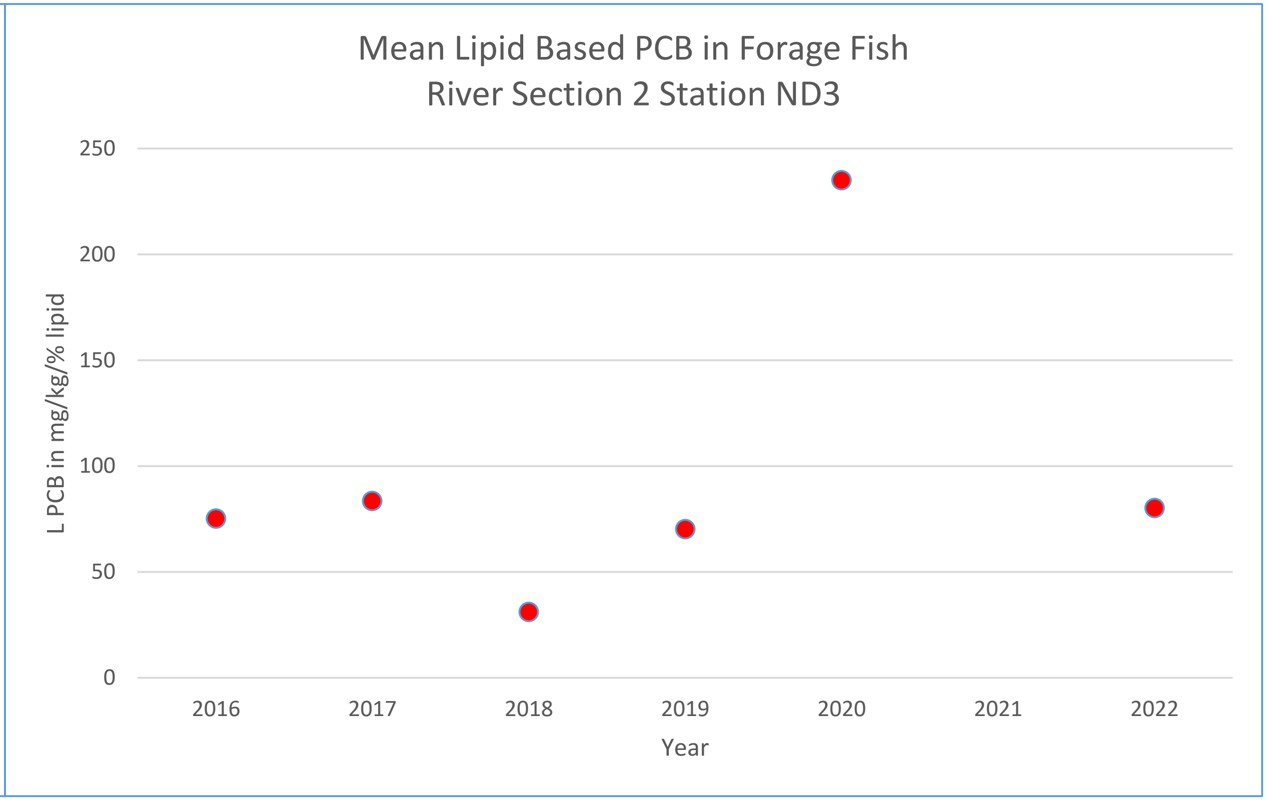
ND3 Forage Fish PCB



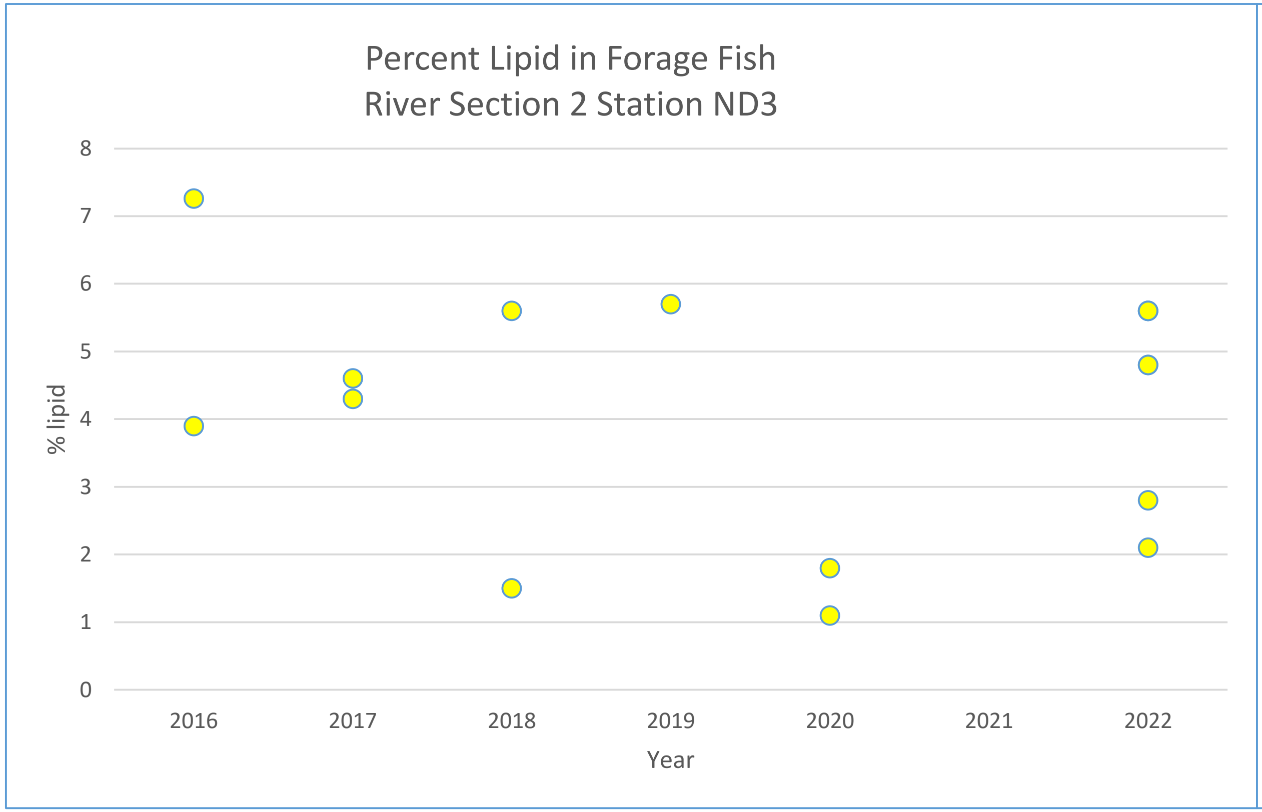


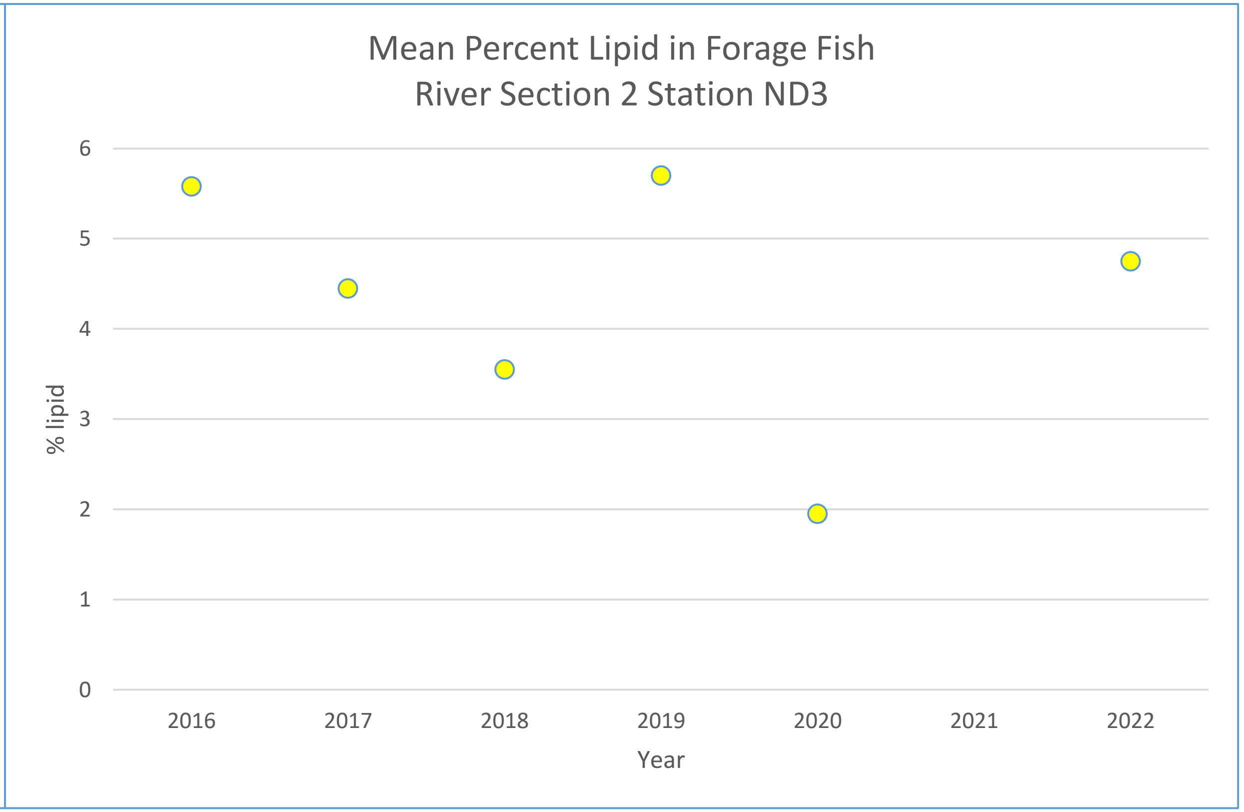
ND3 Forage Fish Lipid Based PCB



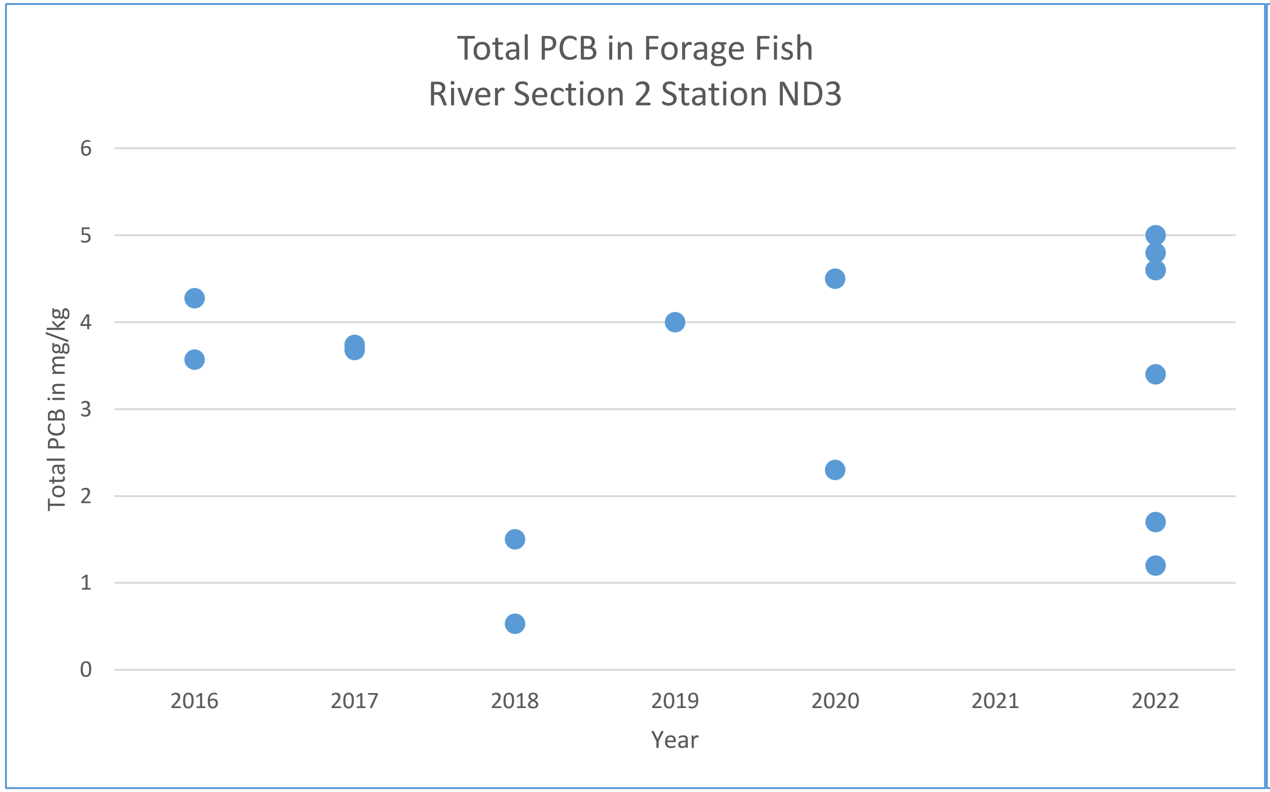


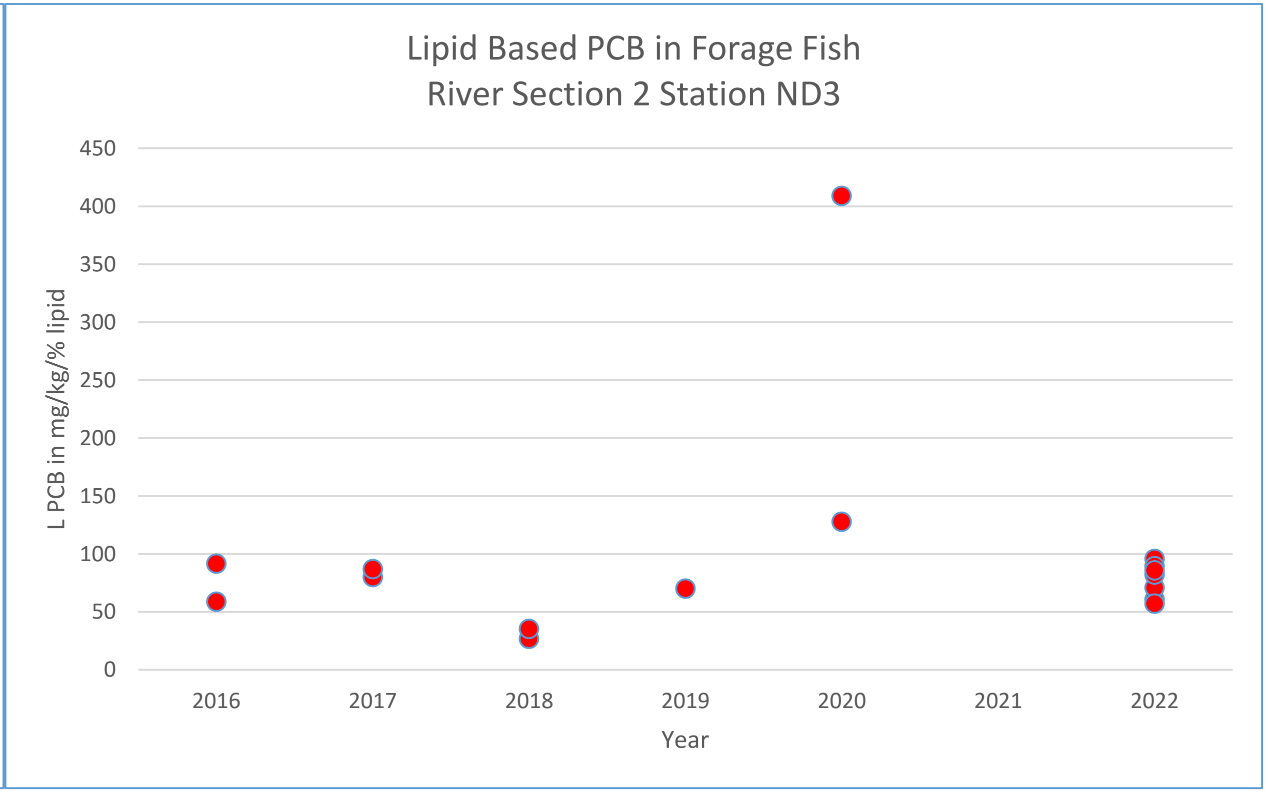
ND3 Forage Fish Percent Lipid



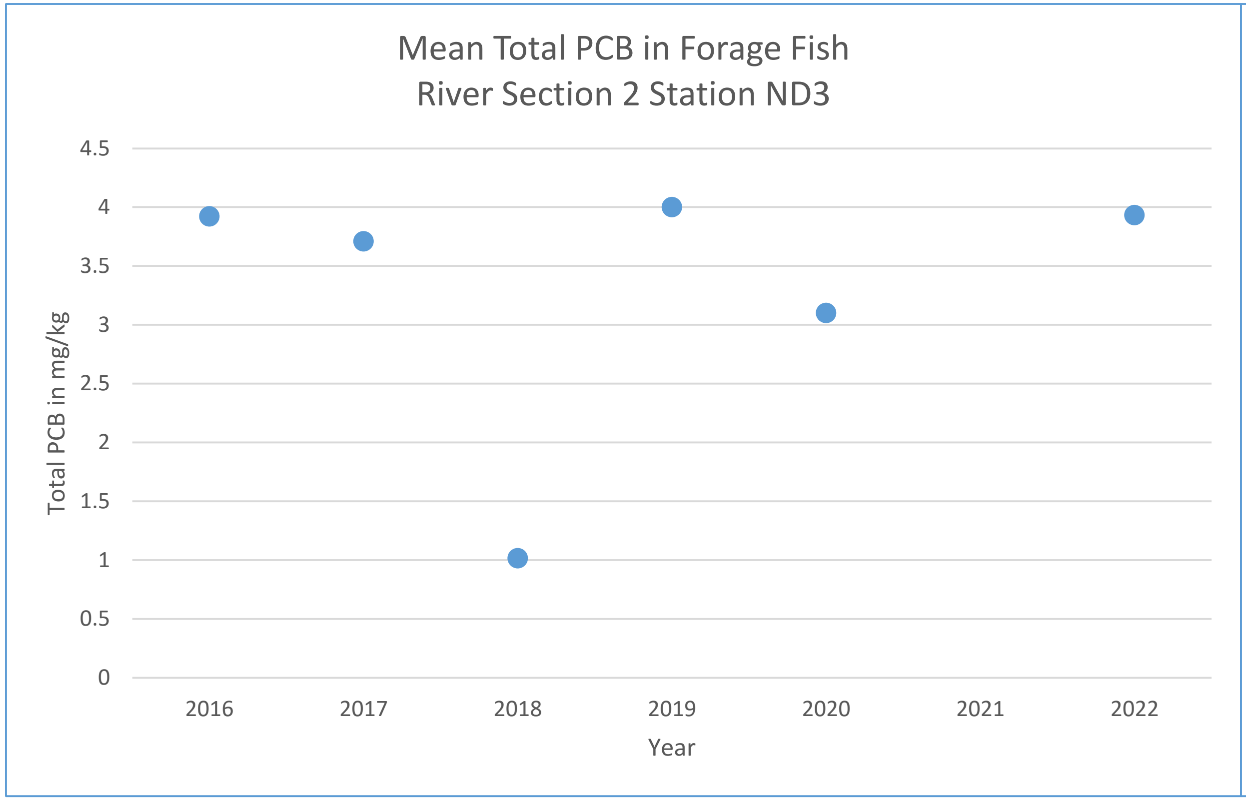


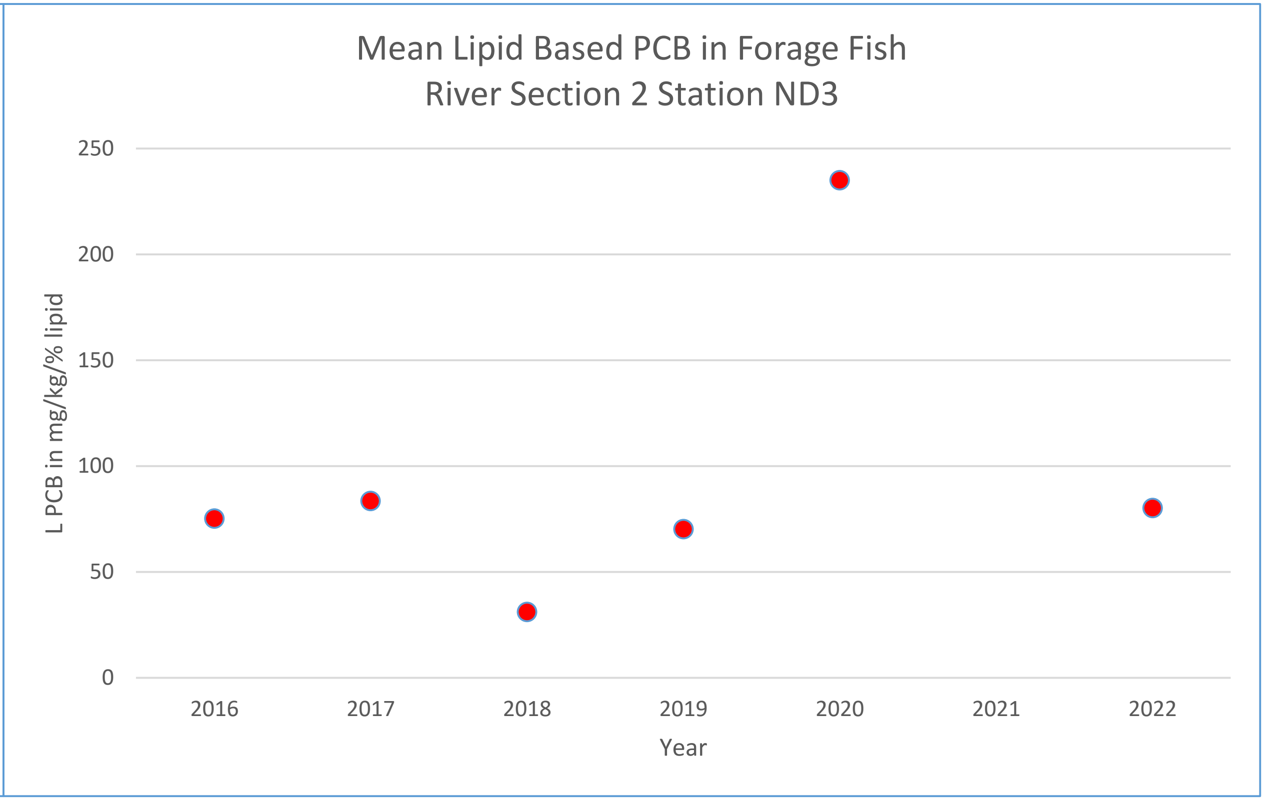
ND3 Forage Fish Total PCB and Lipid Based PCB





ND3 Forage Fish Mean Total PCB and Mean Lipid Based PCB



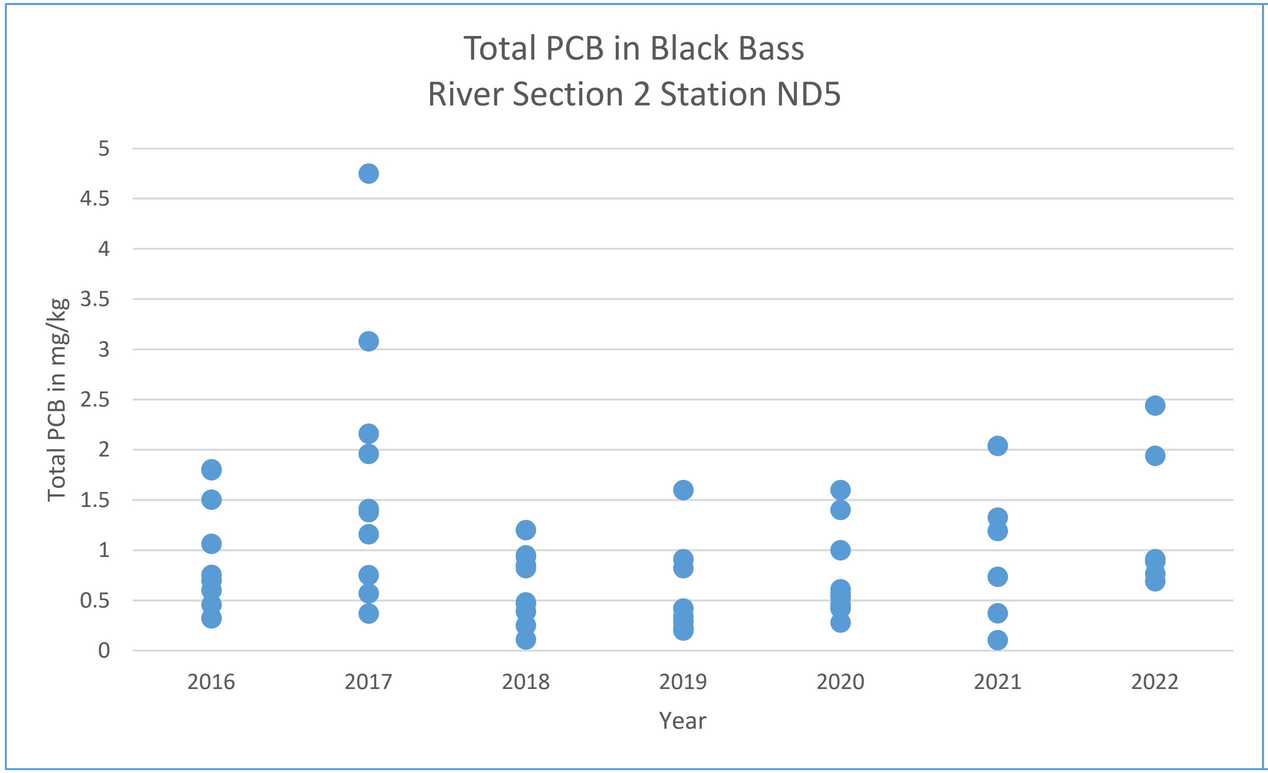


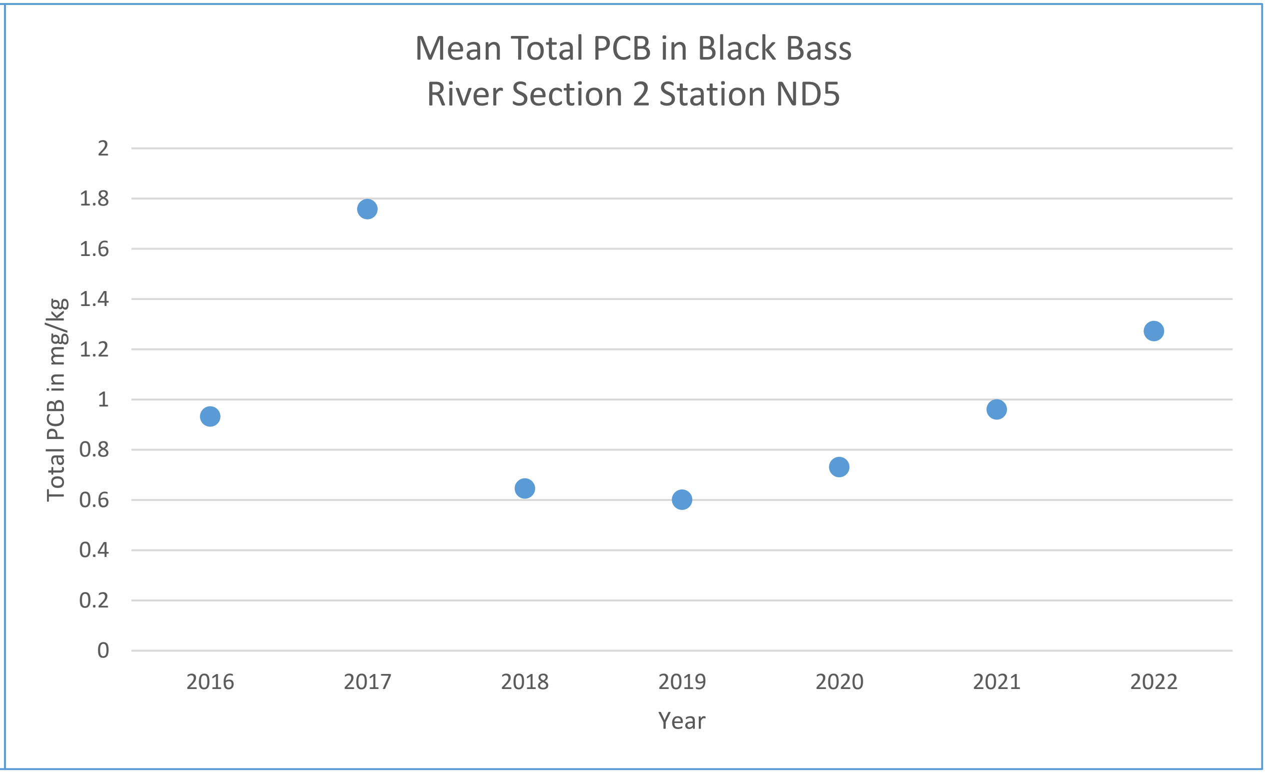
Station ND5

Stations ND5 and SW1

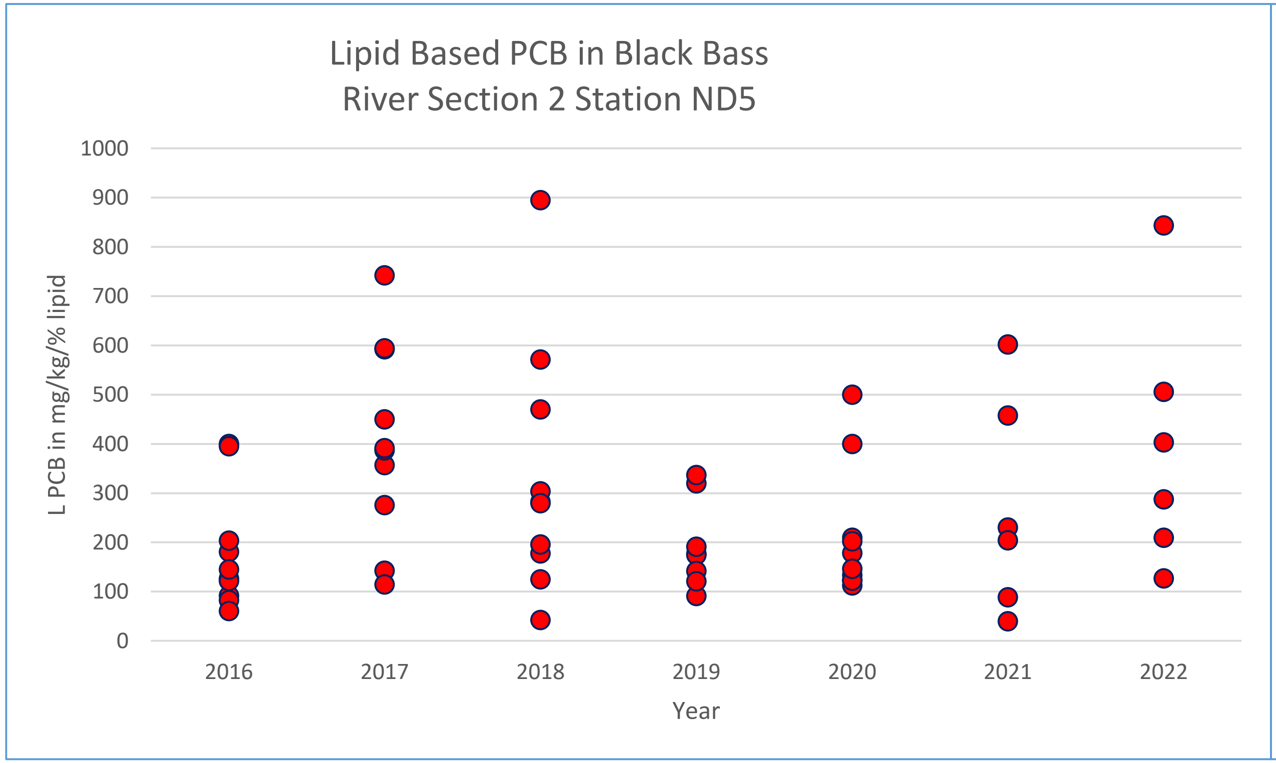
ND5 Black Bass Data

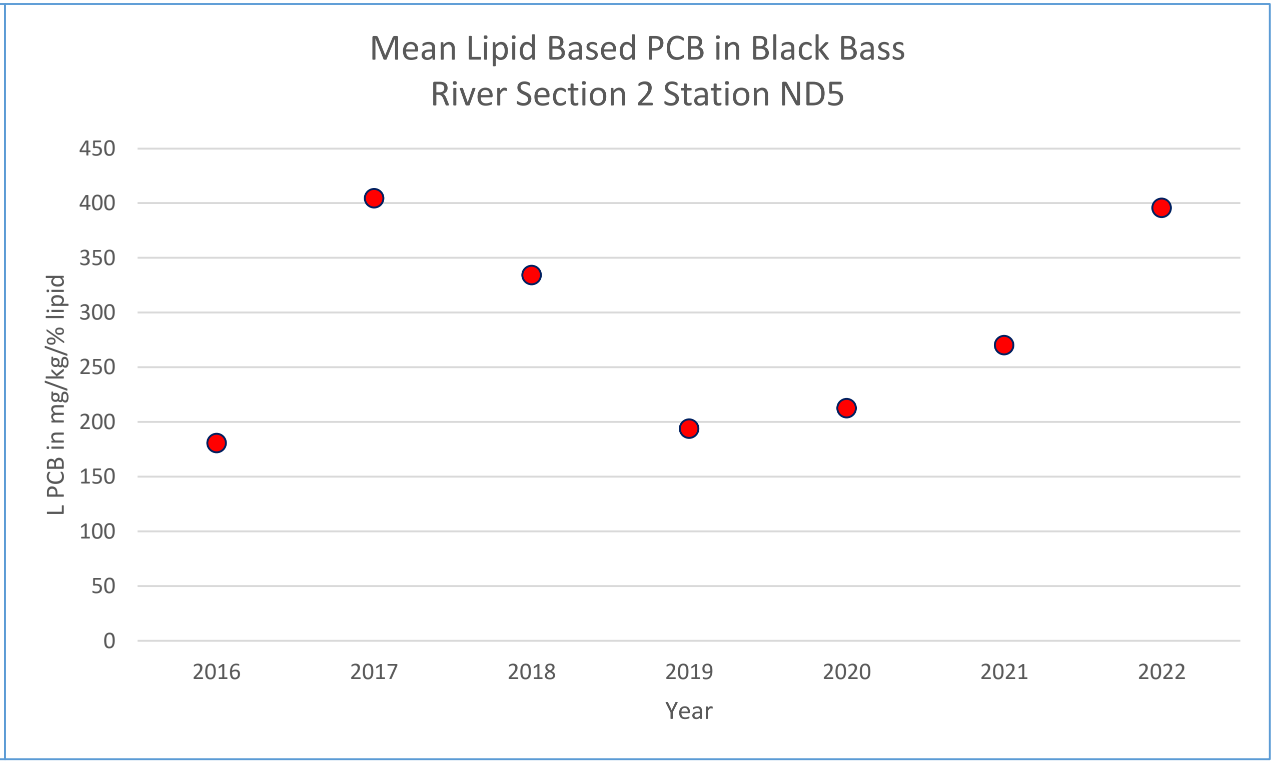
ND5 Black Bass Total PCB



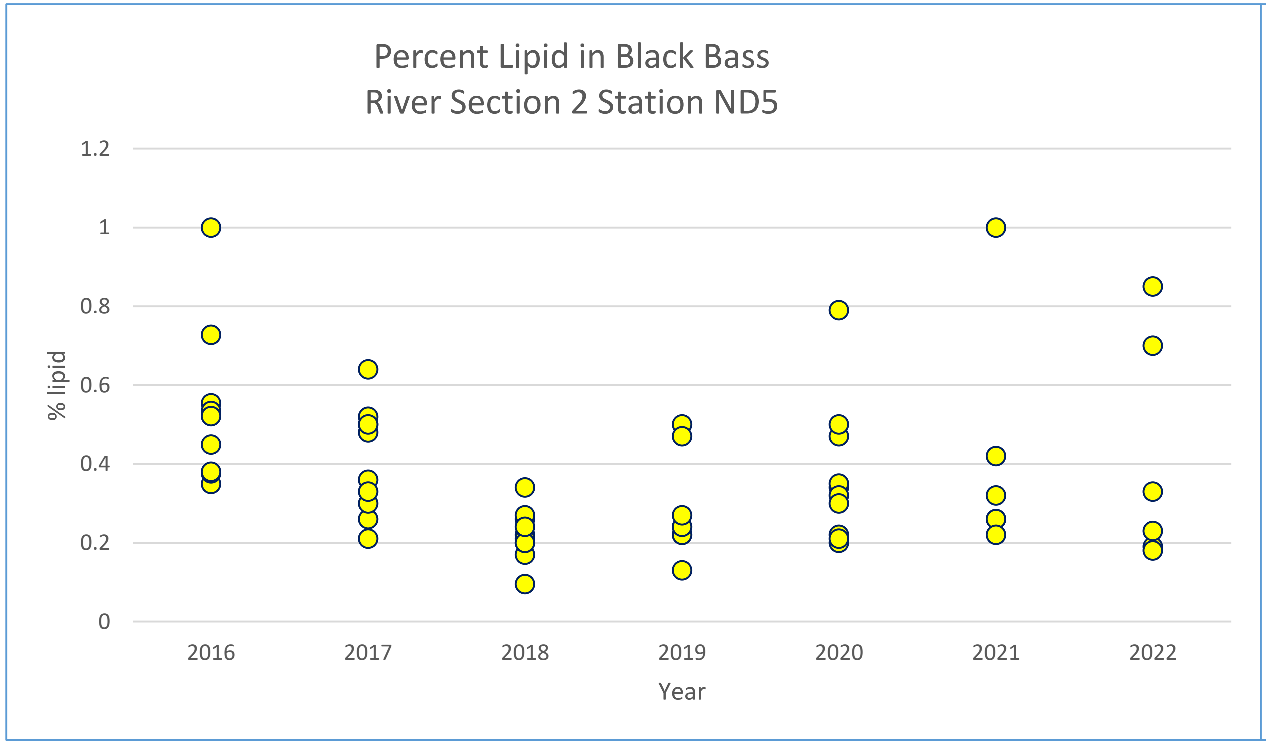


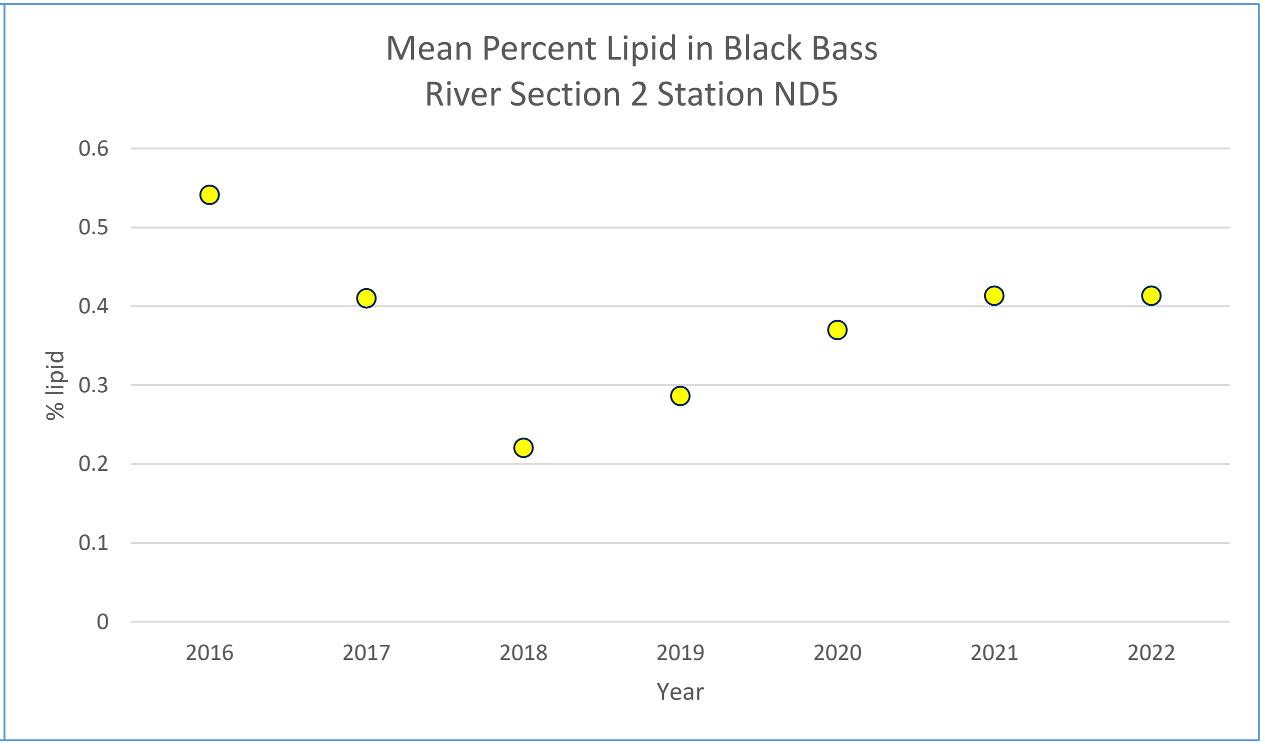
ND5 Black Bass Lipid Based PCB



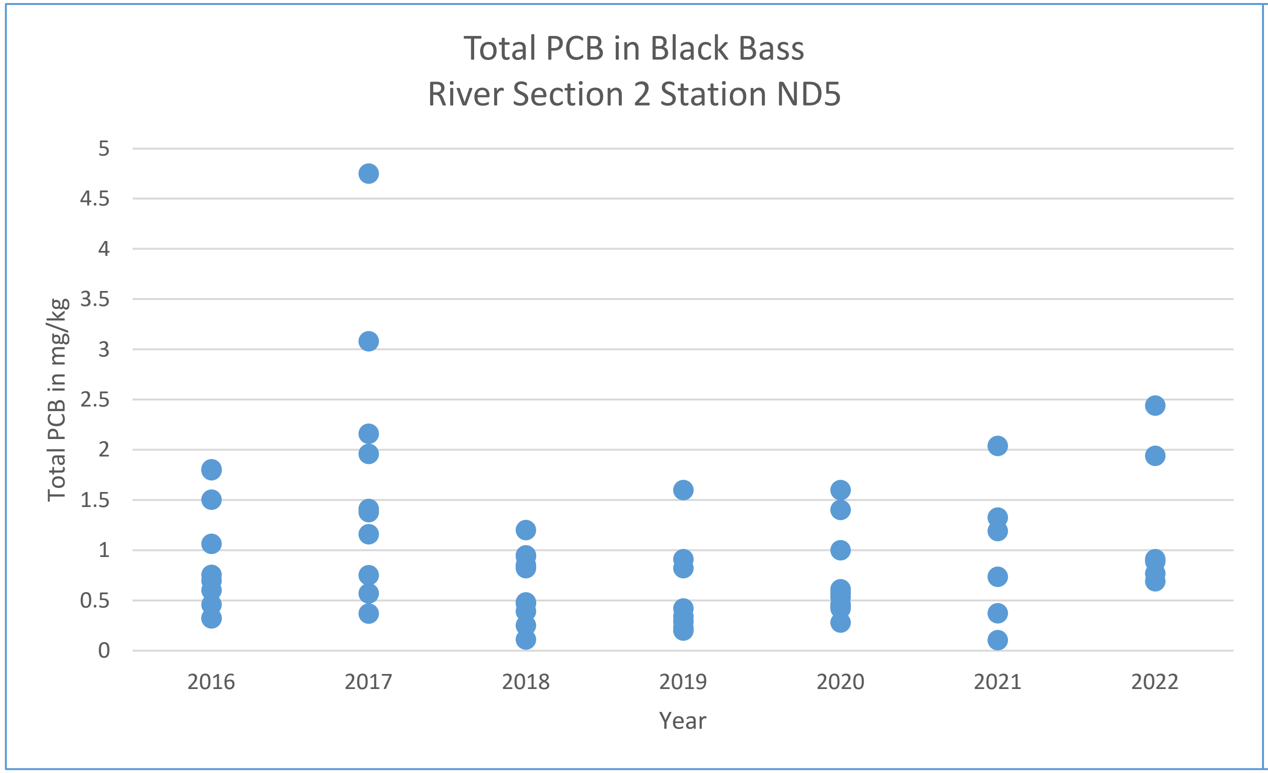


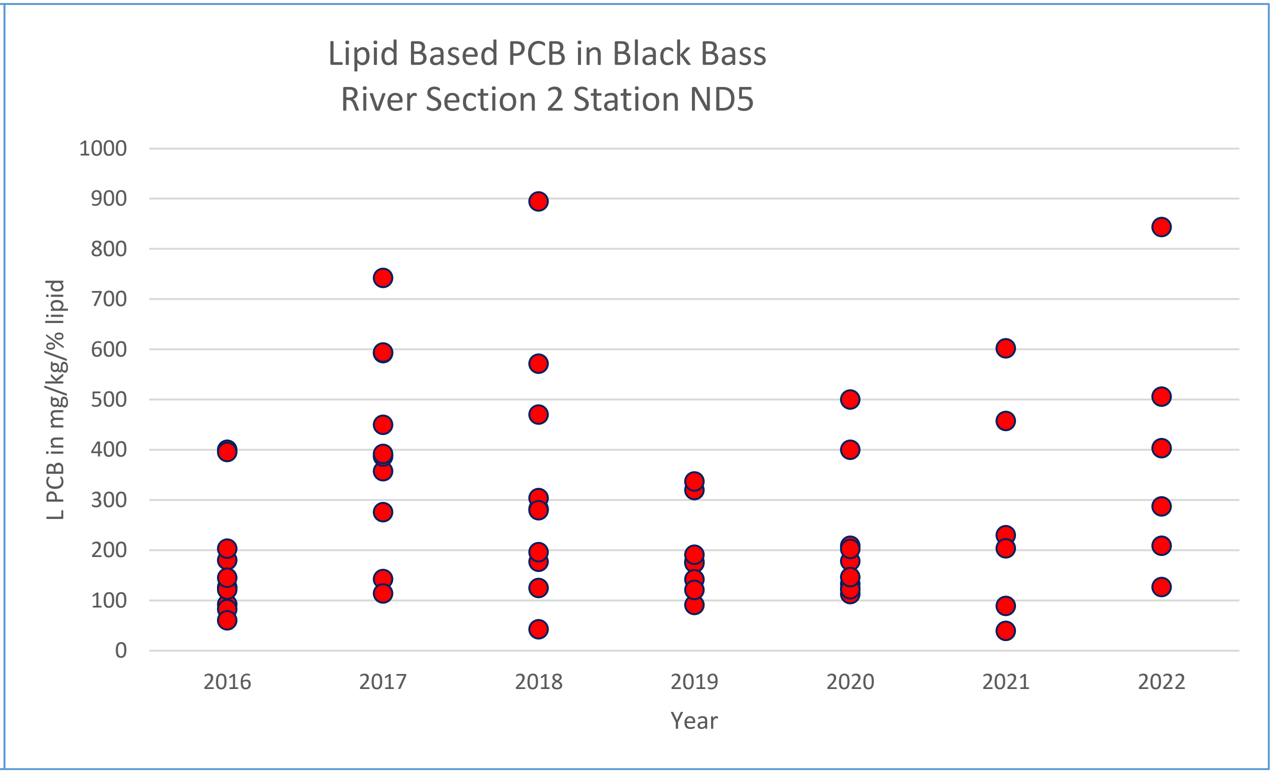
ND5 Black Bass Percent Lipid



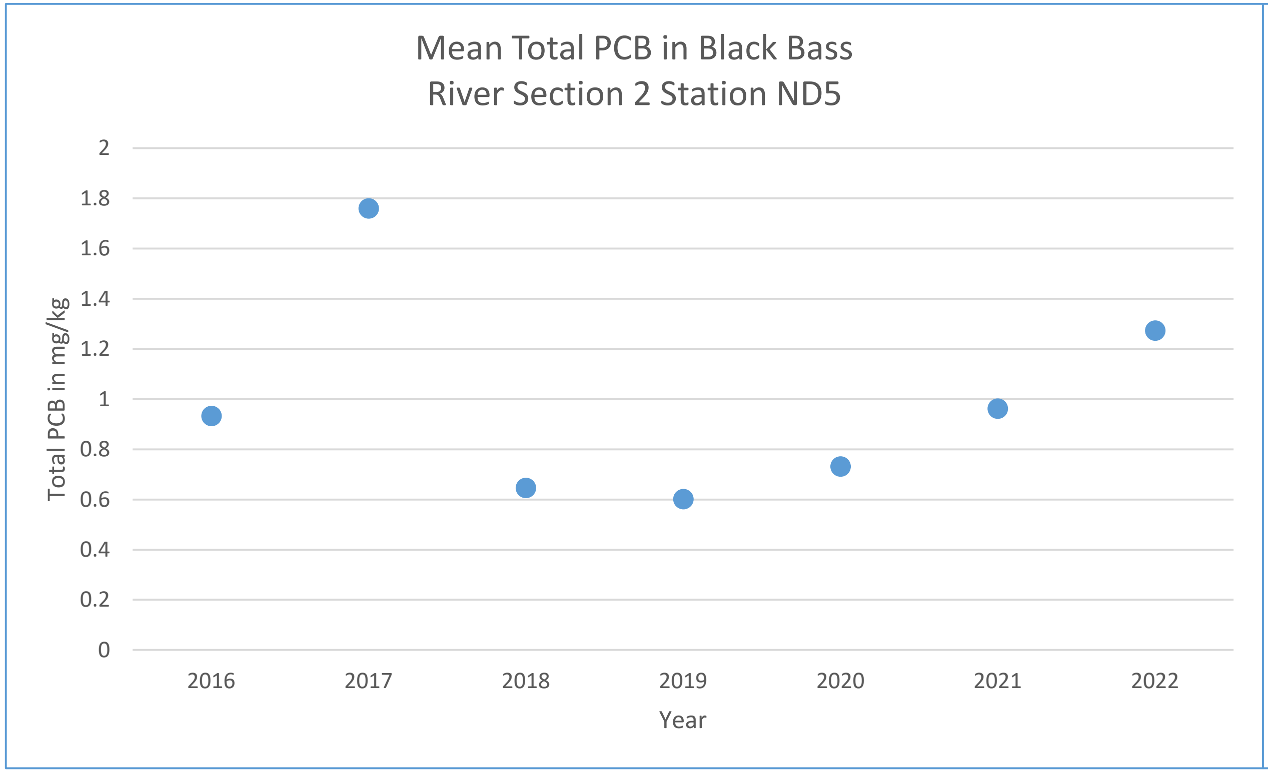


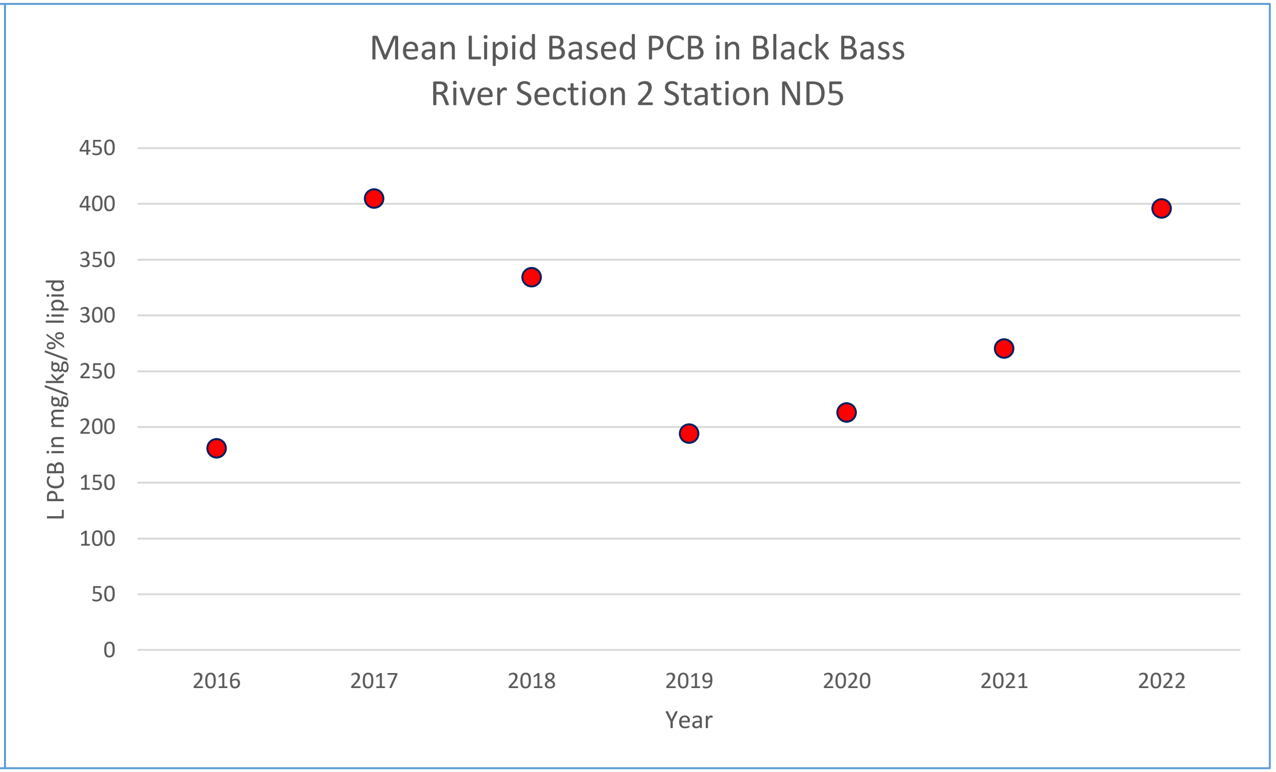
ND5 Black Bass Total PCB and Lipid Based PCB





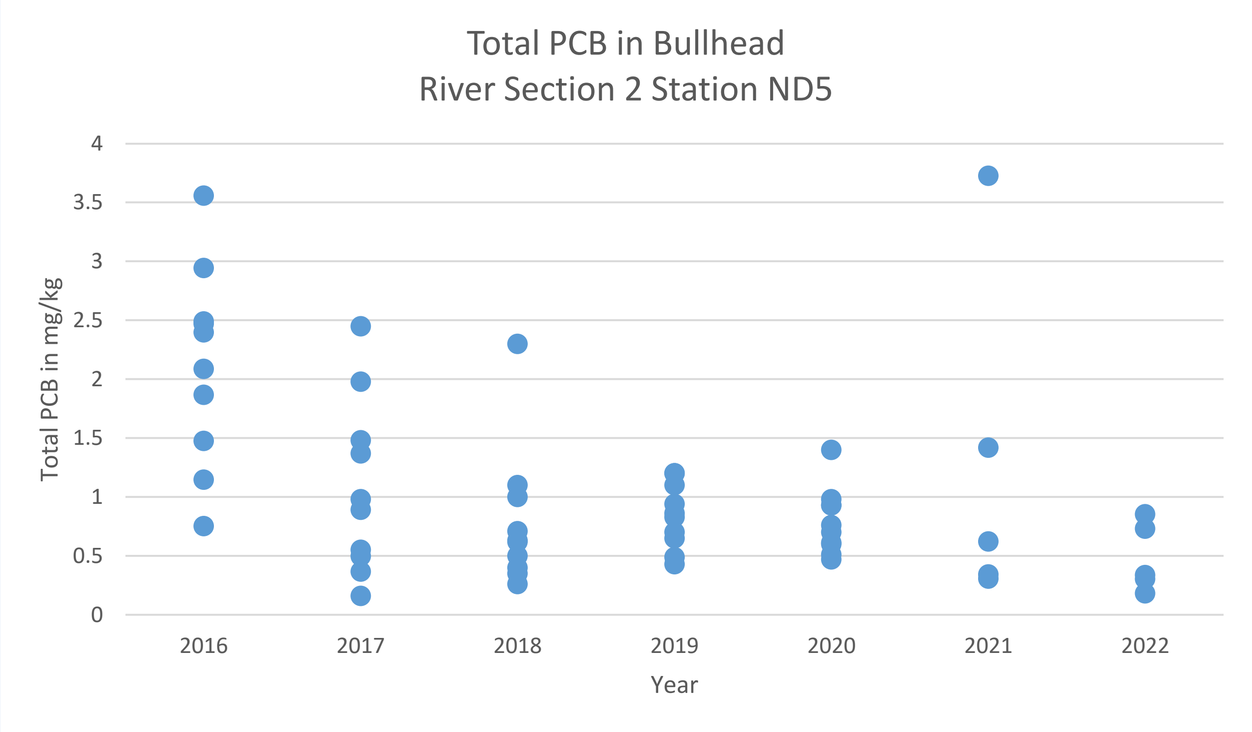
ND5 Black Bass Mean Total PCB and Mean Lipid Based PCB

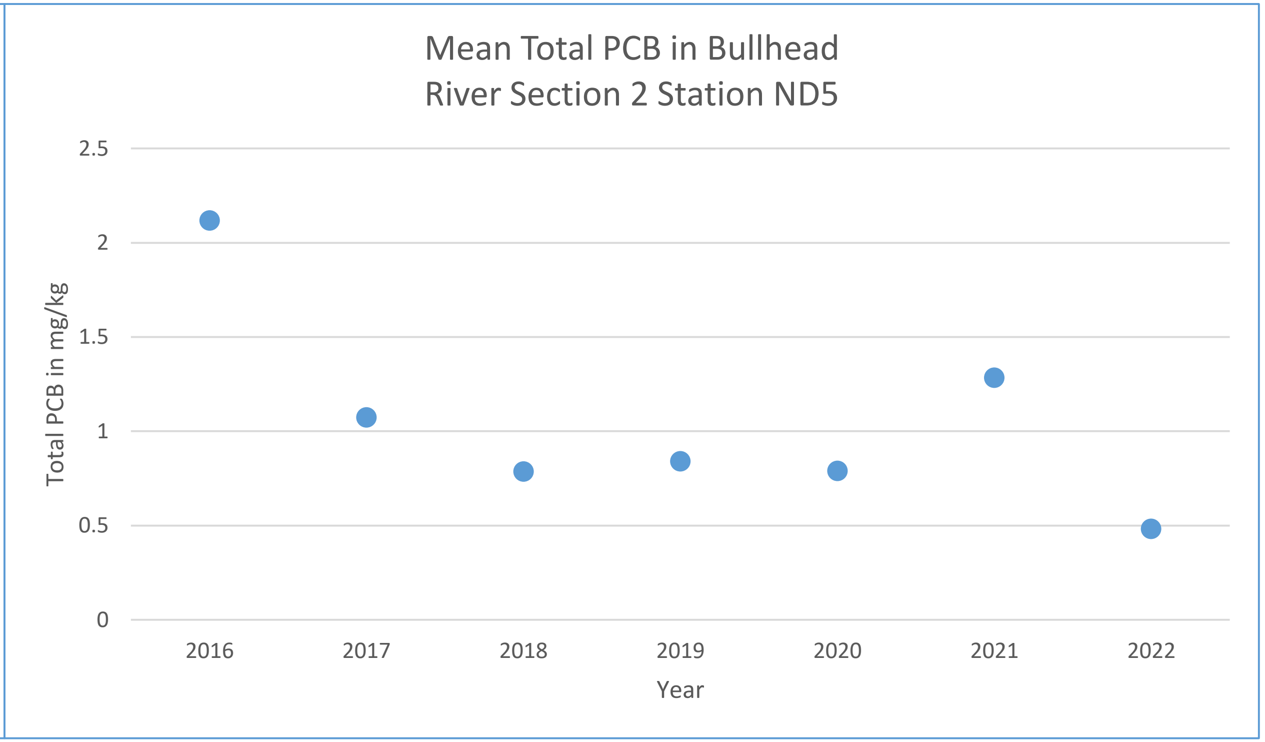




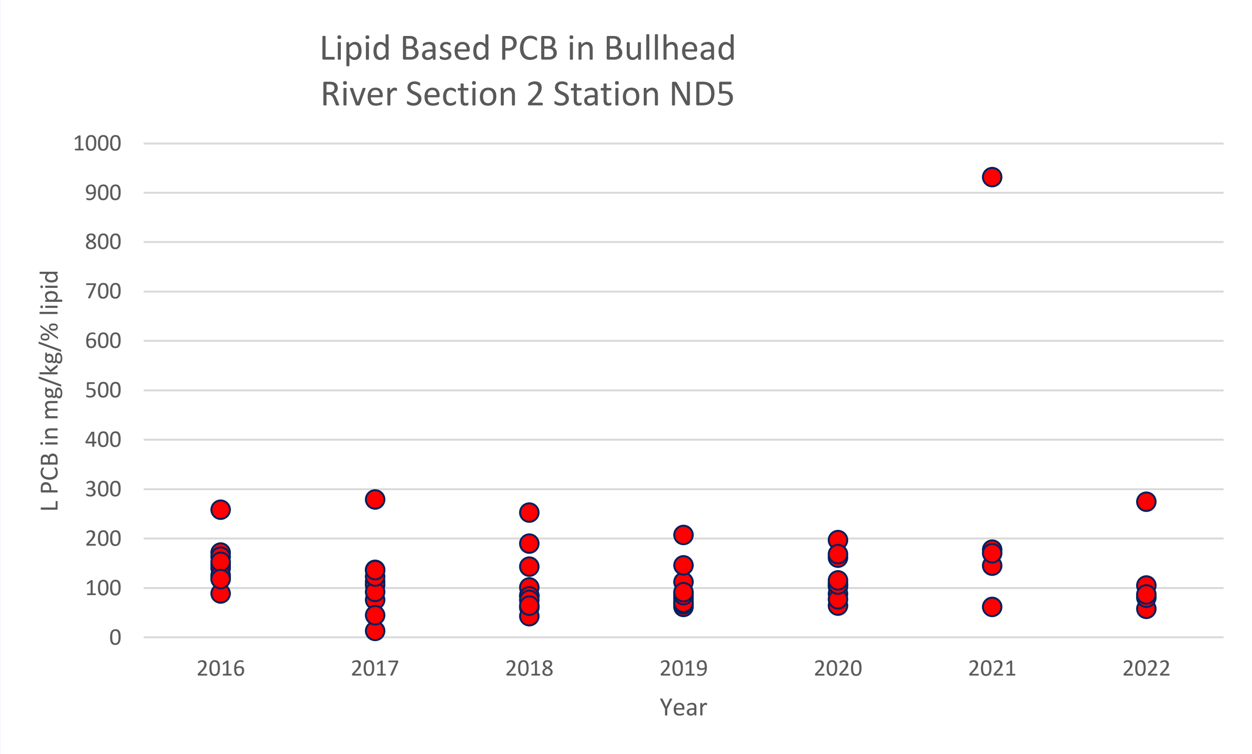
ND5 Bullhead Data

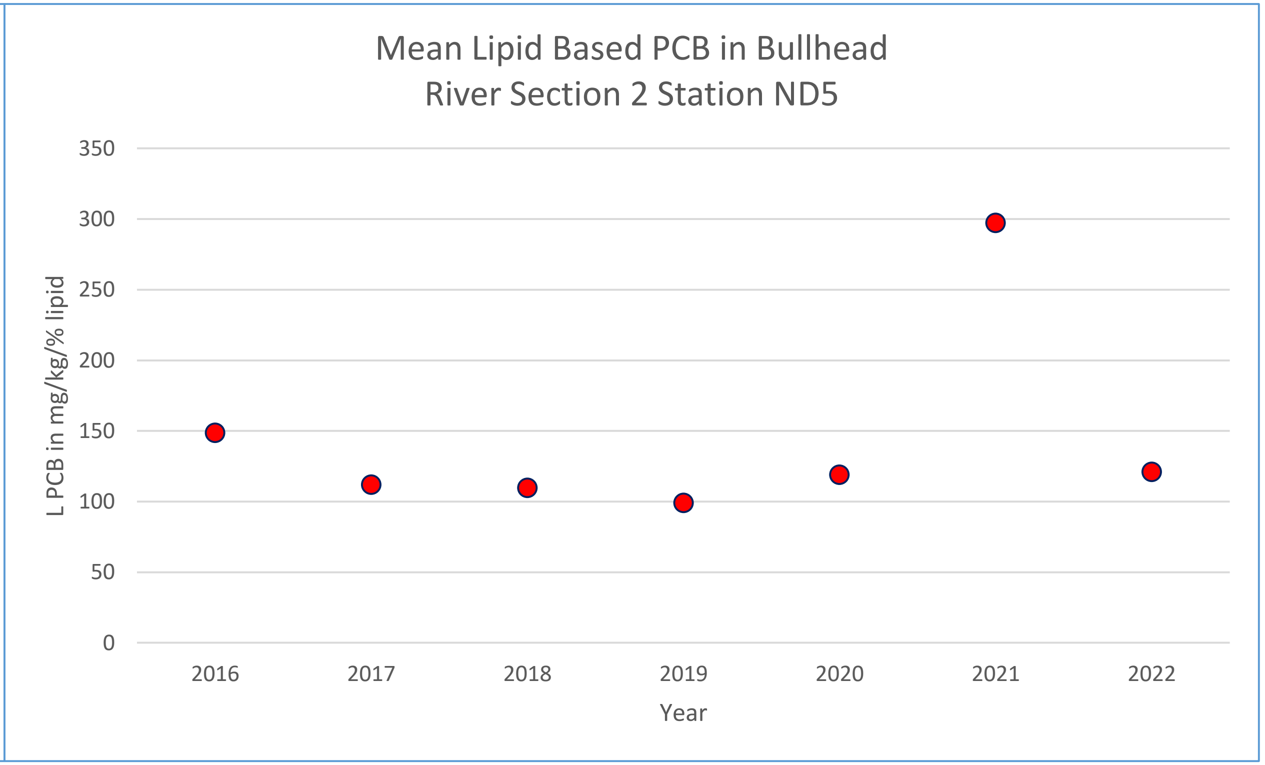
ND5 Bullhead Total PCB



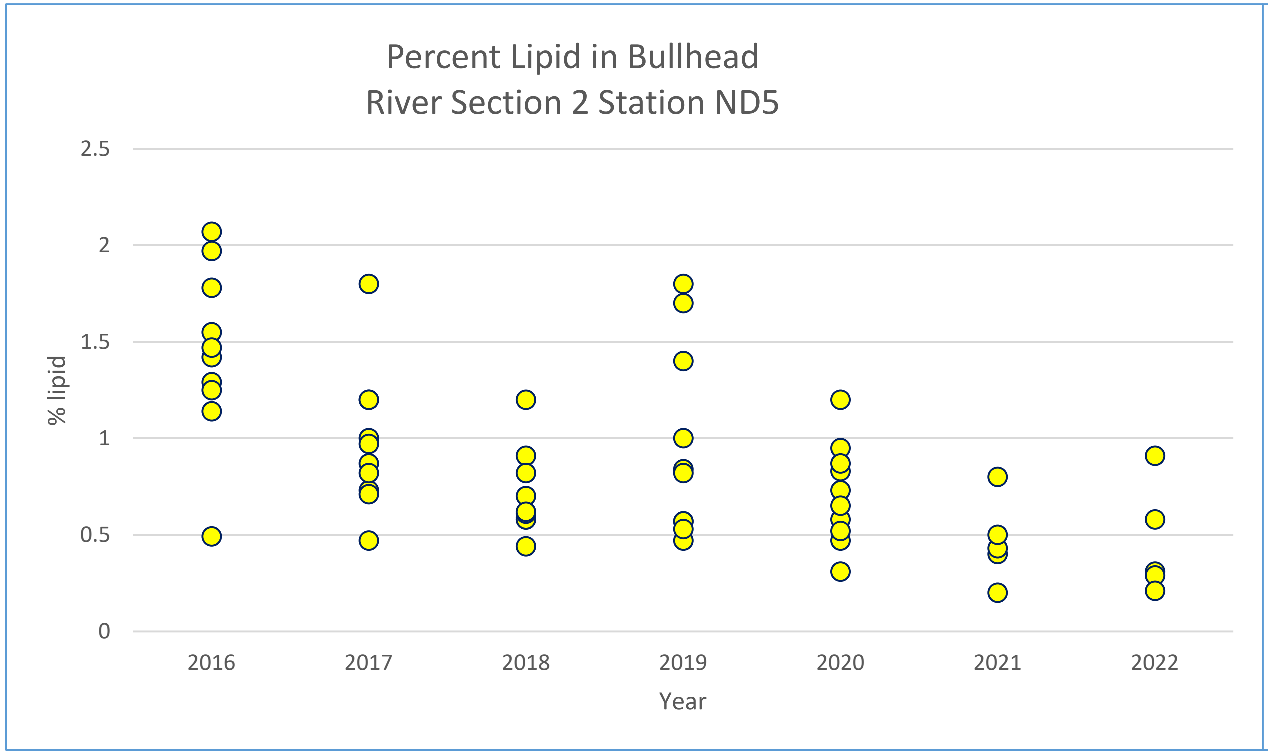


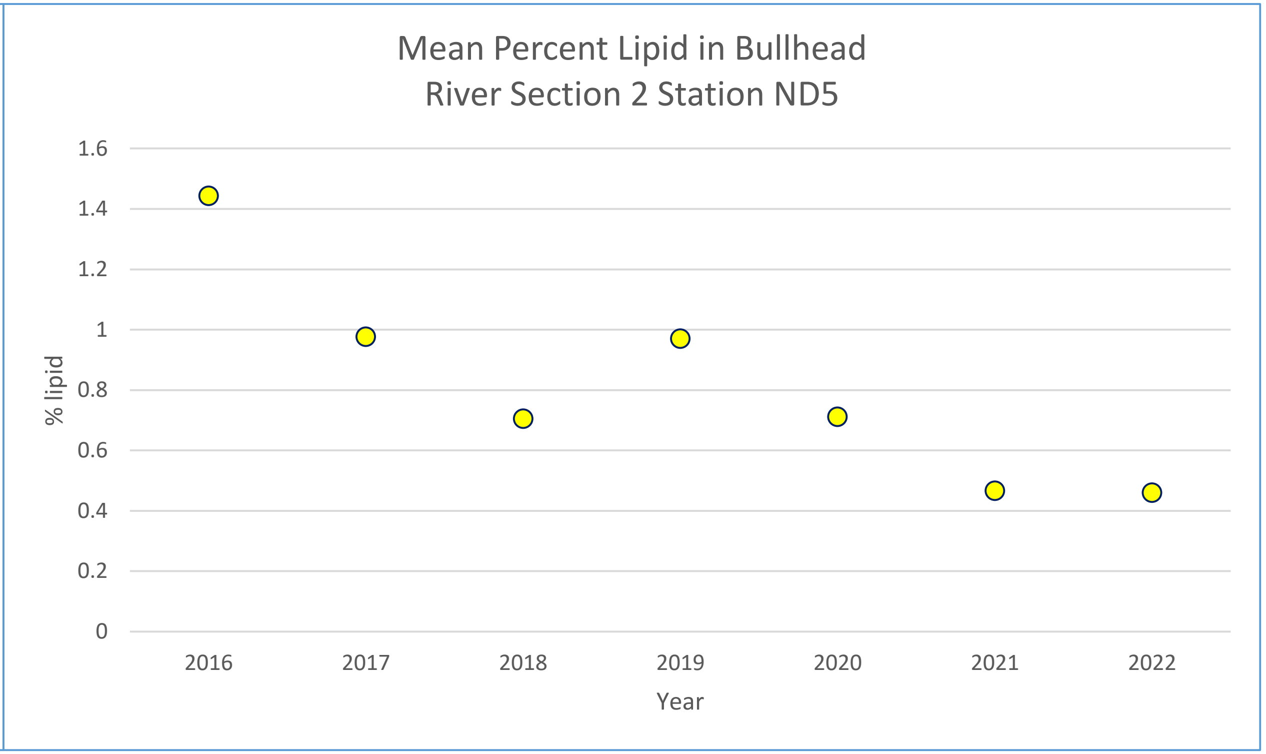
ND5 Bullhead Lipid Based PCB



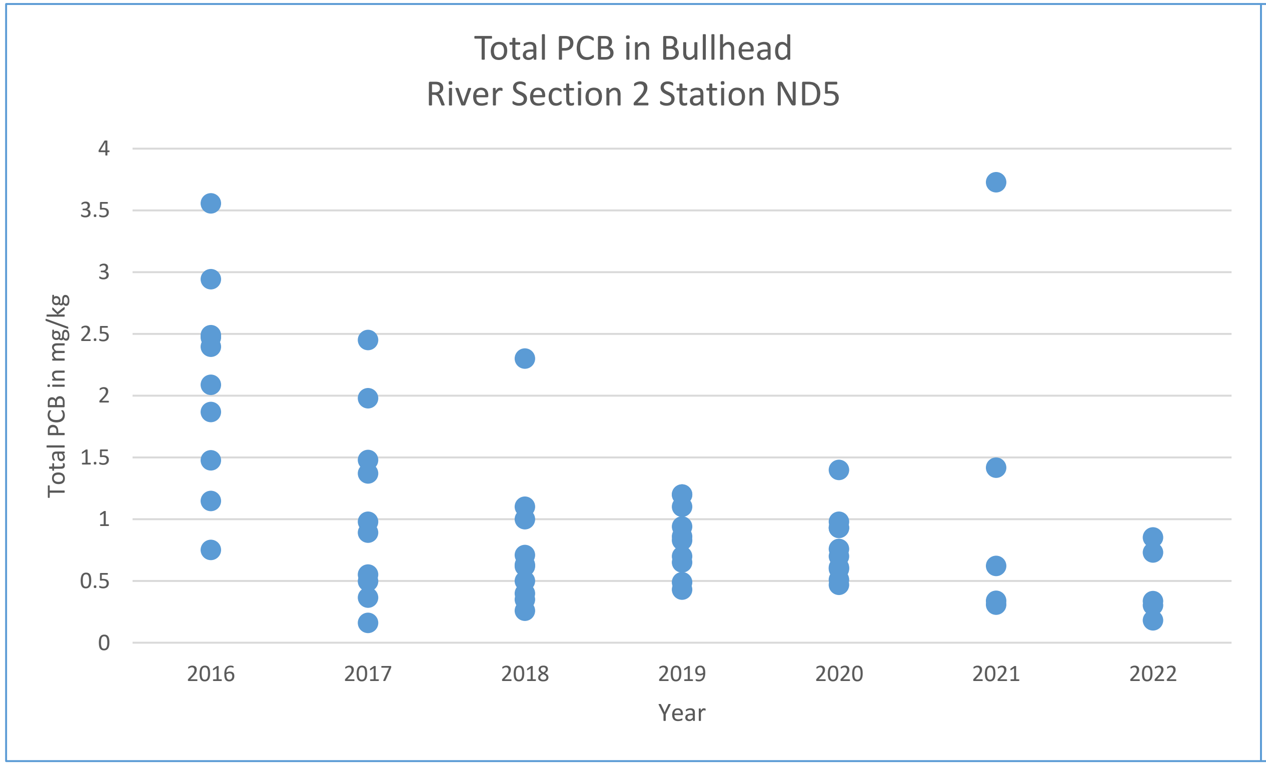


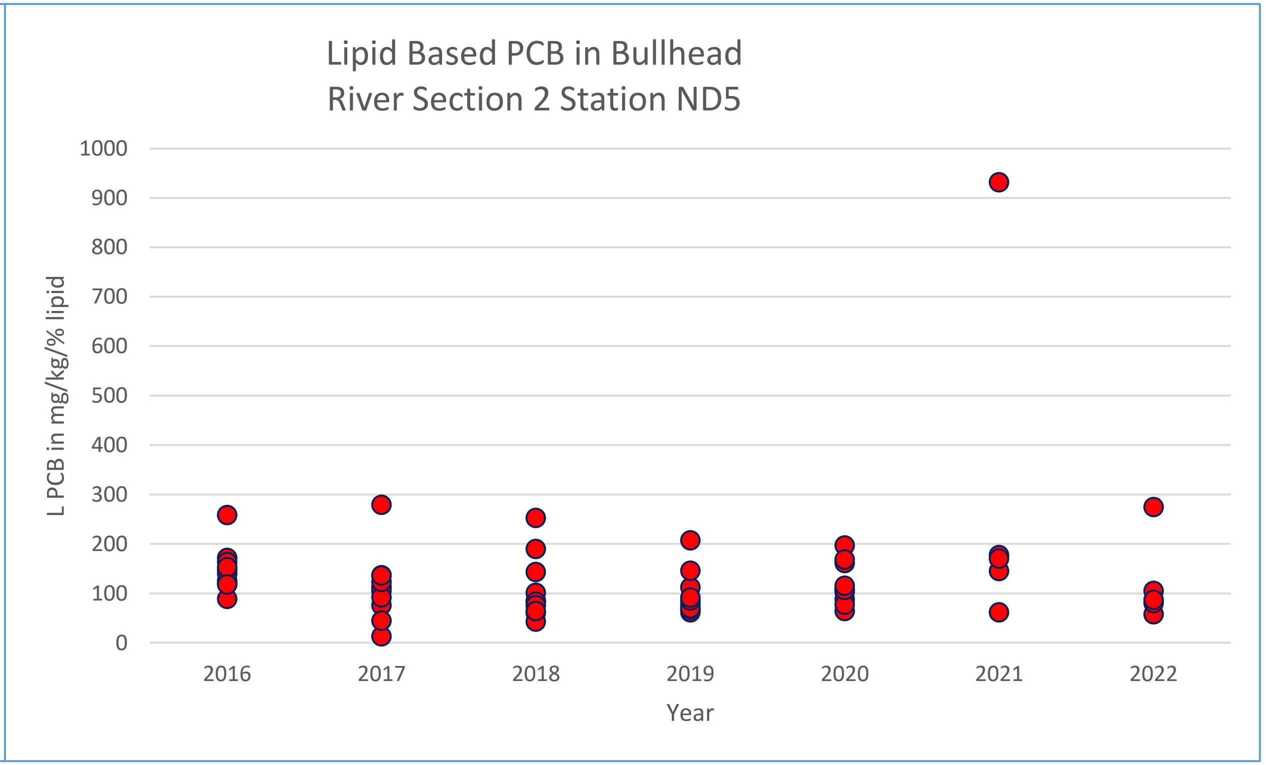
ND5 Bullhead Percent Lipid



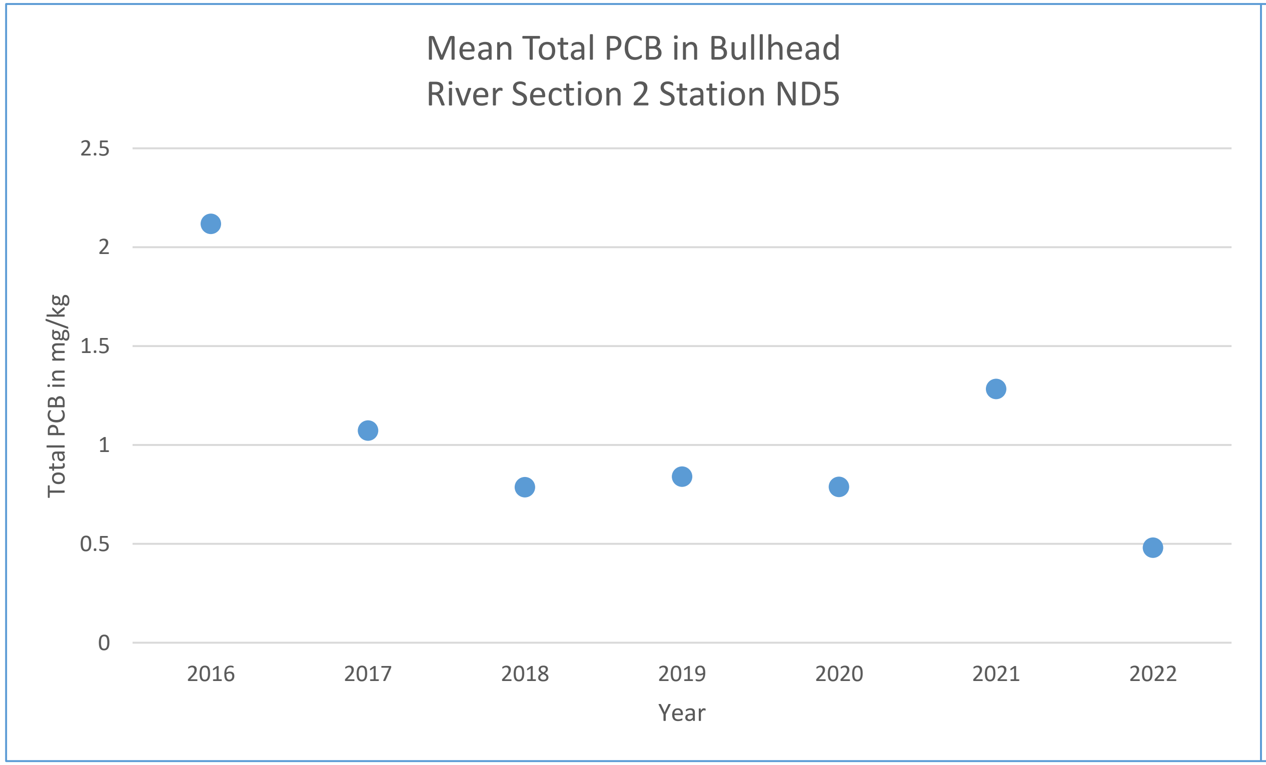


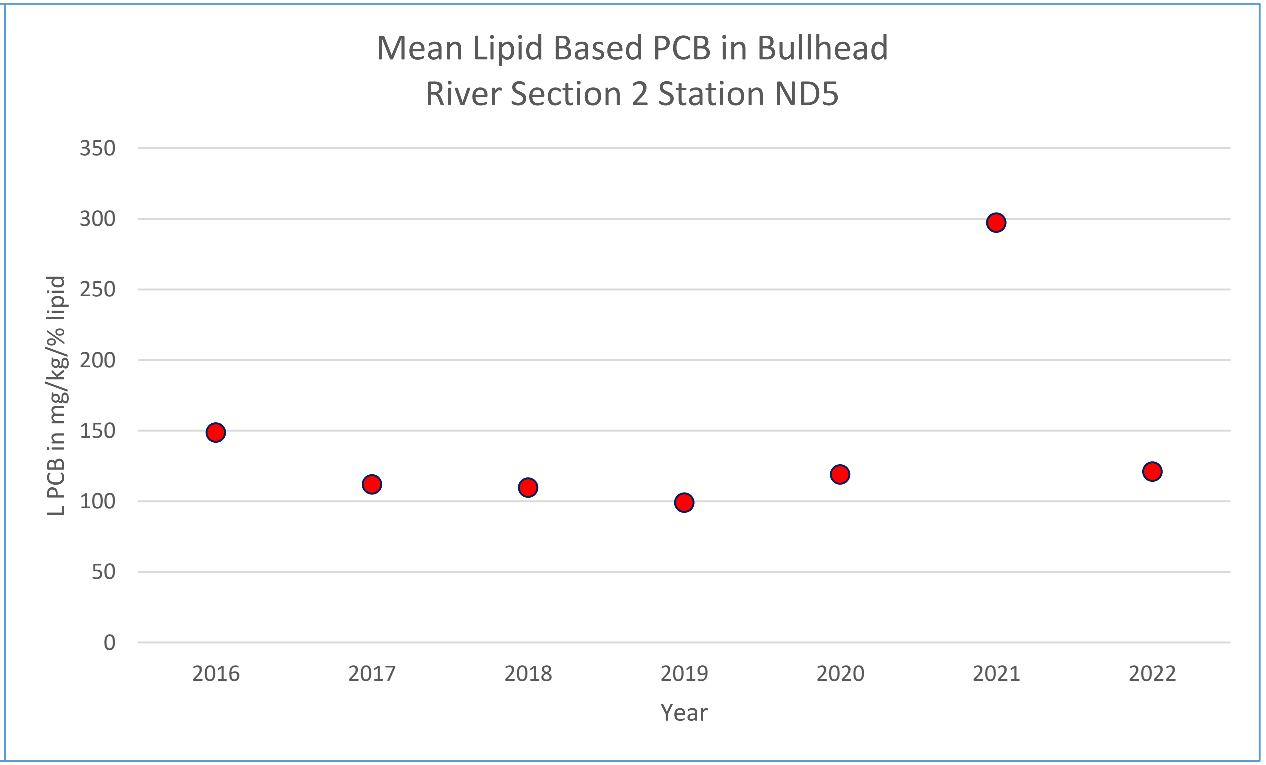
ND5 Bullhead Total PCB and Lipid Based PCB





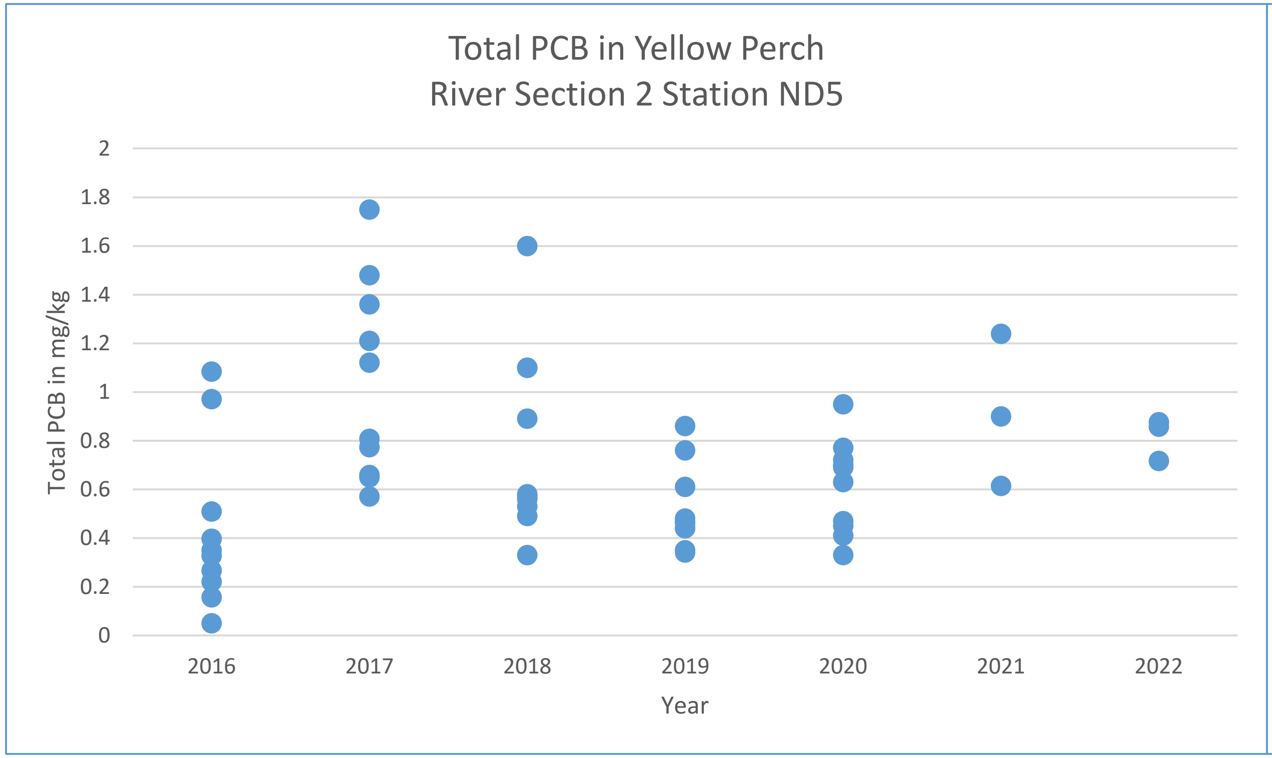
ND5 Bullhead Mean Total PCB and Mean Lipid Based PCB

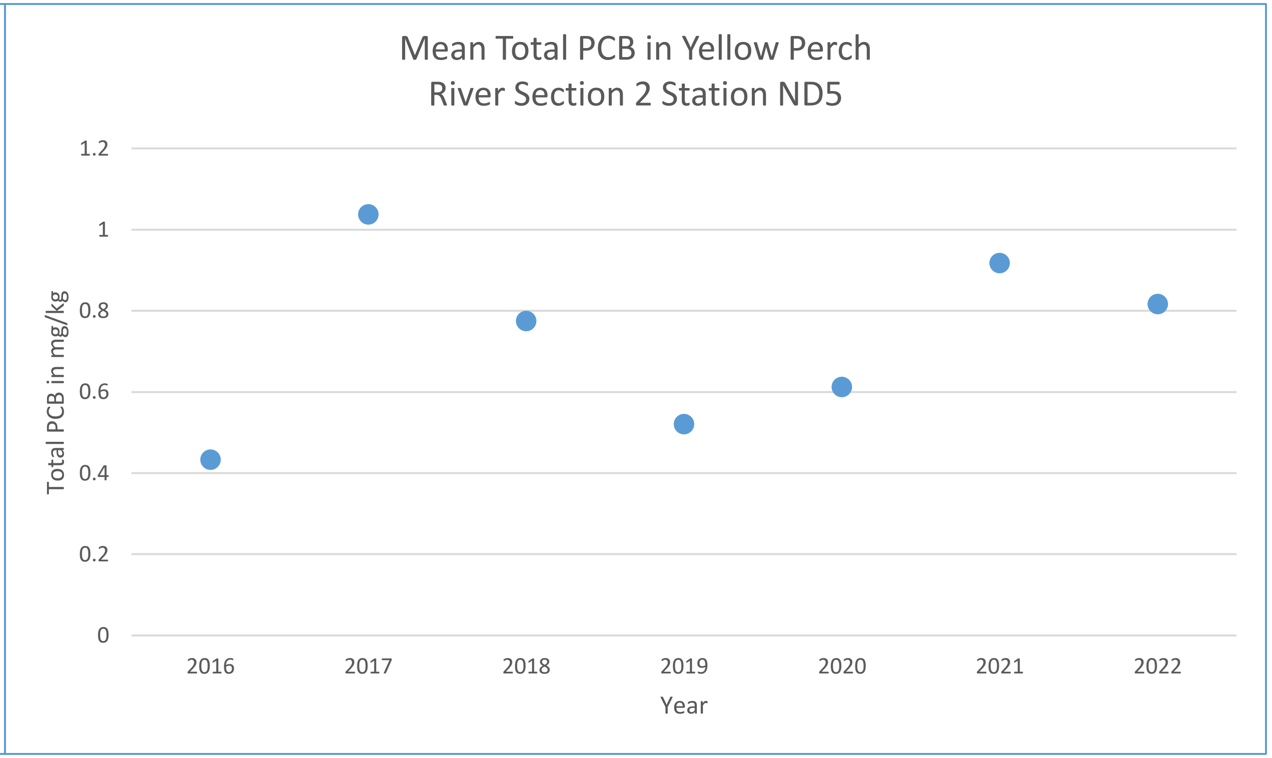




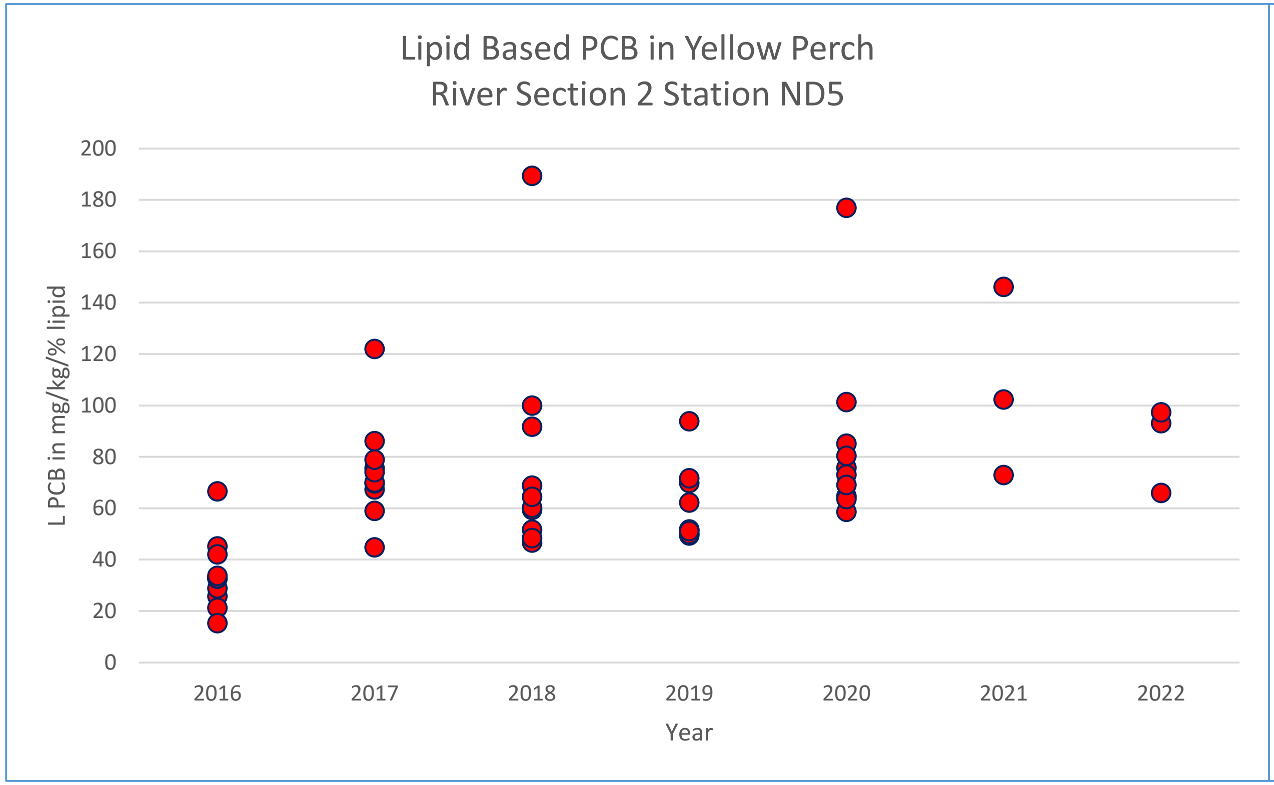
ND5 Yellow Perch Data

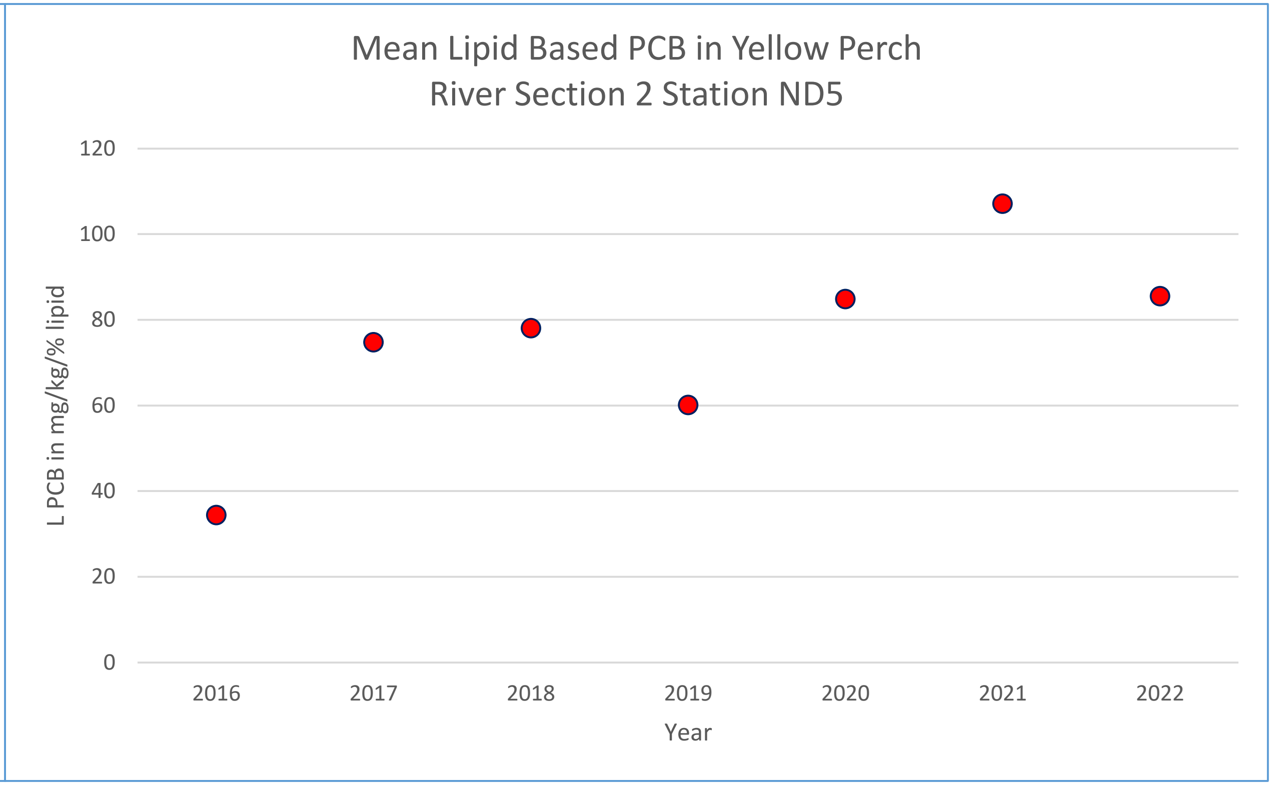
ND5 Yellow Perch Total PCB



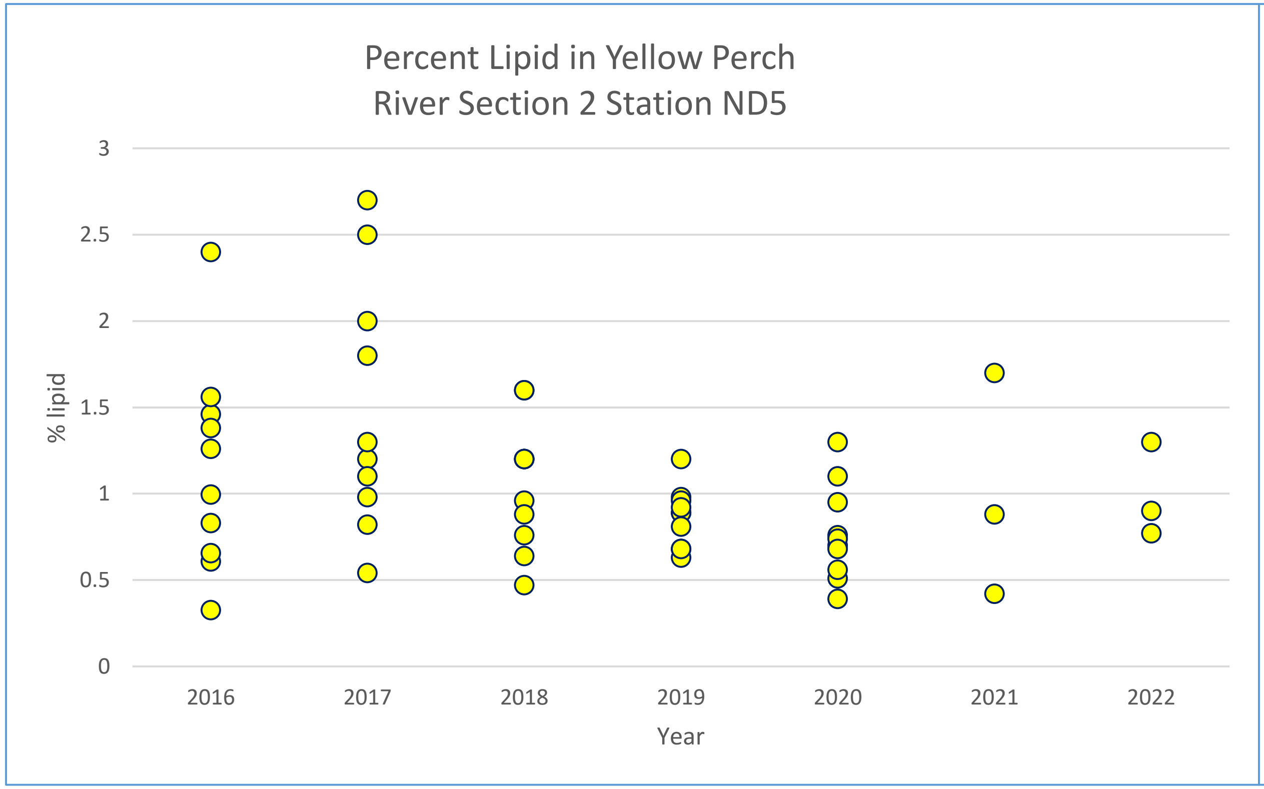


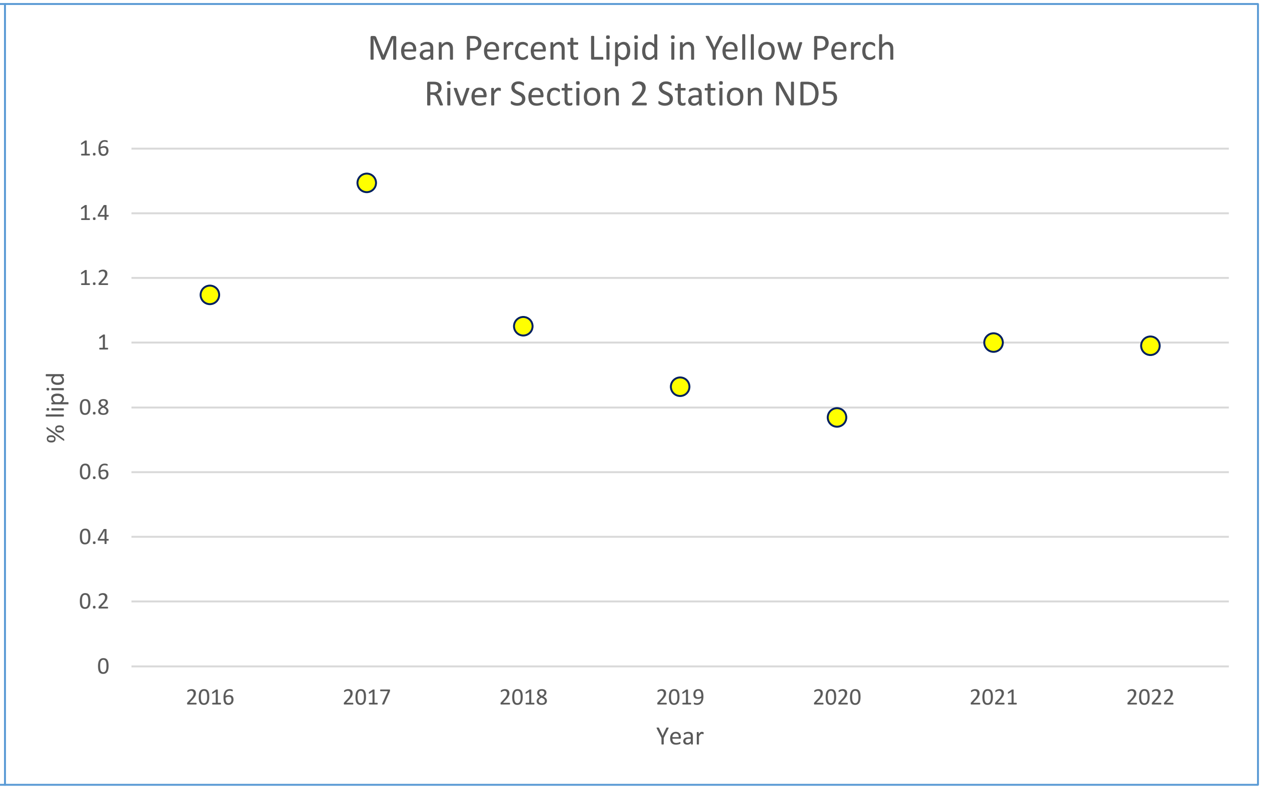
ND5 Yellow Perch Lipid Based PCB



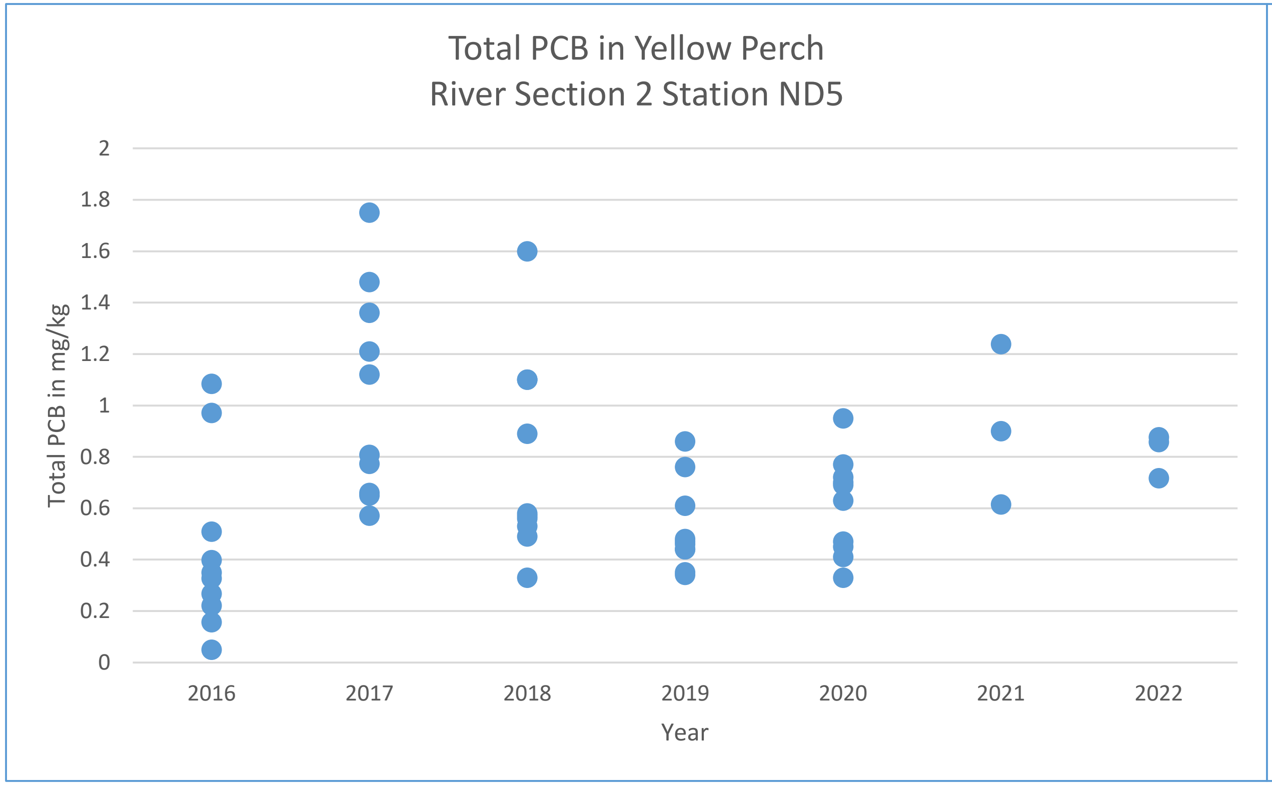


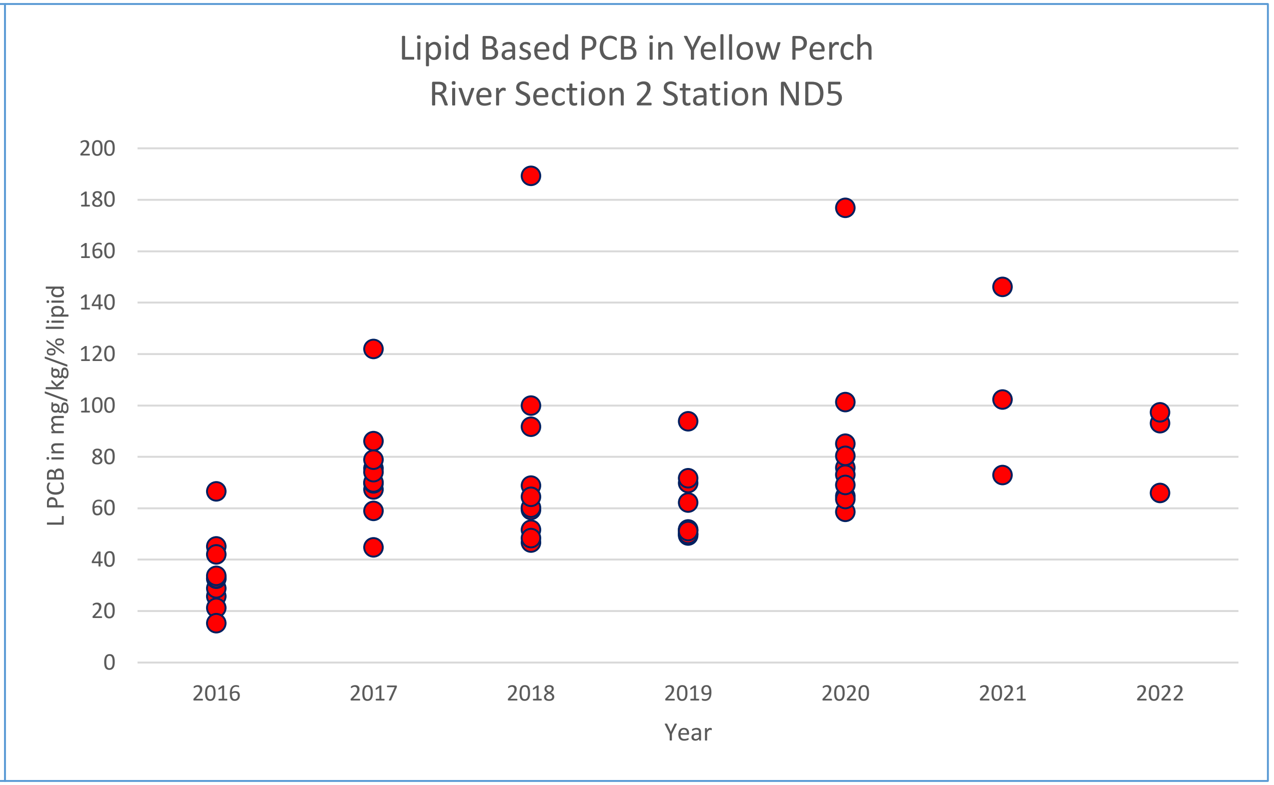
ND5 Yellow Perch Percent Lipid



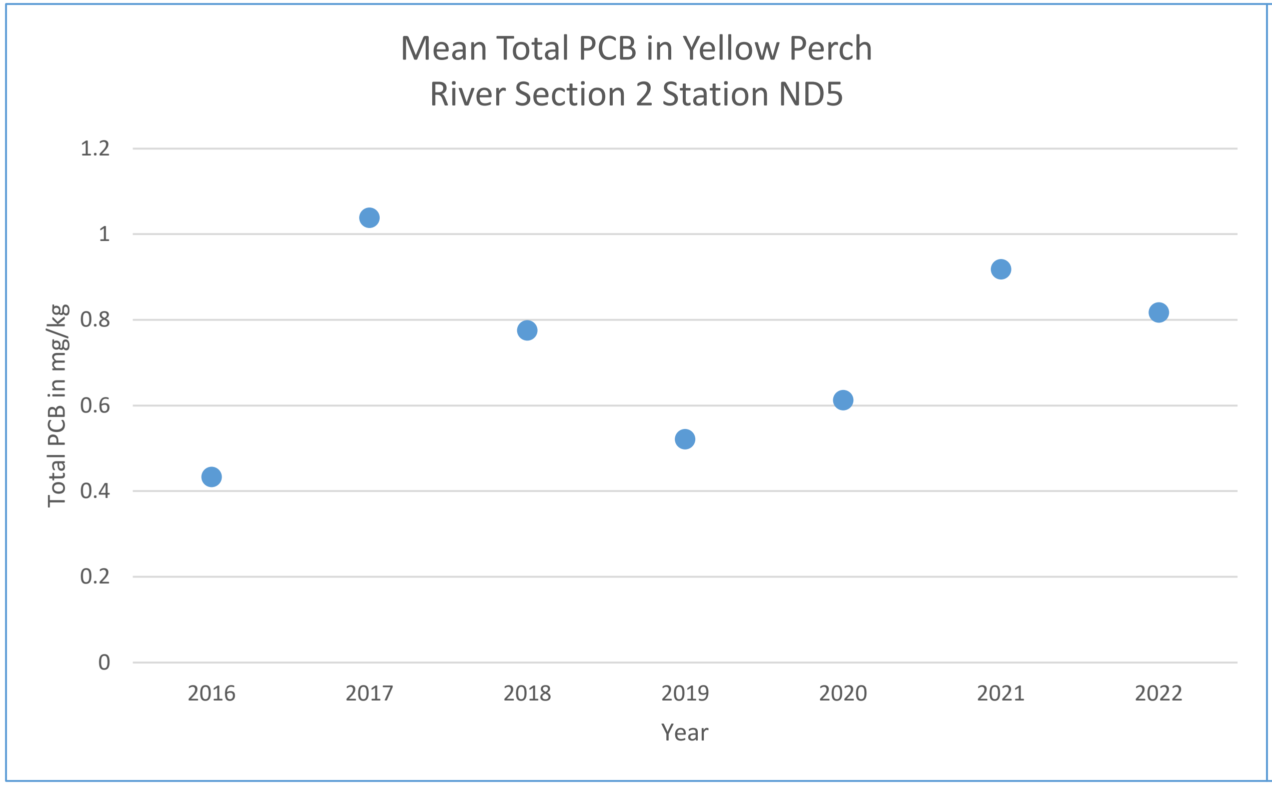


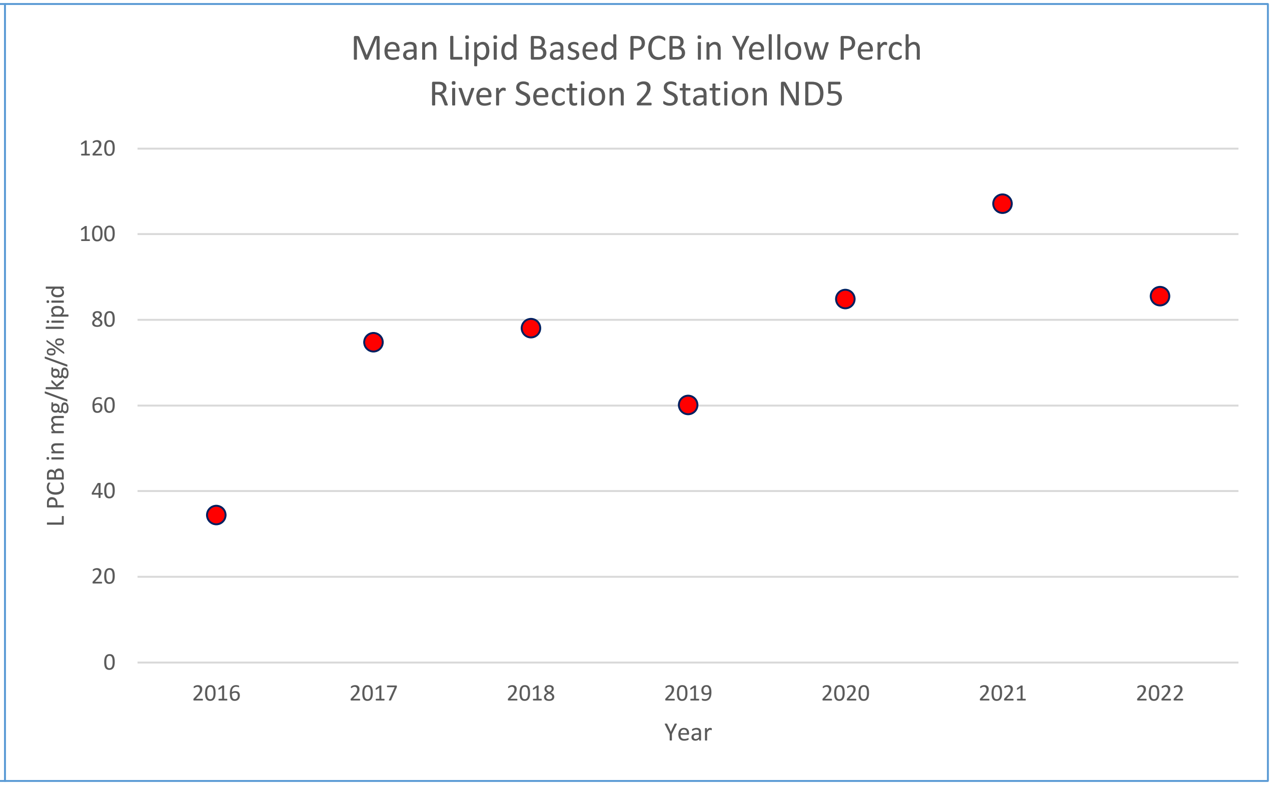
ND5 Yellow Perch Total PCB and Lipid Based PCB





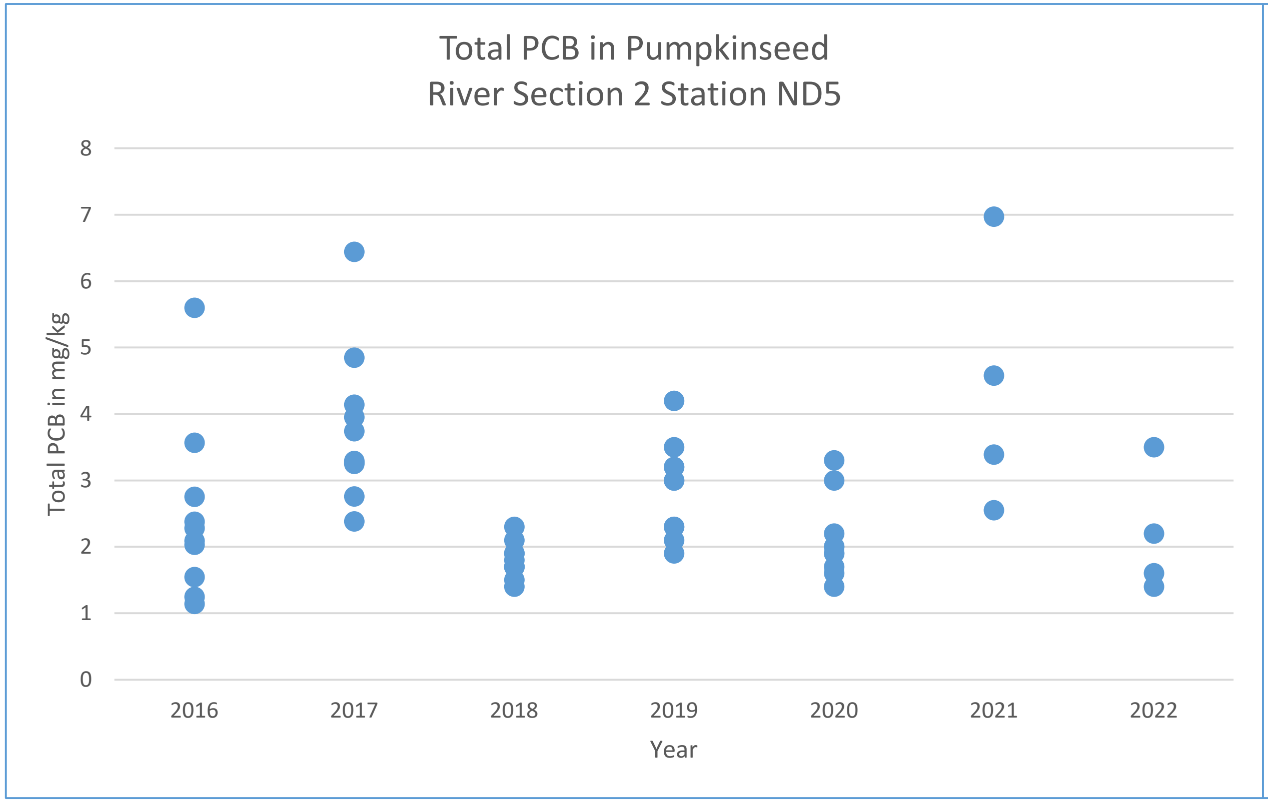
ND5 Yellow Perch Mean Total PCB and Mean Lipid Based PCB

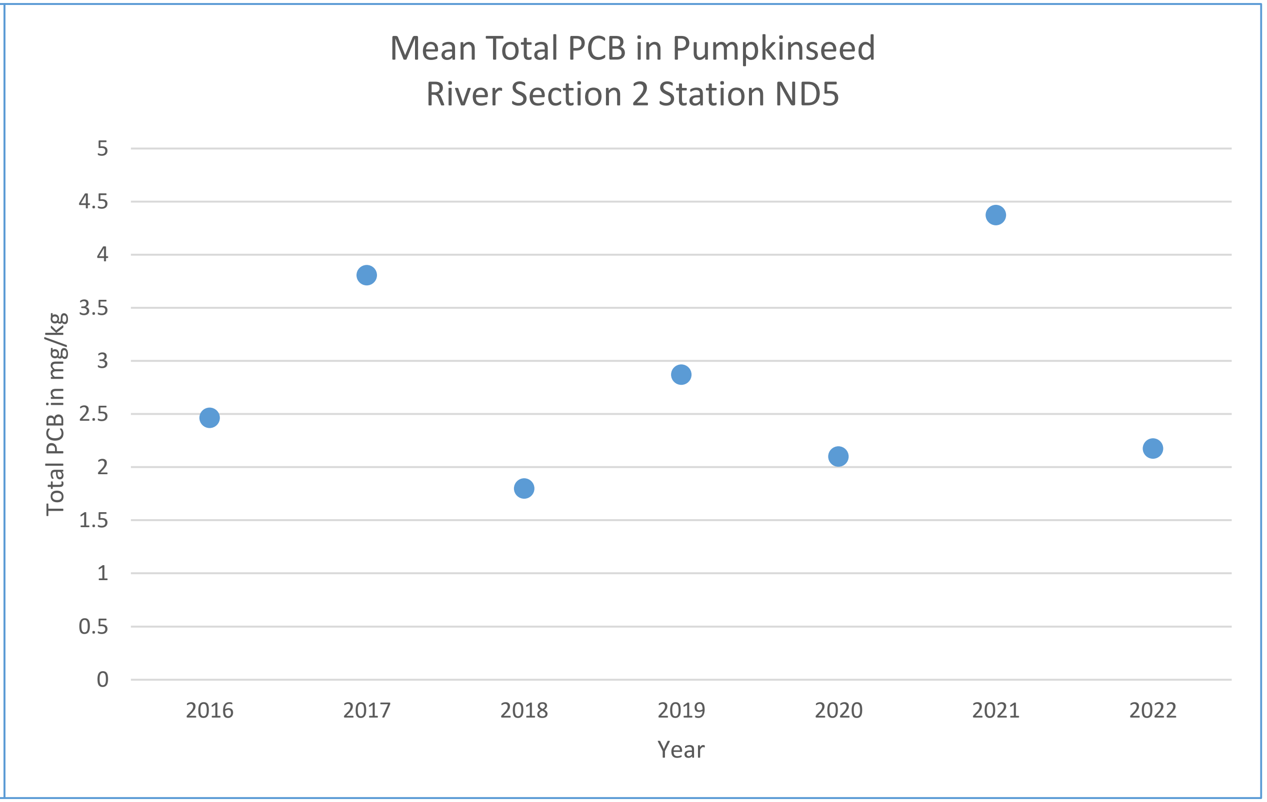




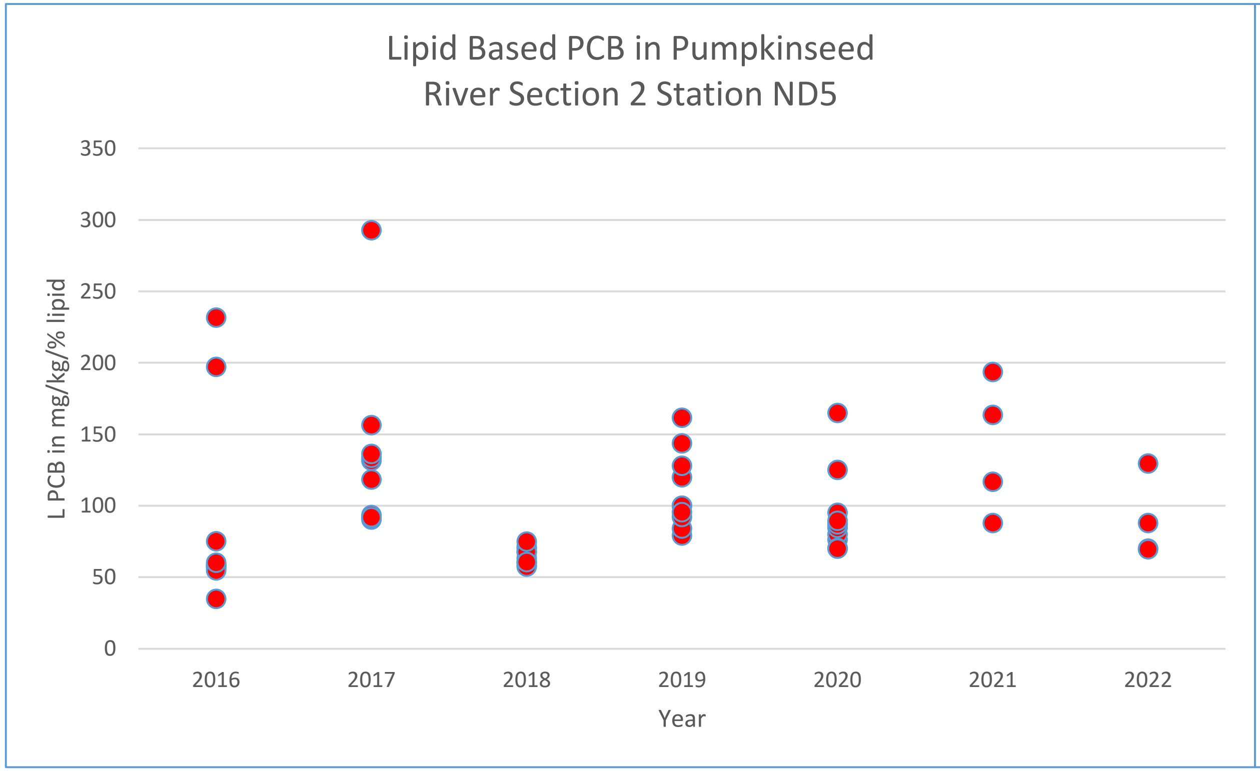
ND5 Pumpkinseed Data

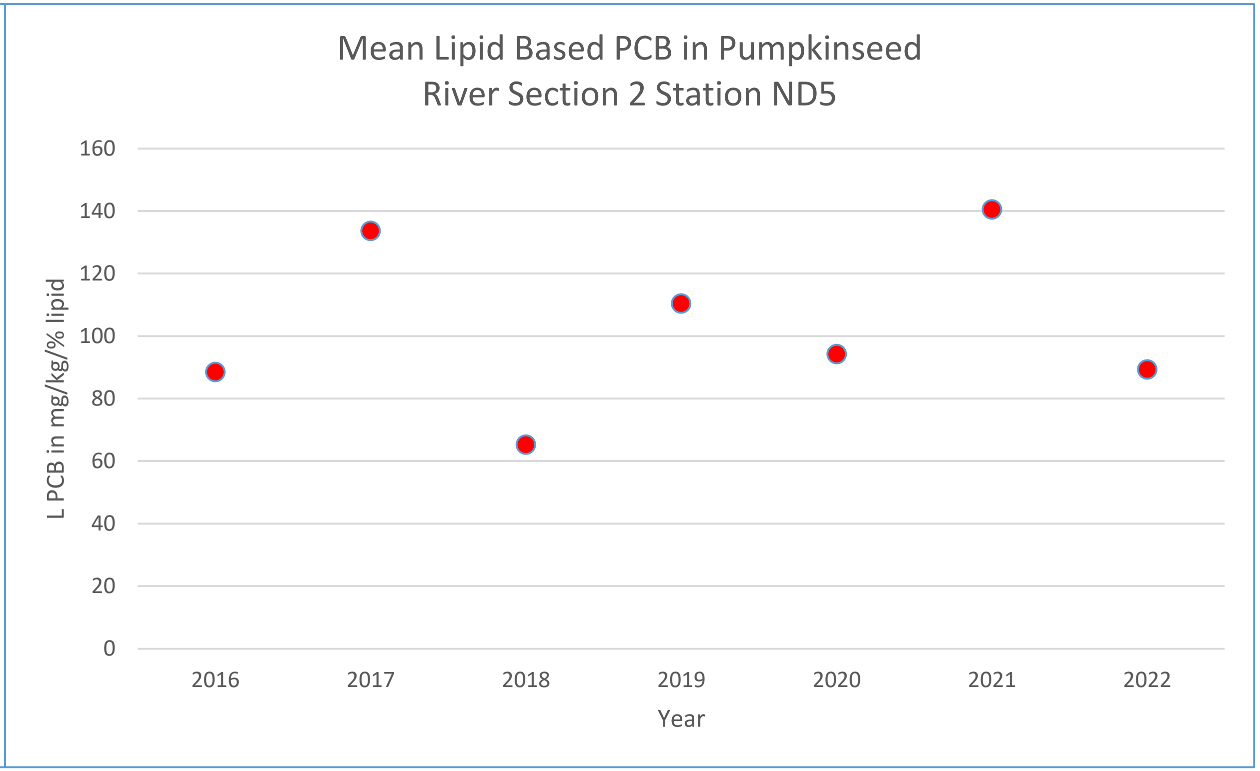
ND5 Pumpkinseed Total PCB



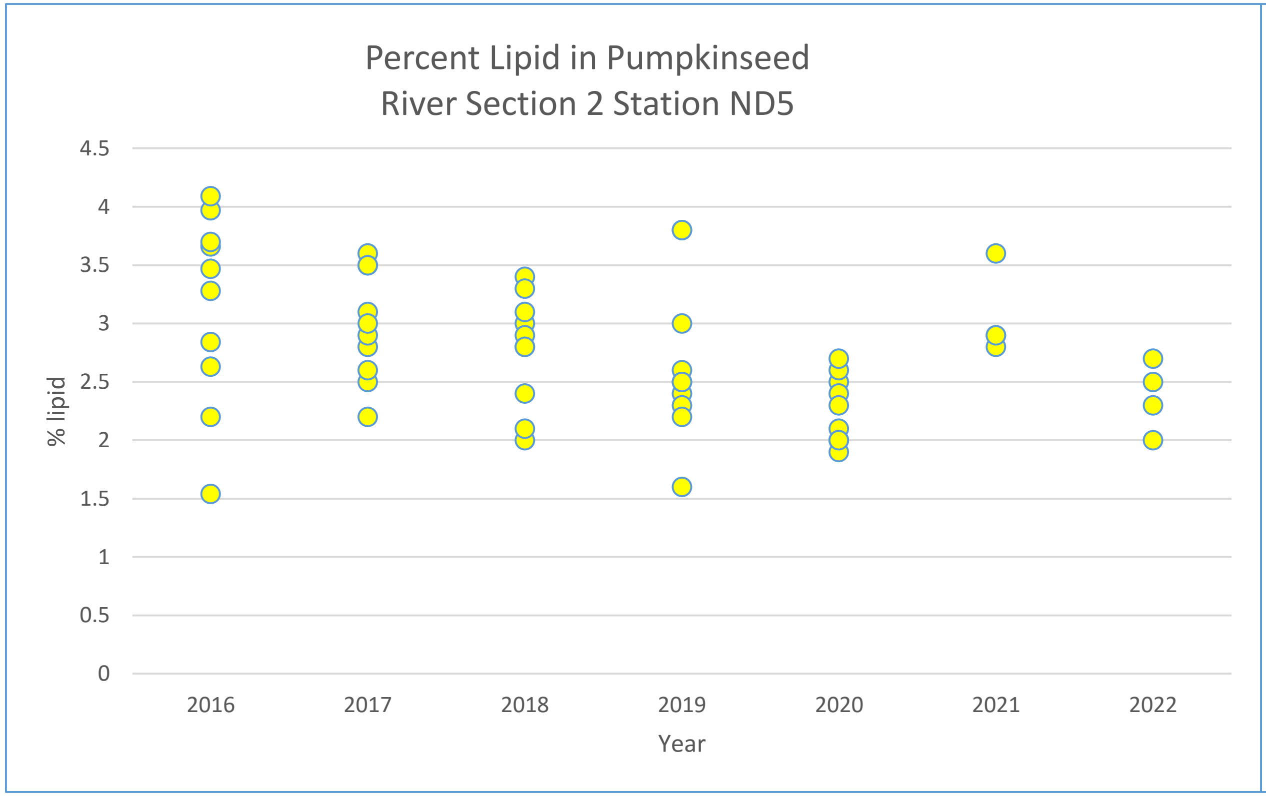


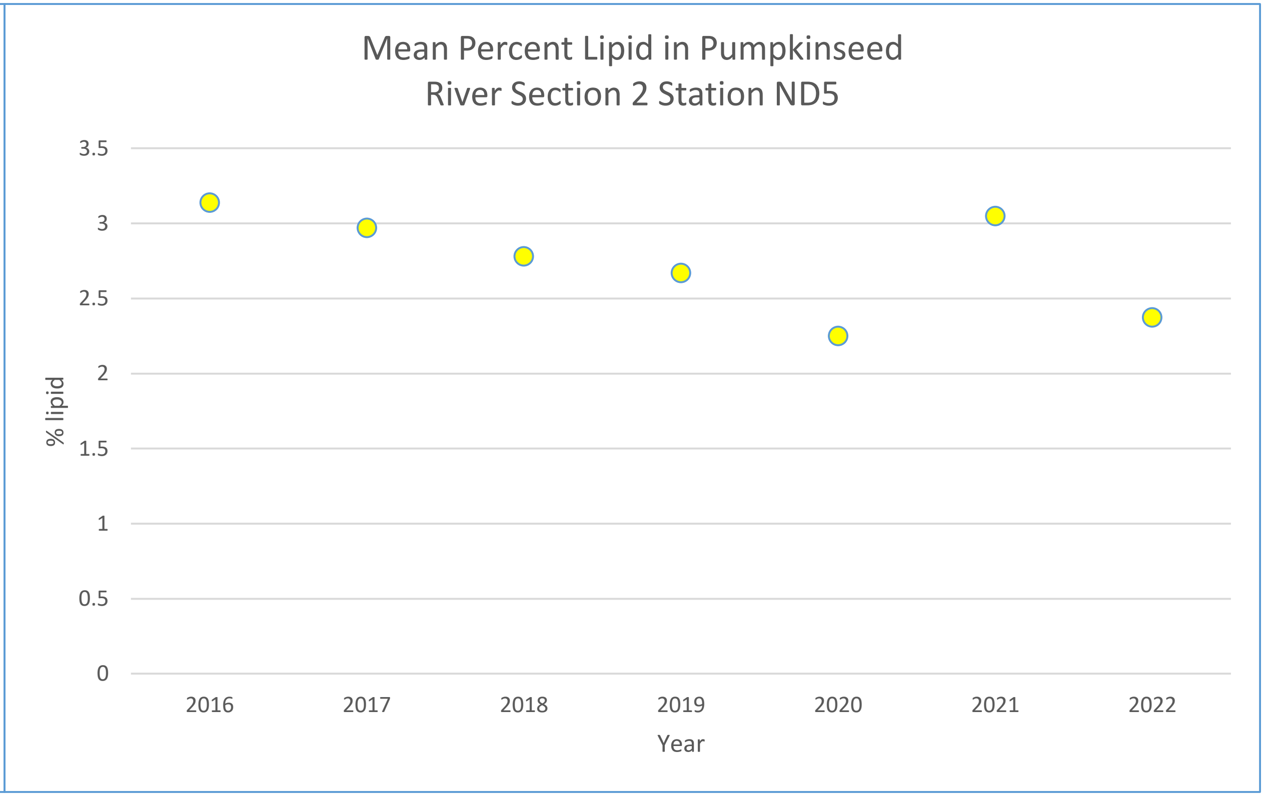
ND5 Pumpkinseed Lipid Based PCB



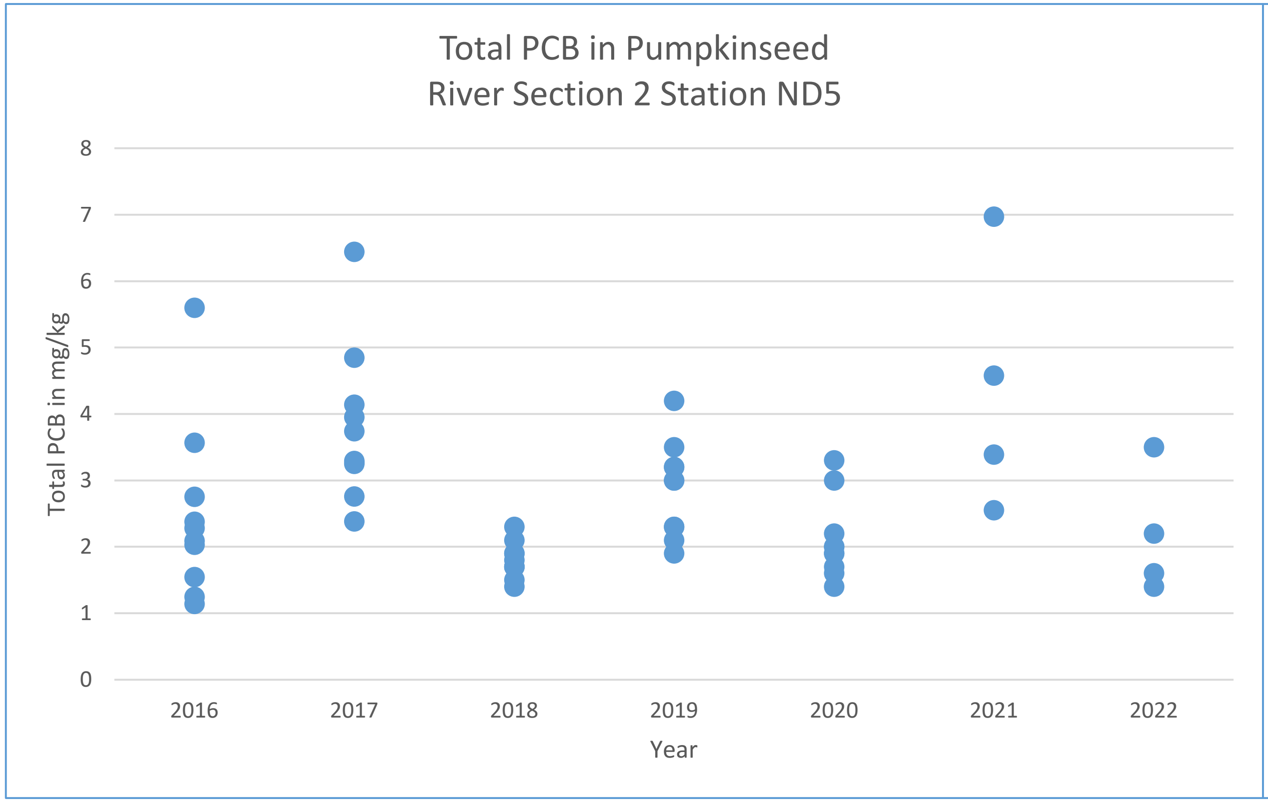


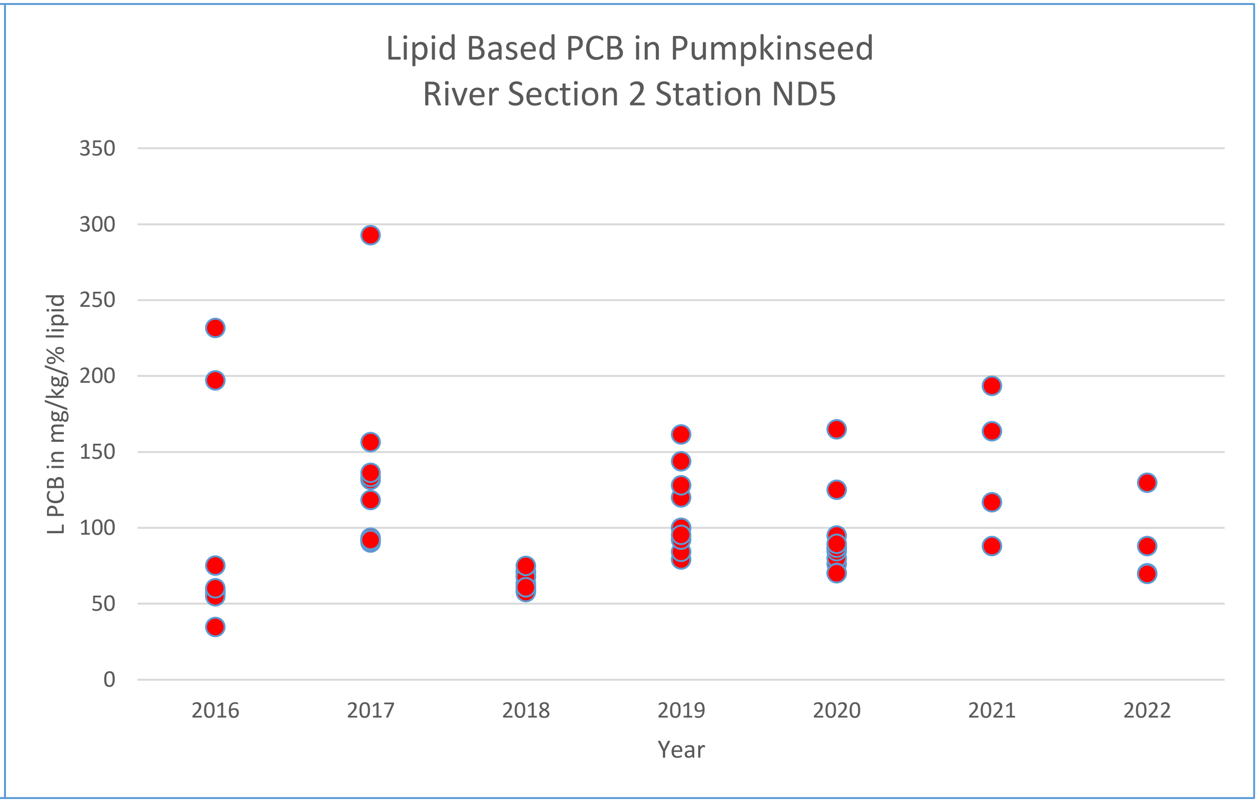
ND5 Pumpkinseed Percent Lipid



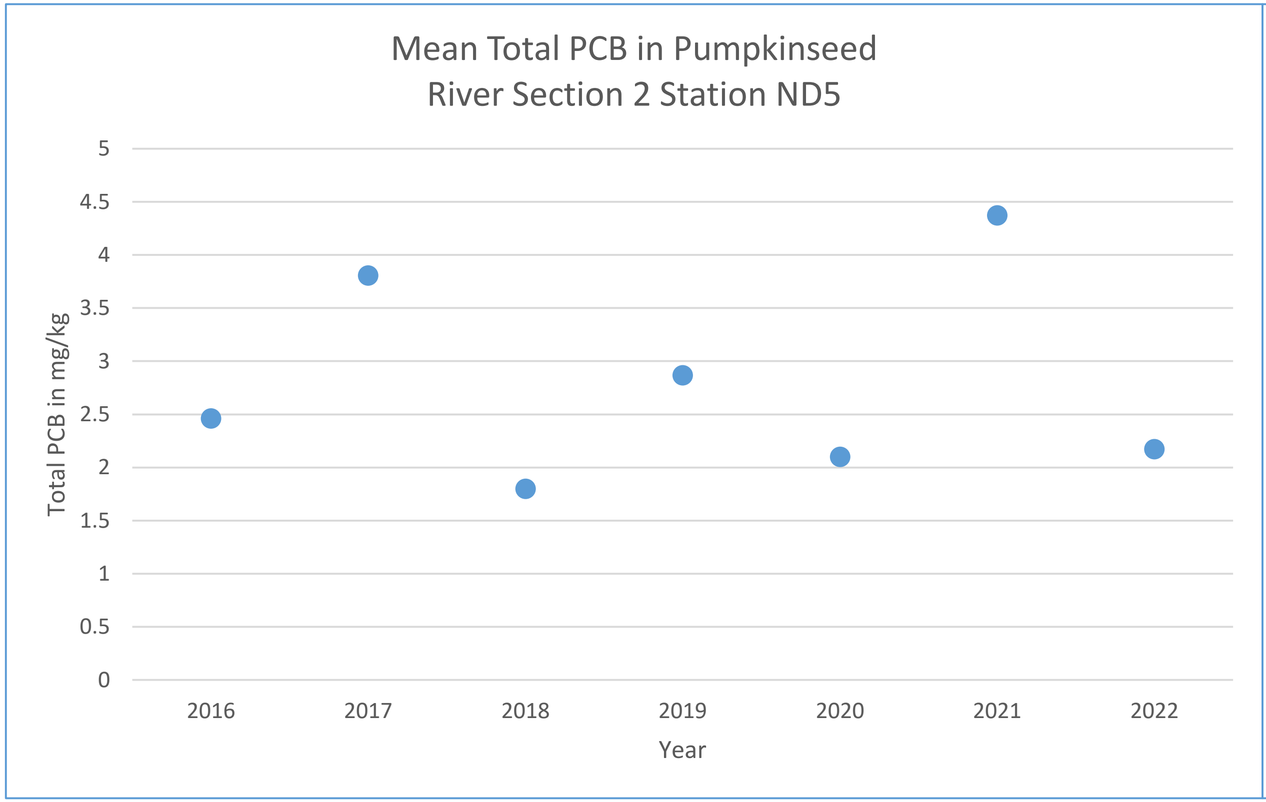


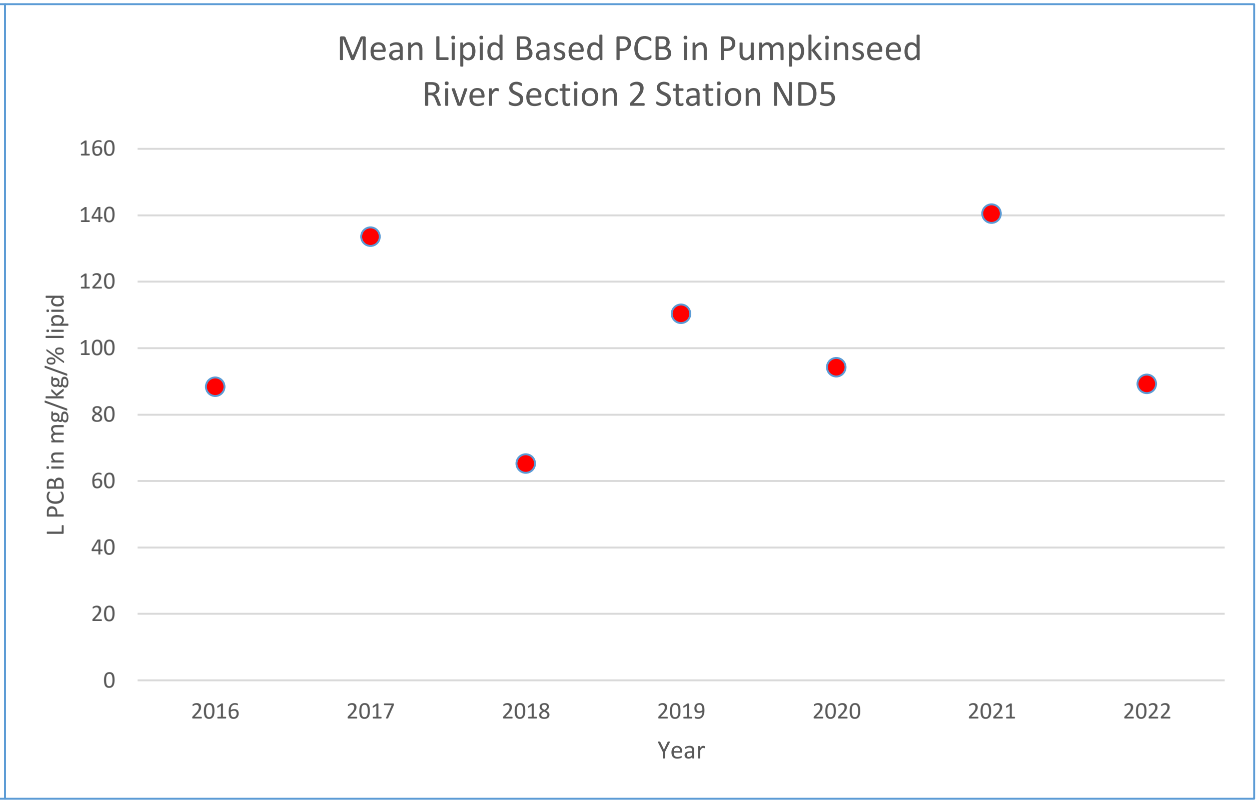
ND5 Pumpkinseed Total PCB and Lipid Based PCB





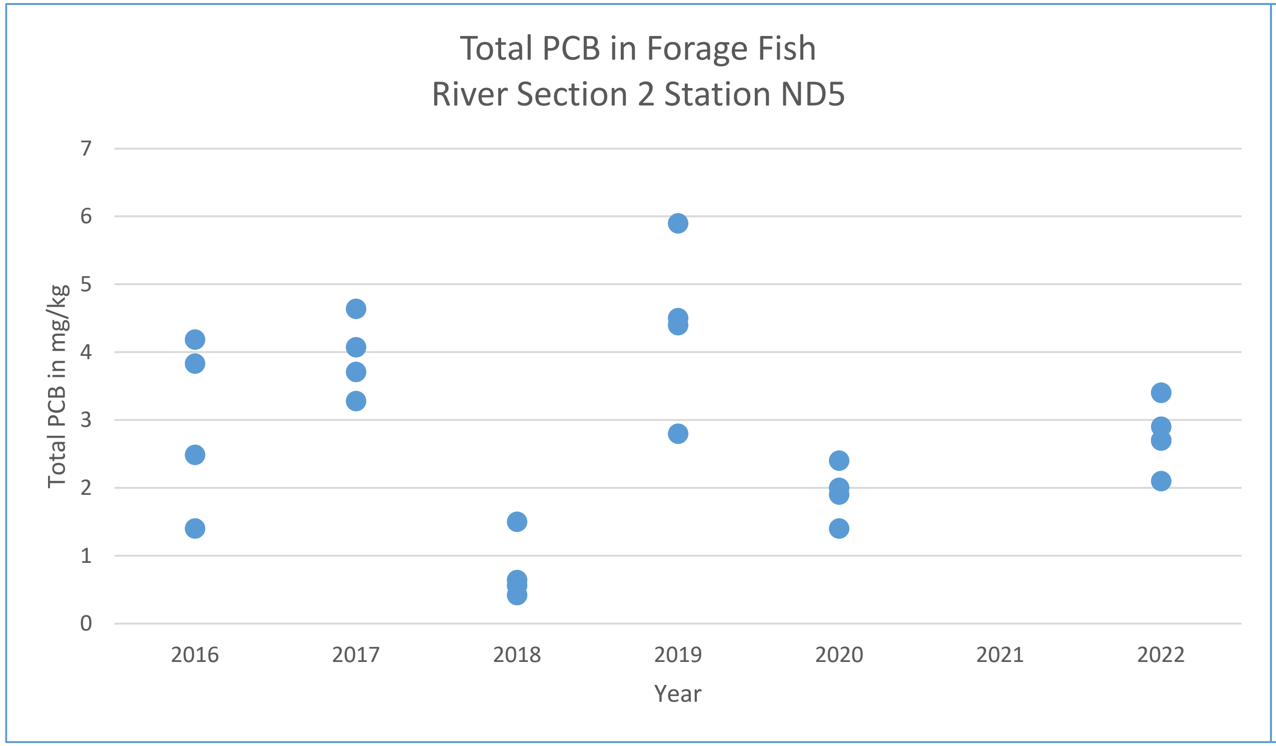
ND5 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

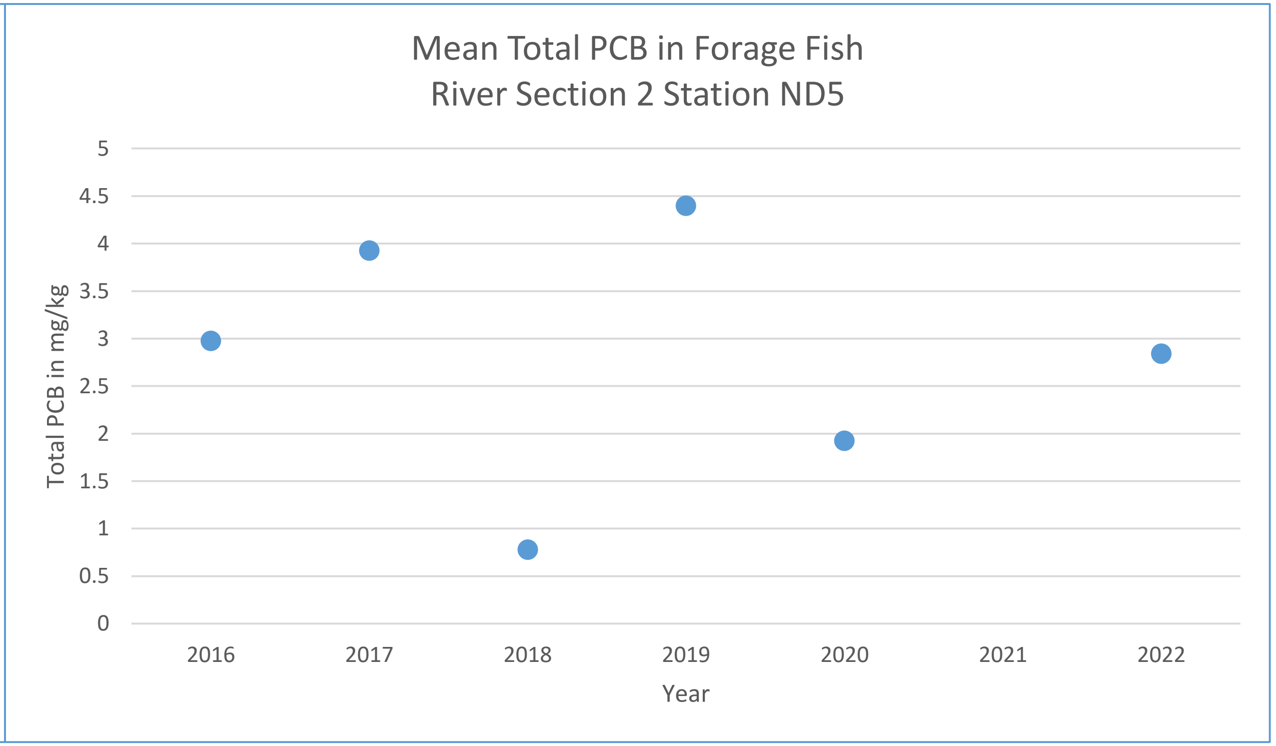




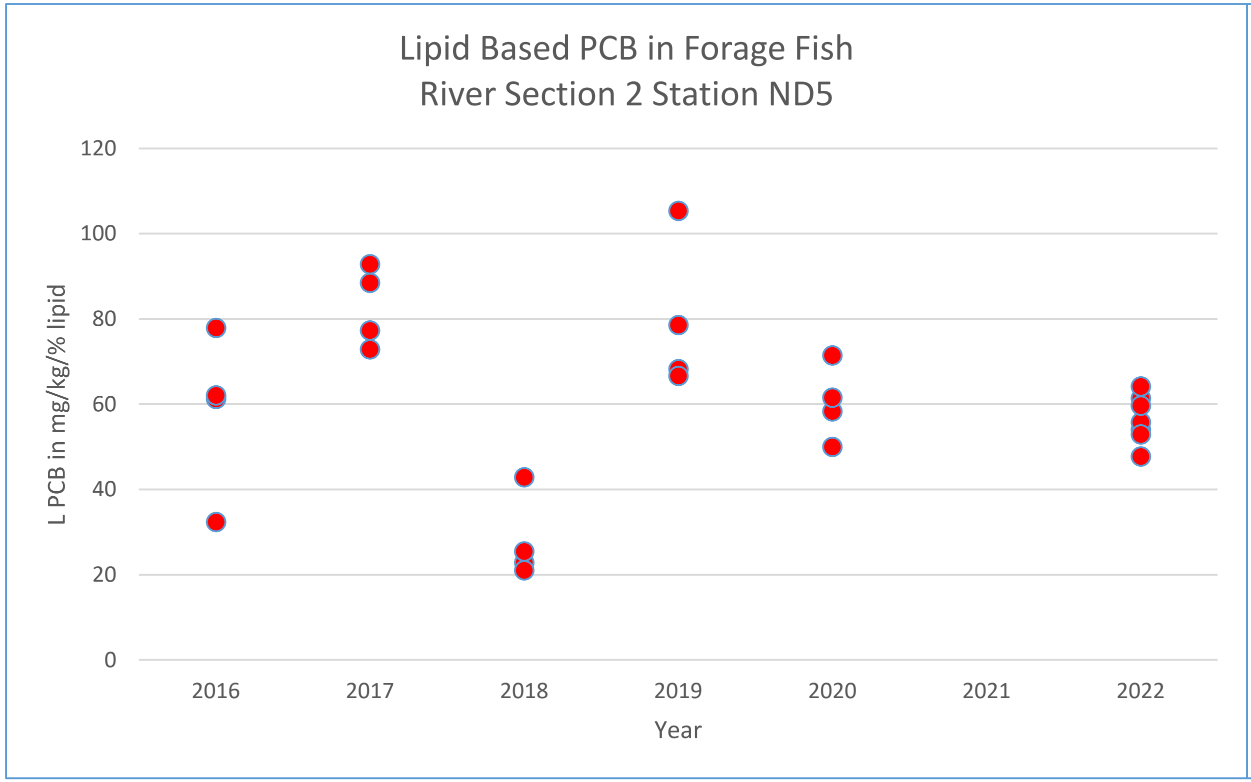
ND5 Forage Fish Data

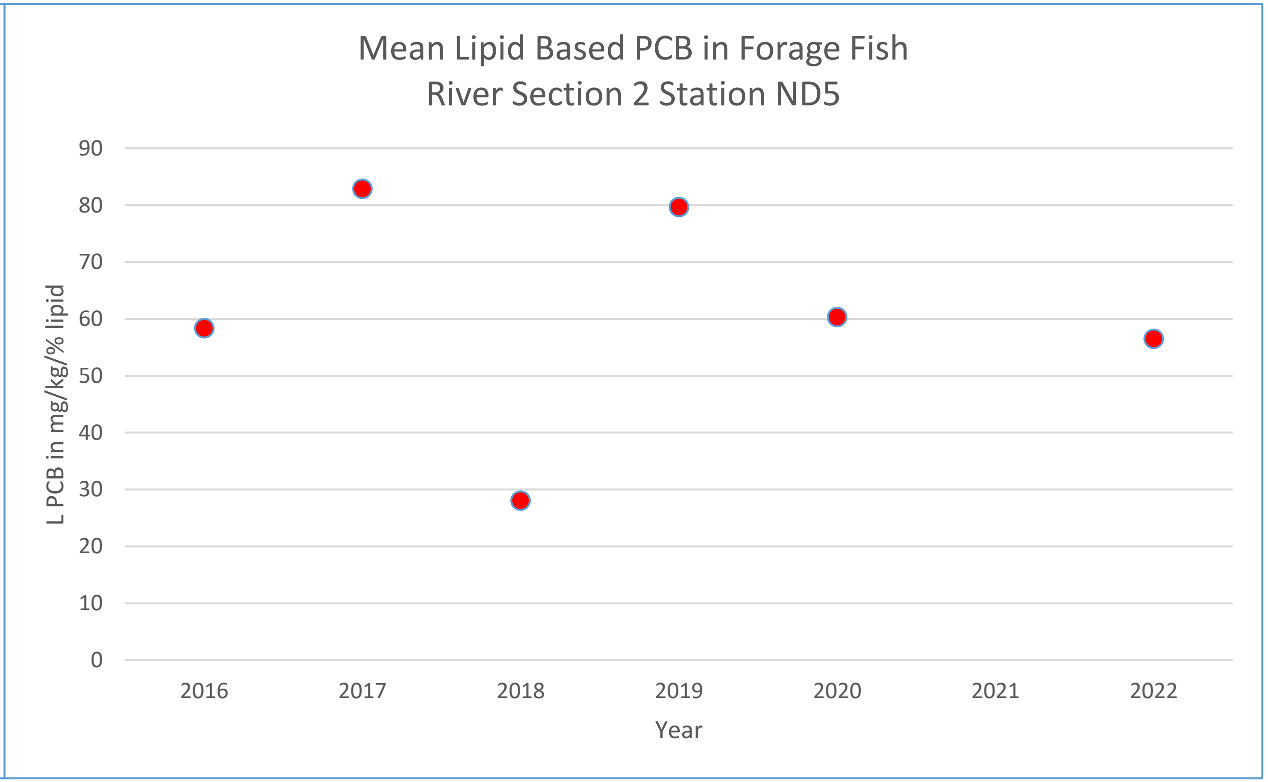
ND5 Forage Fish Total PCB



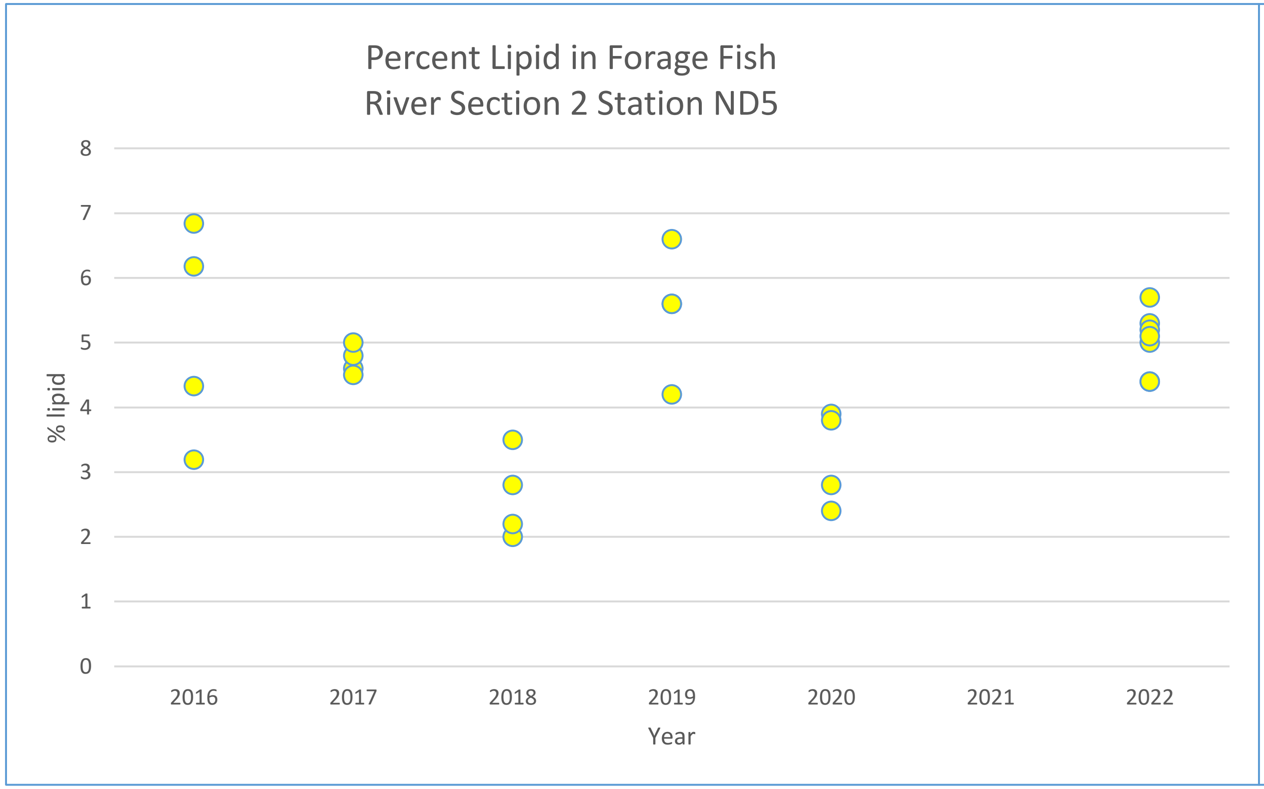


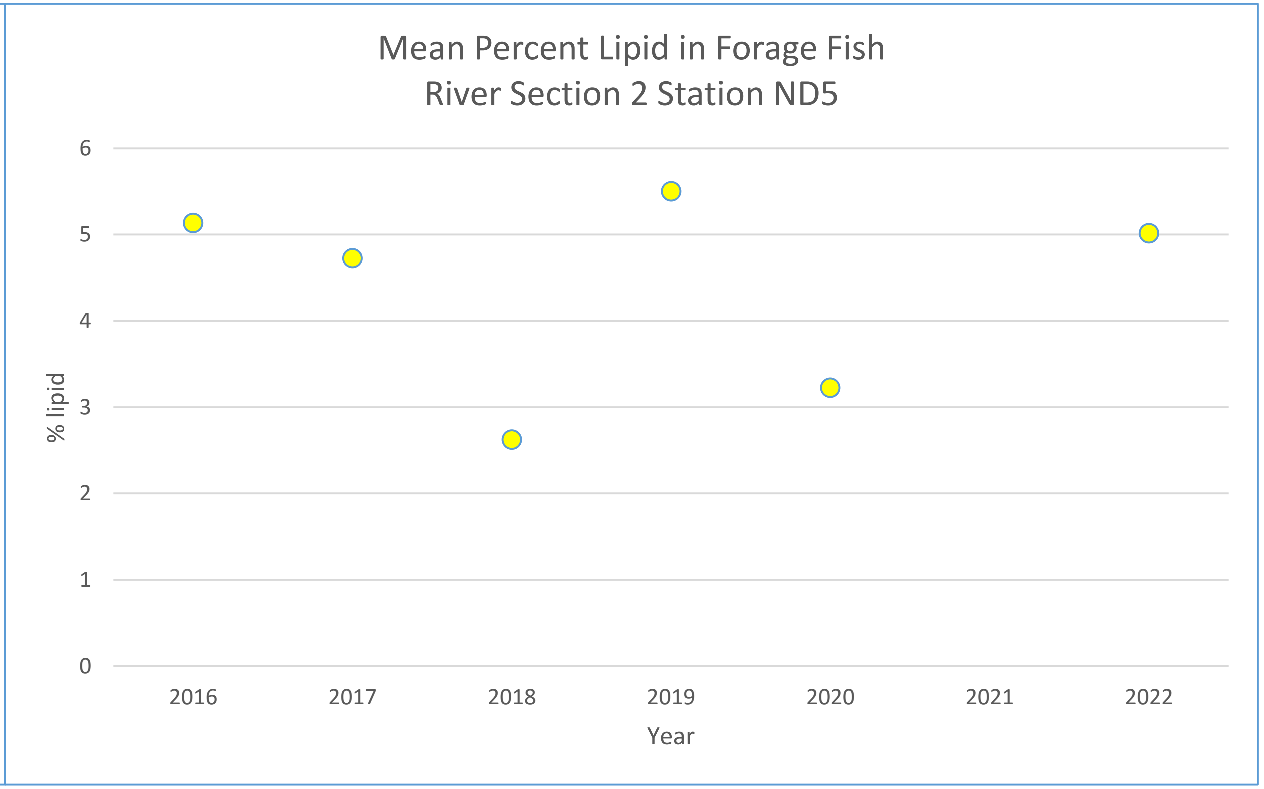
ND5 Forage Fish Lipid Based PCB



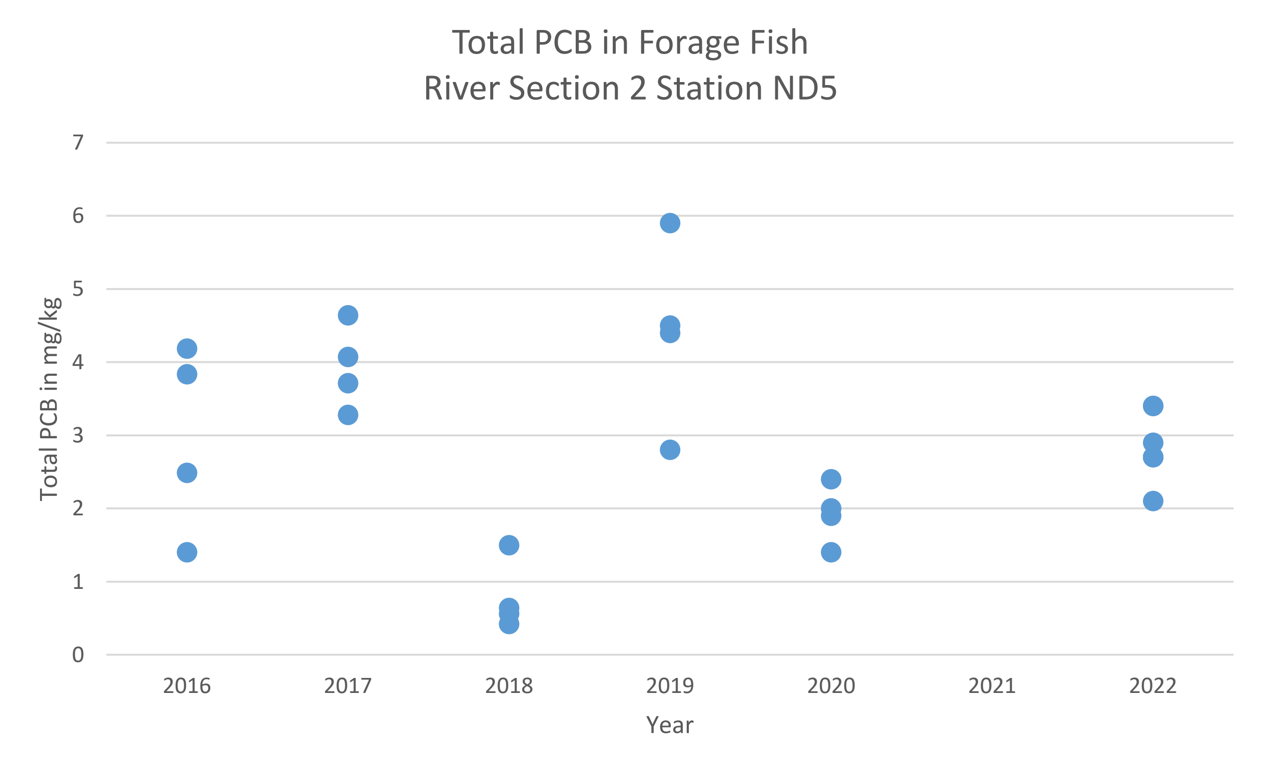


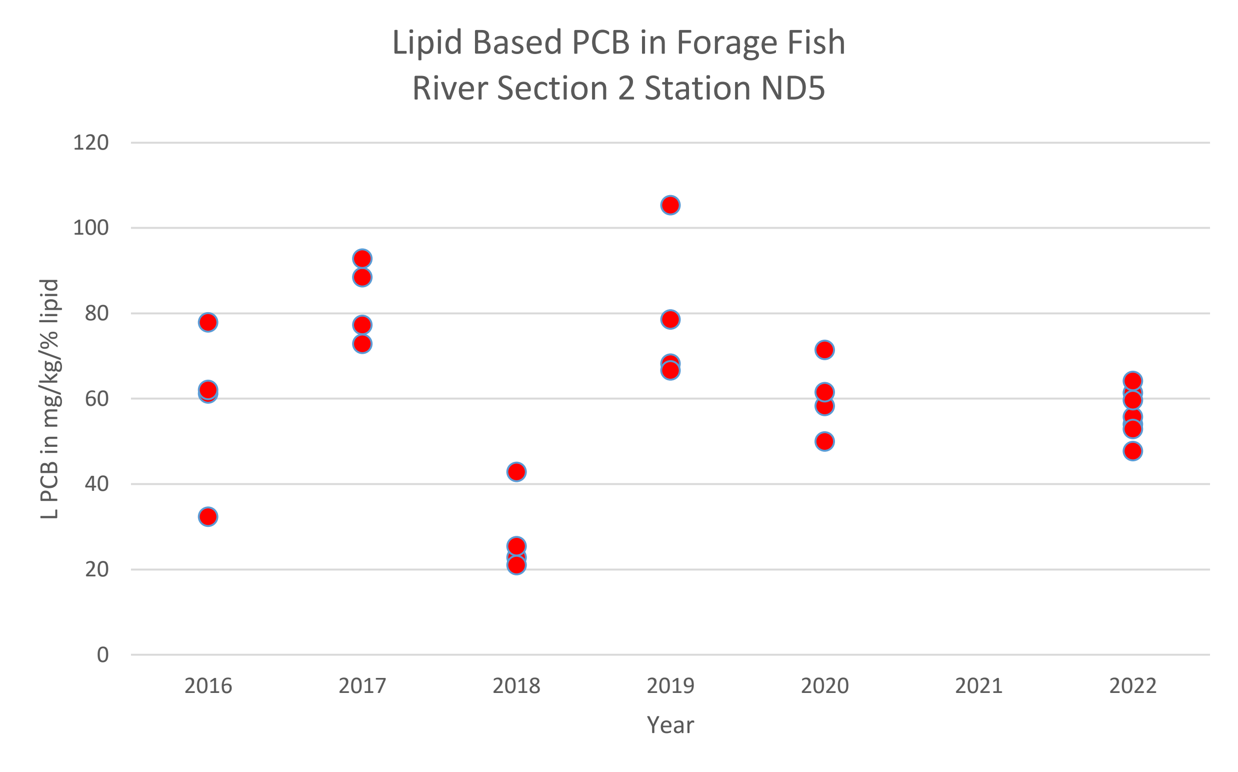
ND5 Forage Fish Percent Lipid



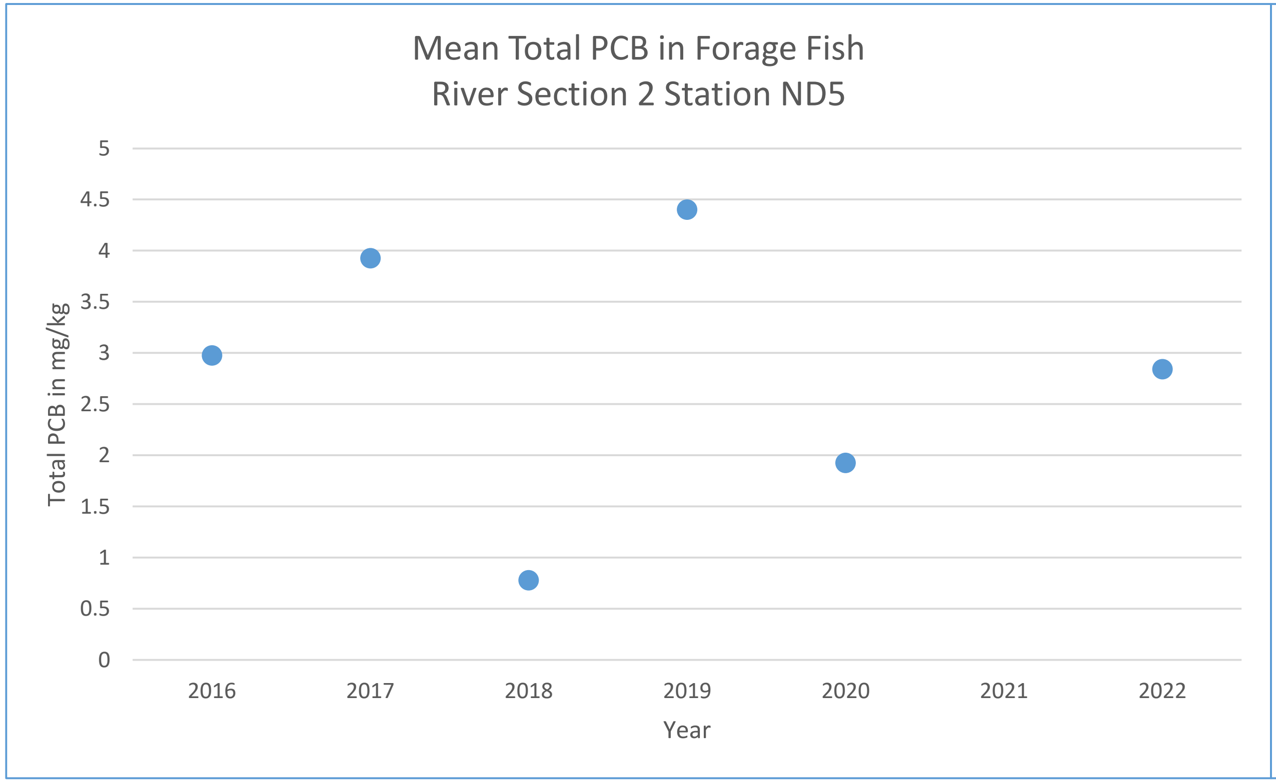


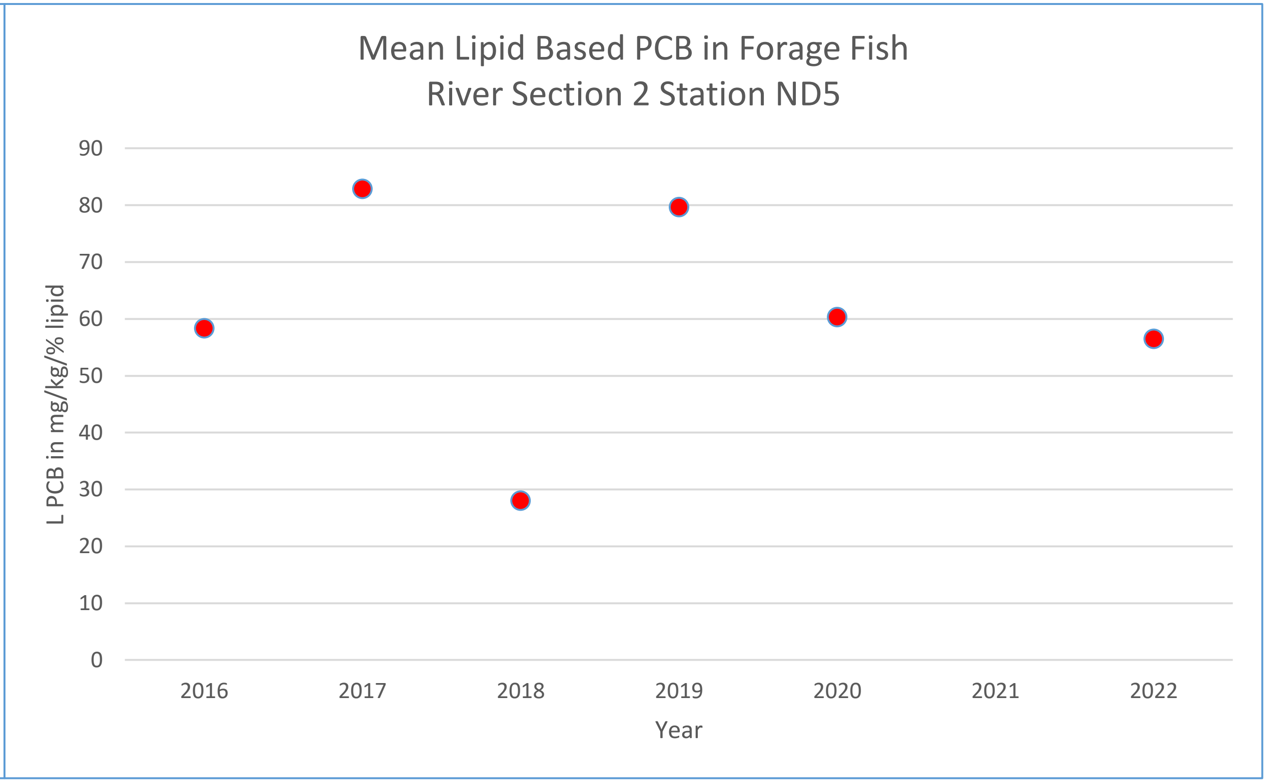
ND5 Forage Fish Total PCB and Lipid Based PCB





ND5 Forage Fish Mean Total PCB and Mean Lipid Based PCB





River Section 3 (Reaches 1-5)
Stillwater, Upper Mechanicville, Lower Mechanicville, Halfmoon, Waterford Pools

Reach 5 (Stillwater Pool)
River Section 2

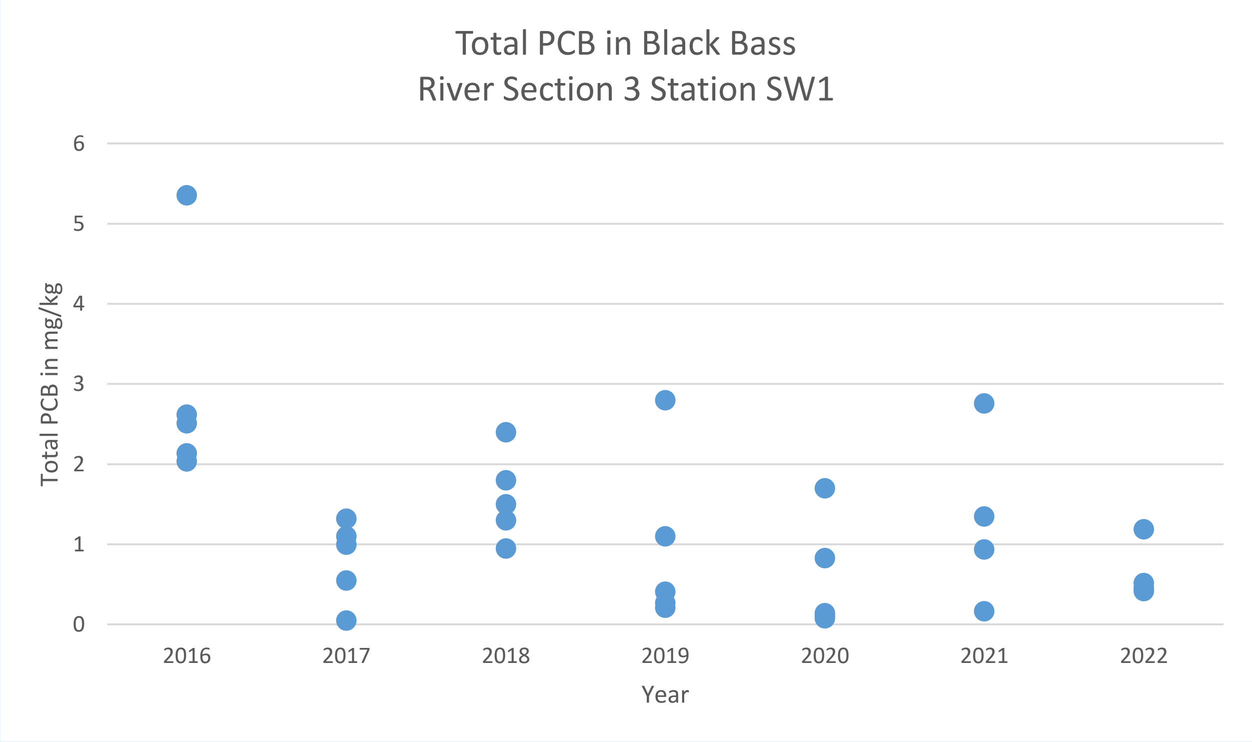
- Reach 5 extends from the Northumberland Dam downstream to the Upper Mechanicville Dam, about 15 miles downstream.
- Reach 5 is approximately half of River Section 3.
- River Section 3 is the remaining portion of the river where EPA selected the less stringent cleanup level for delineating sediment removal. The criteria for removal were approximately three times hgher than in River Section 1.
- There are five fish monitoring stations in Reach 5, designated SW1 through SW5.

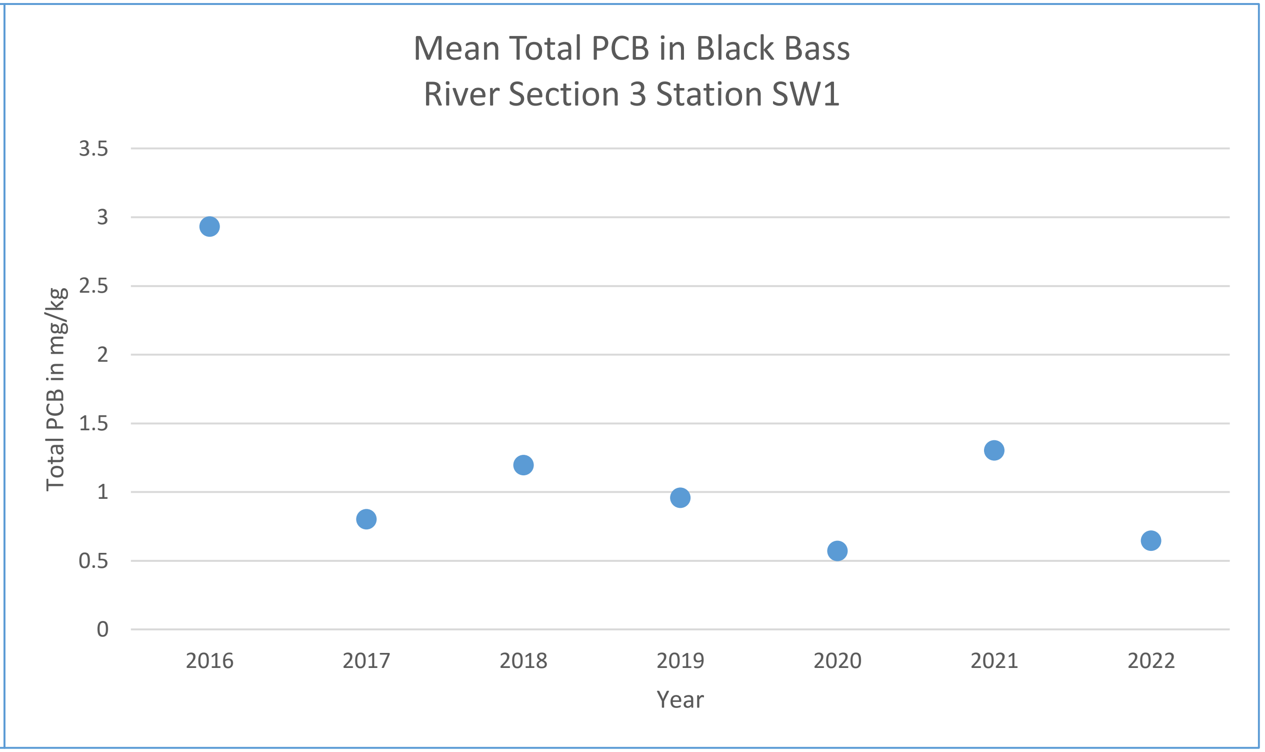
Station SW1

Stations ND5 and SW1

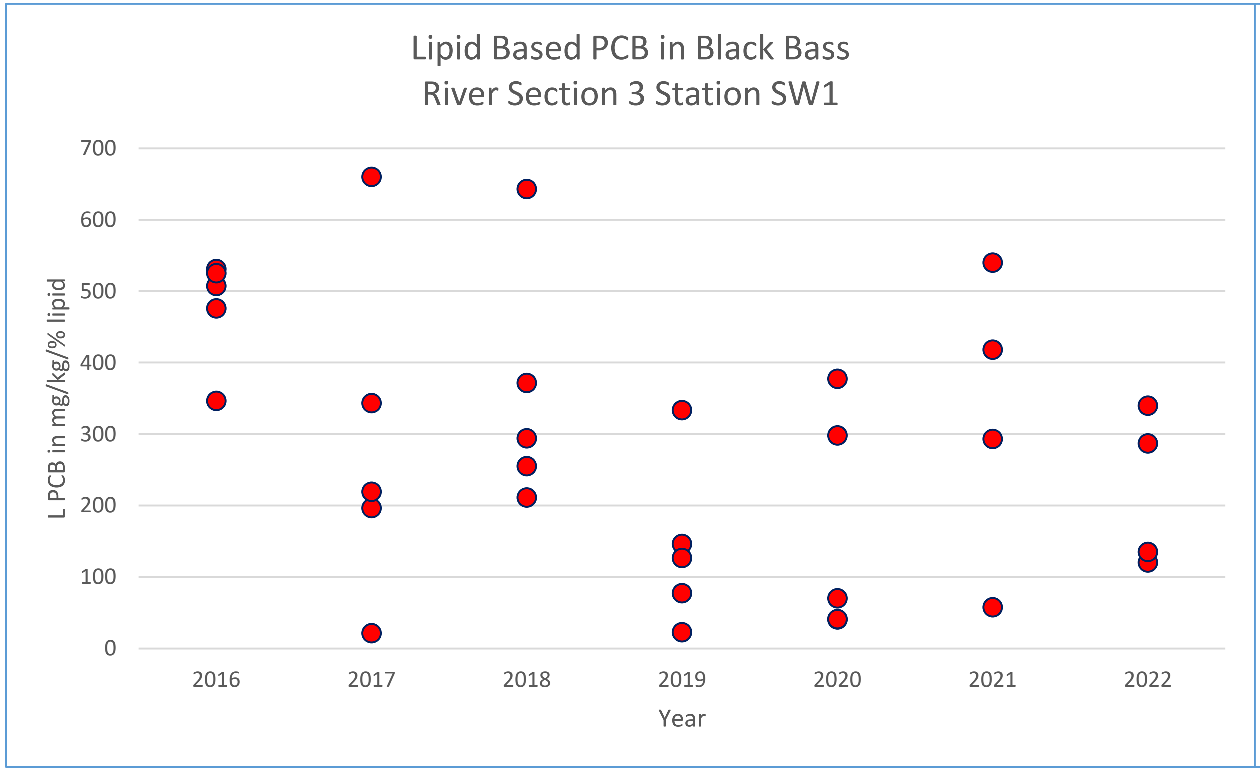
SW1 Black Bass Data

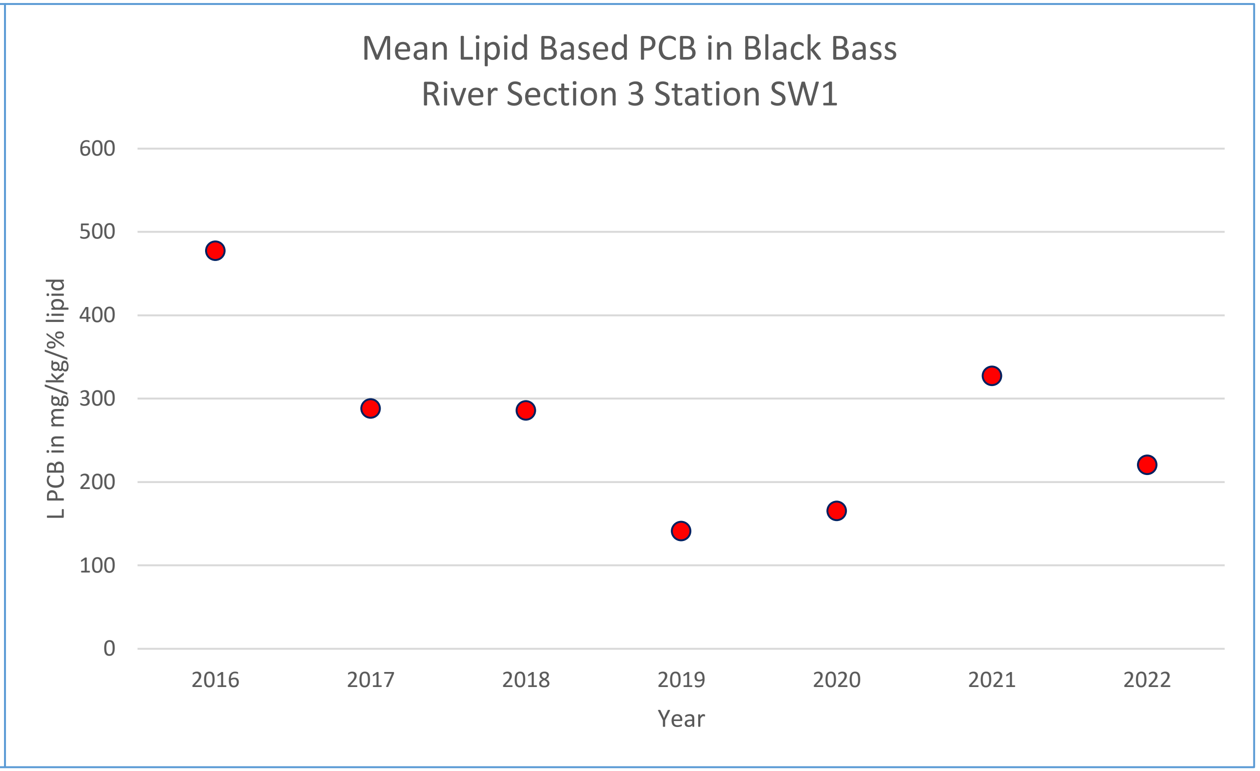
SW1 Black Bass Total PCB



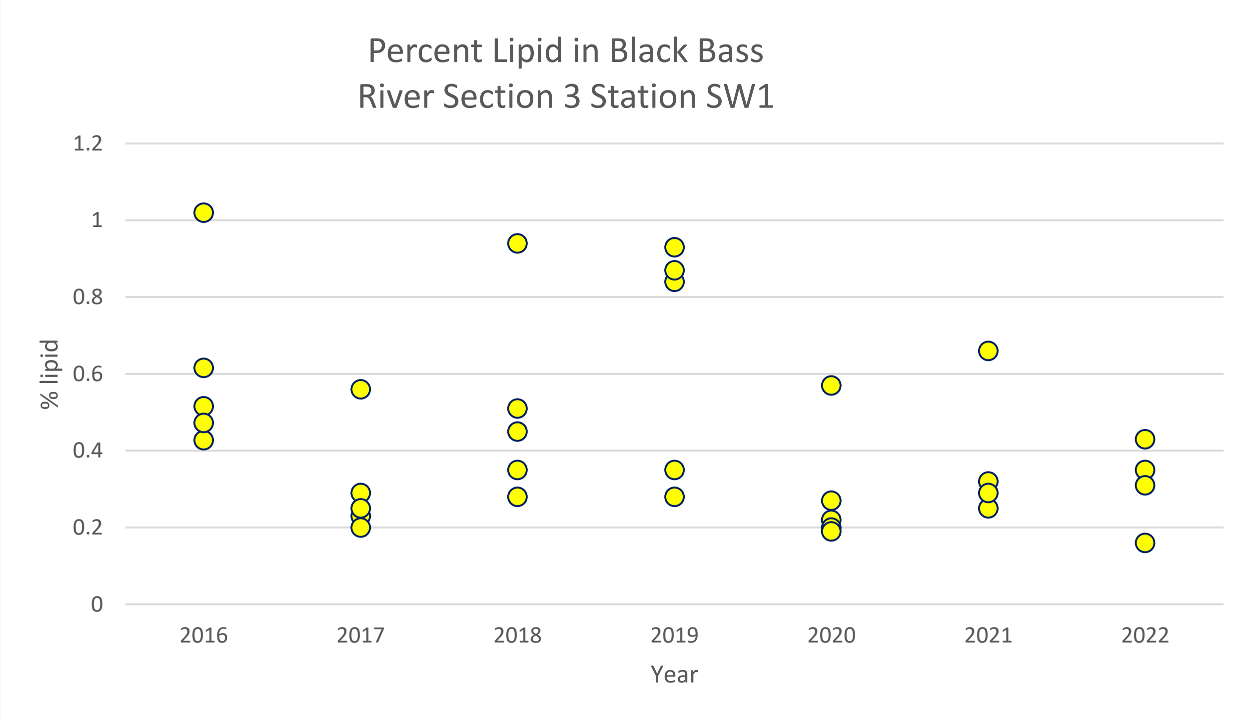


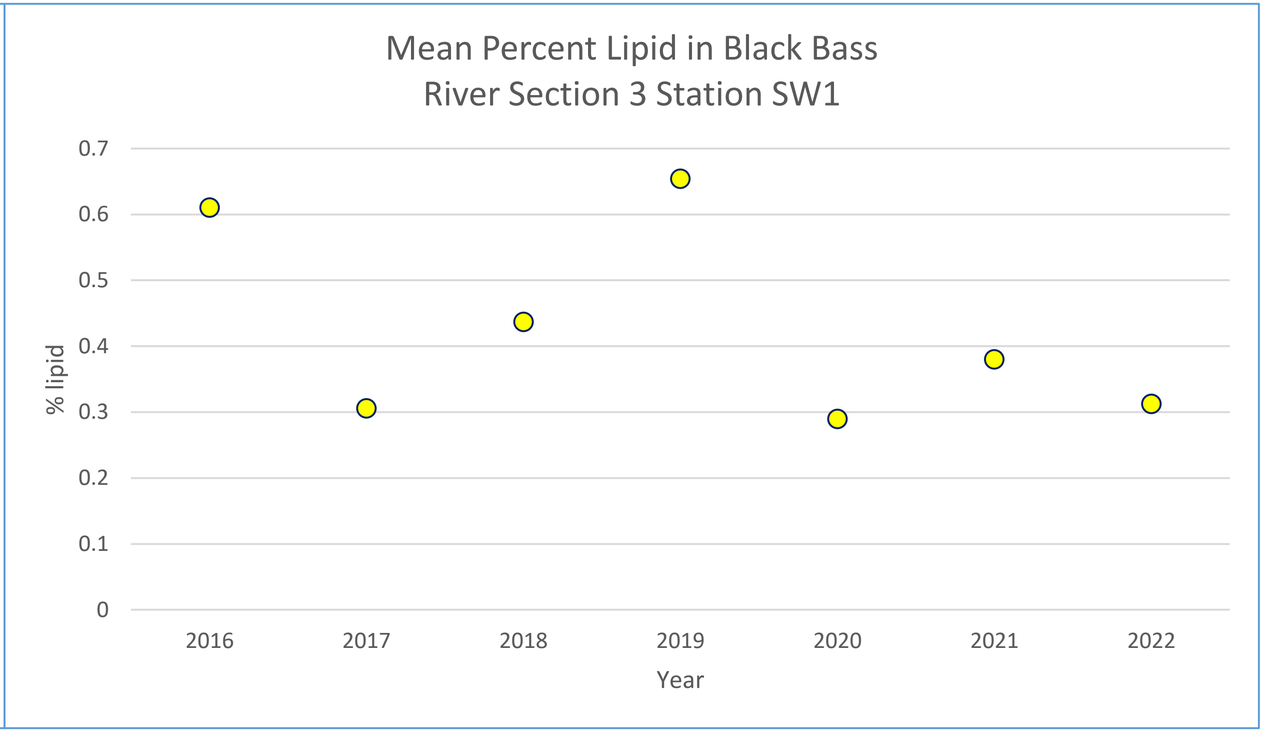
SW1 Black Bass Lipid Based PCB



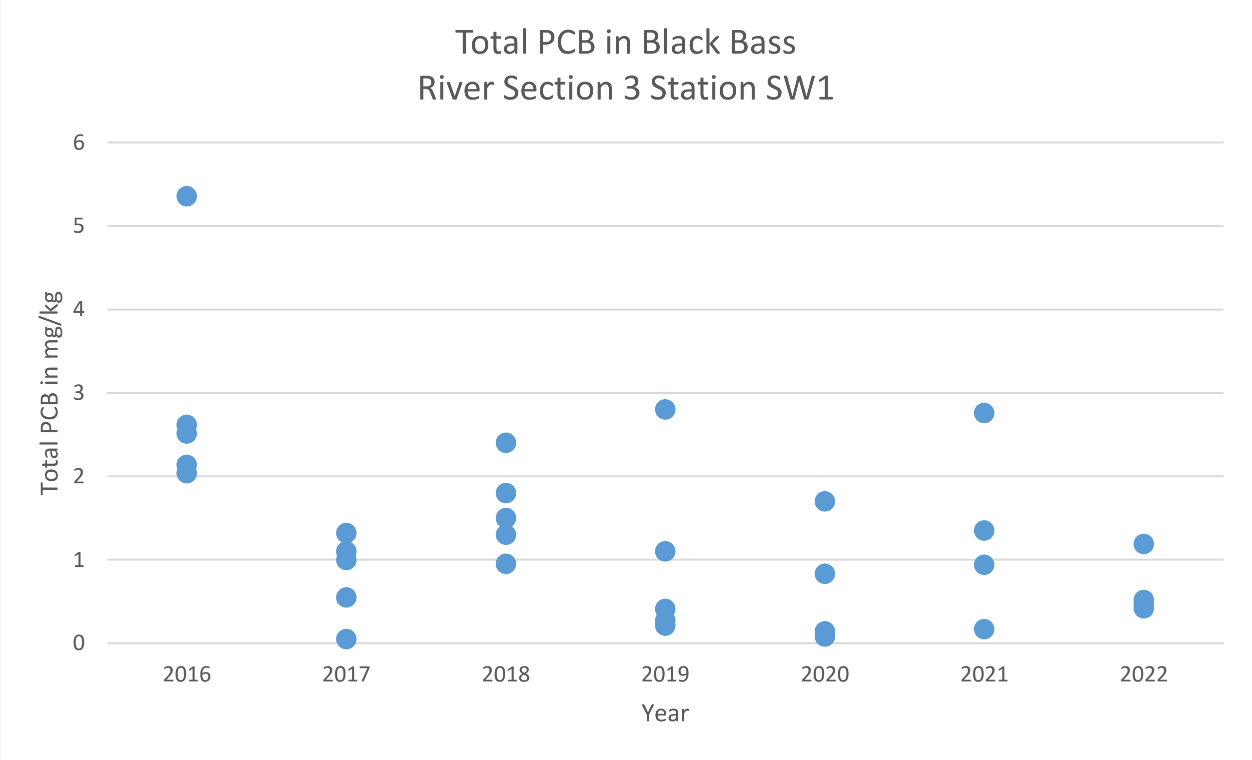


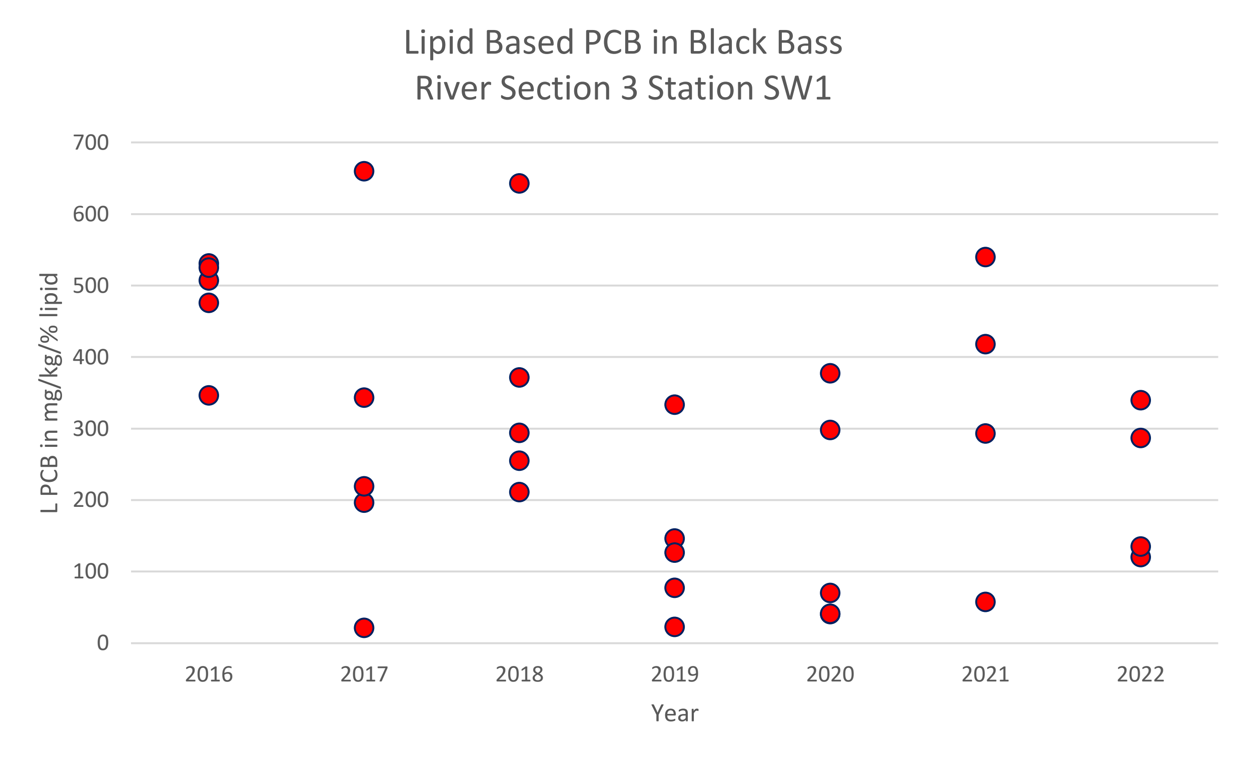
SW1 Black Bass Percent Lipid



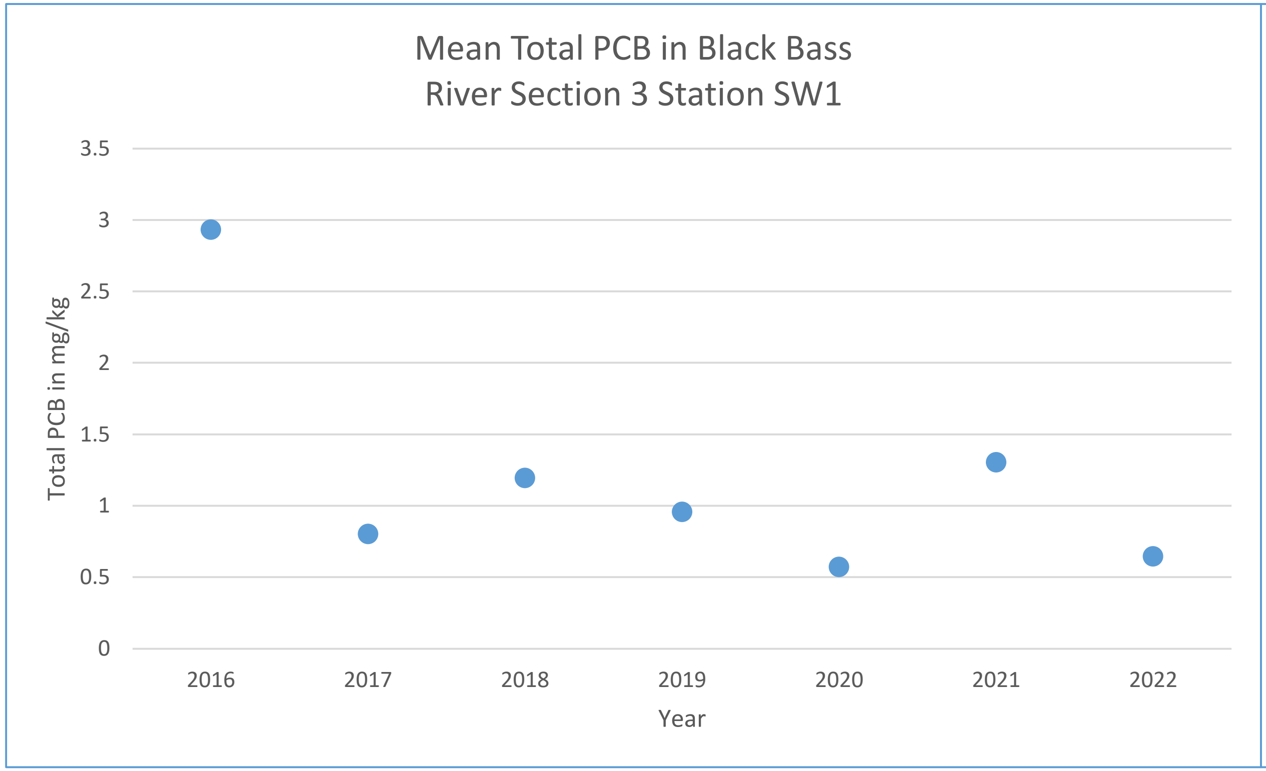


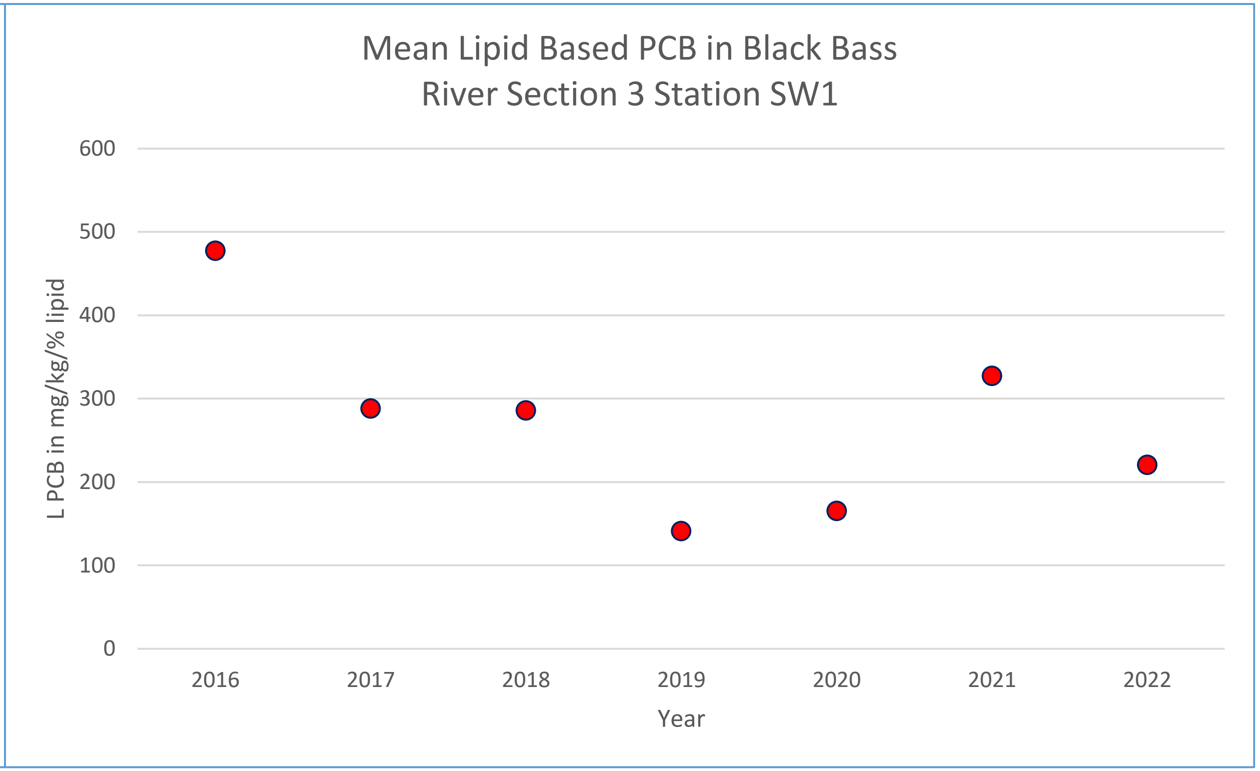
SW1 Black Bass Total PCB and Lipid Based PCB





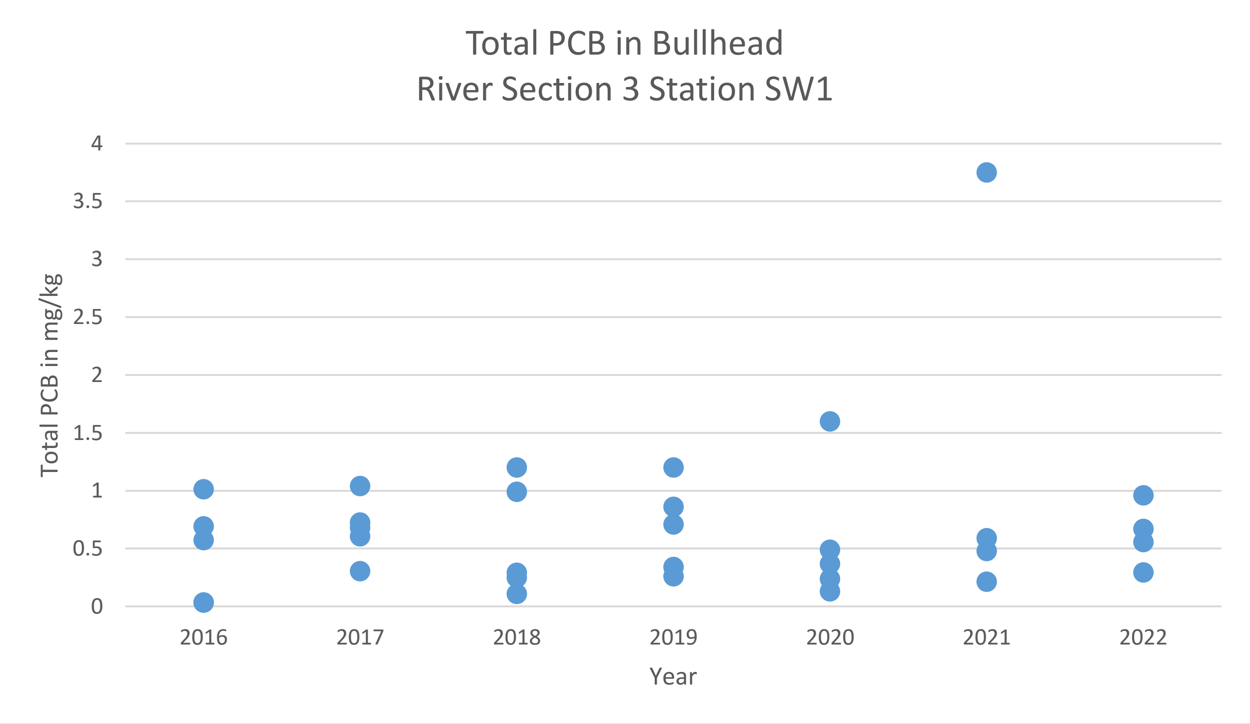
SW1 Black Bass Mean Total PCB and Mean Lipid Based PCB

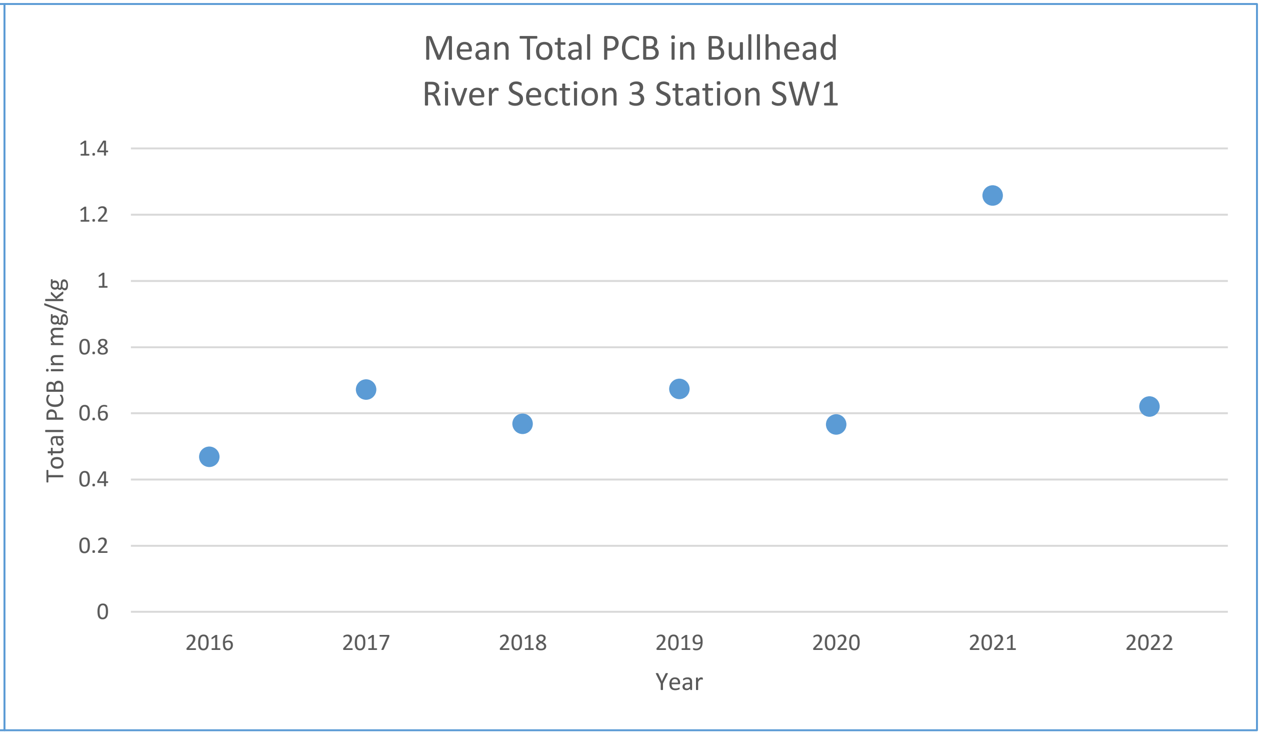




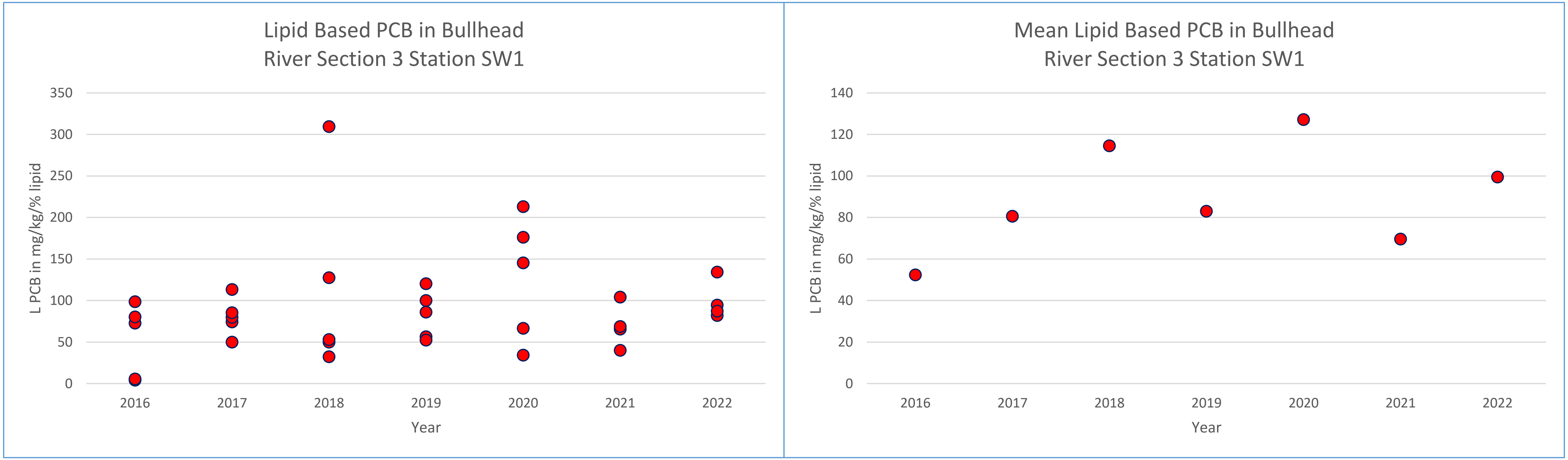
SW1 Bullhead Data

SW1 Bullhead Total PCB

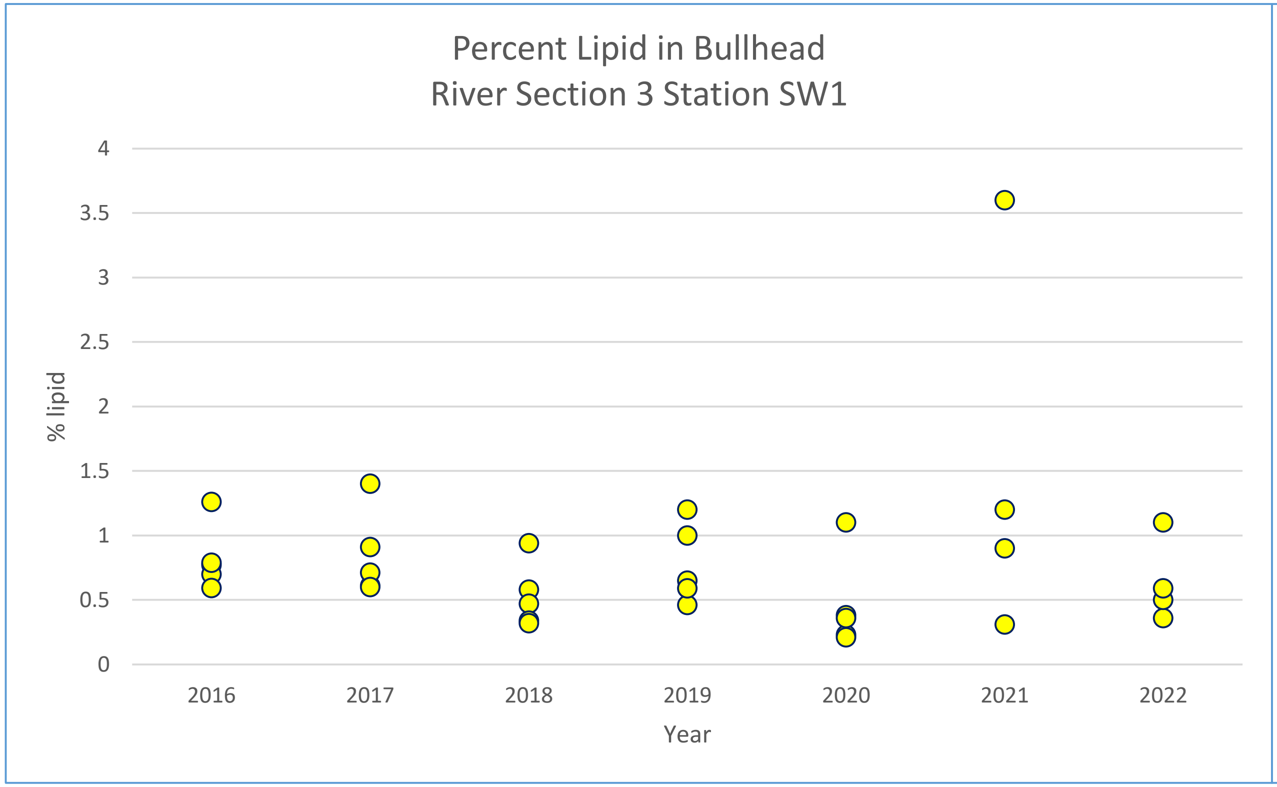


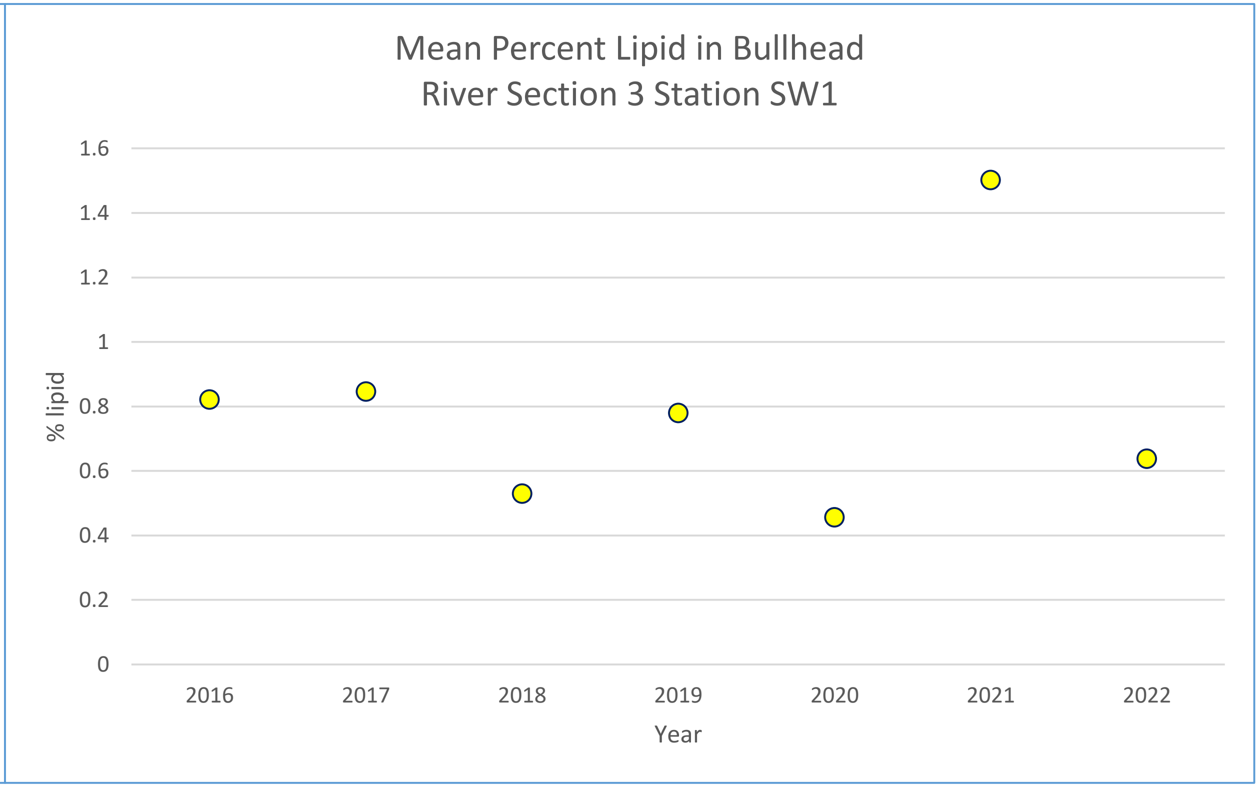


SW1 Bullhead Lipid Based PCB

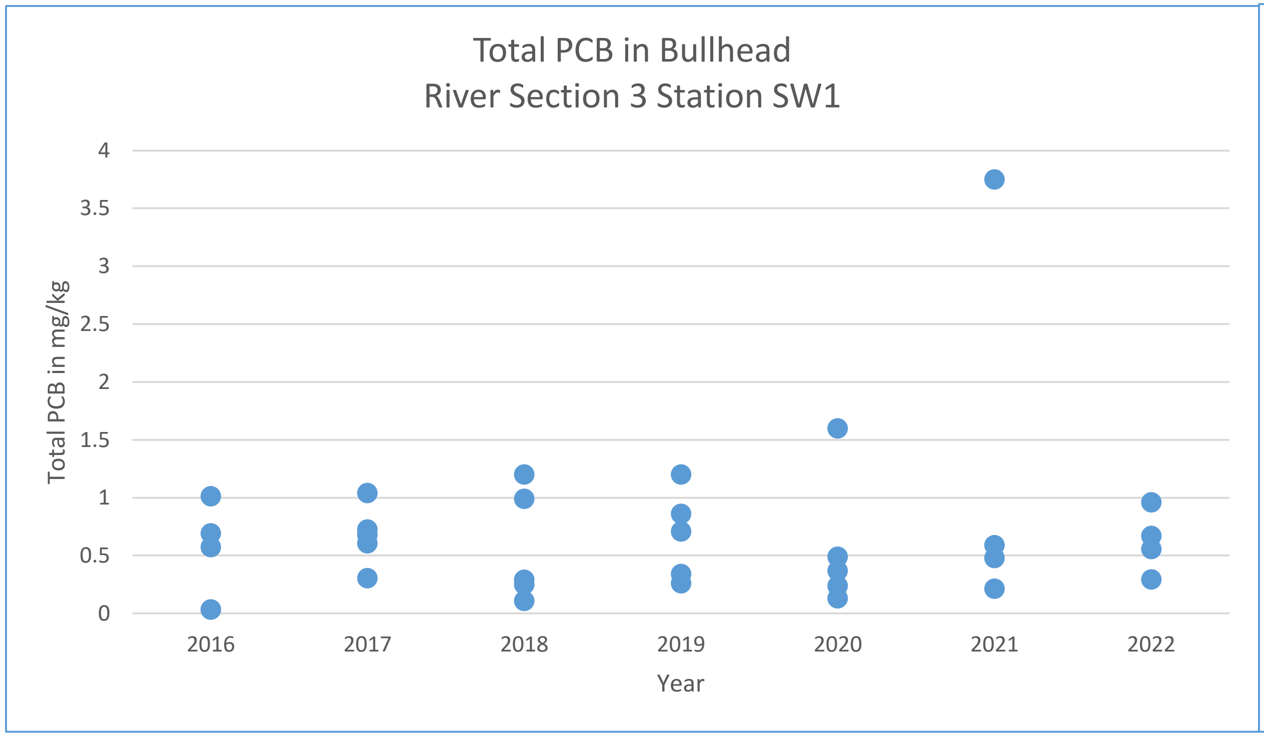


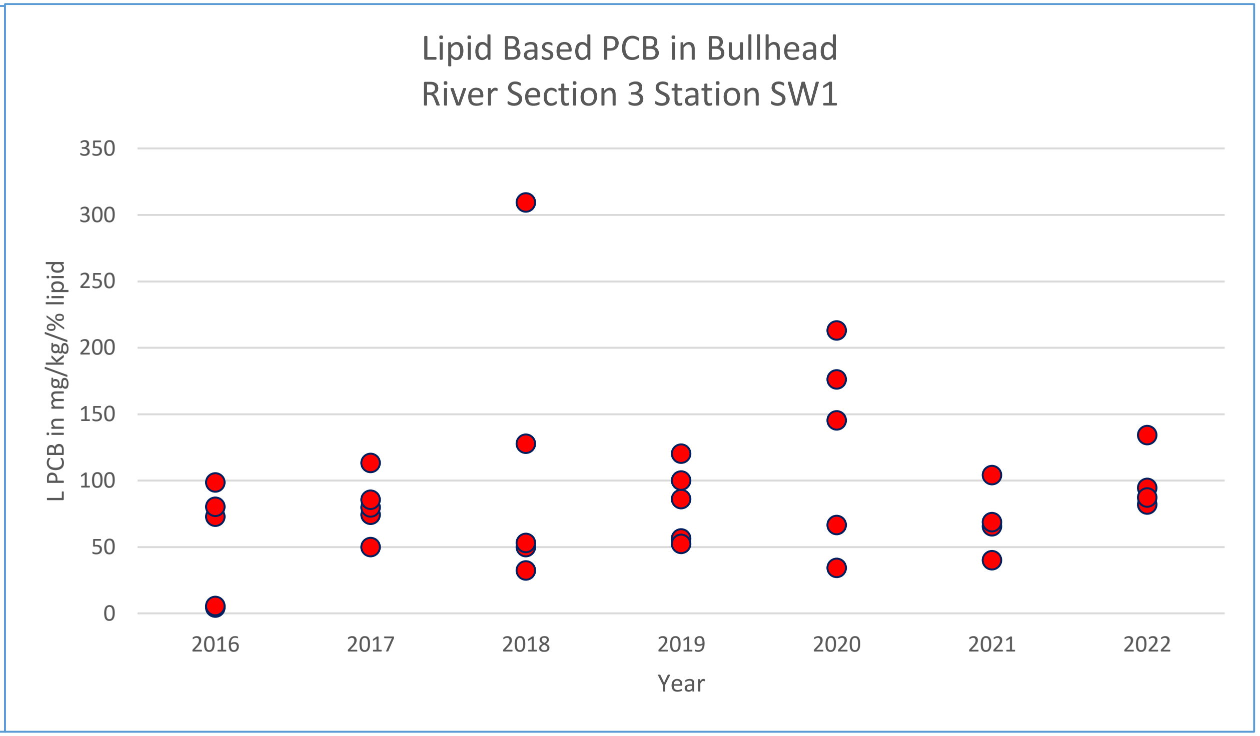
SW1 Bullhead Percent Lipid



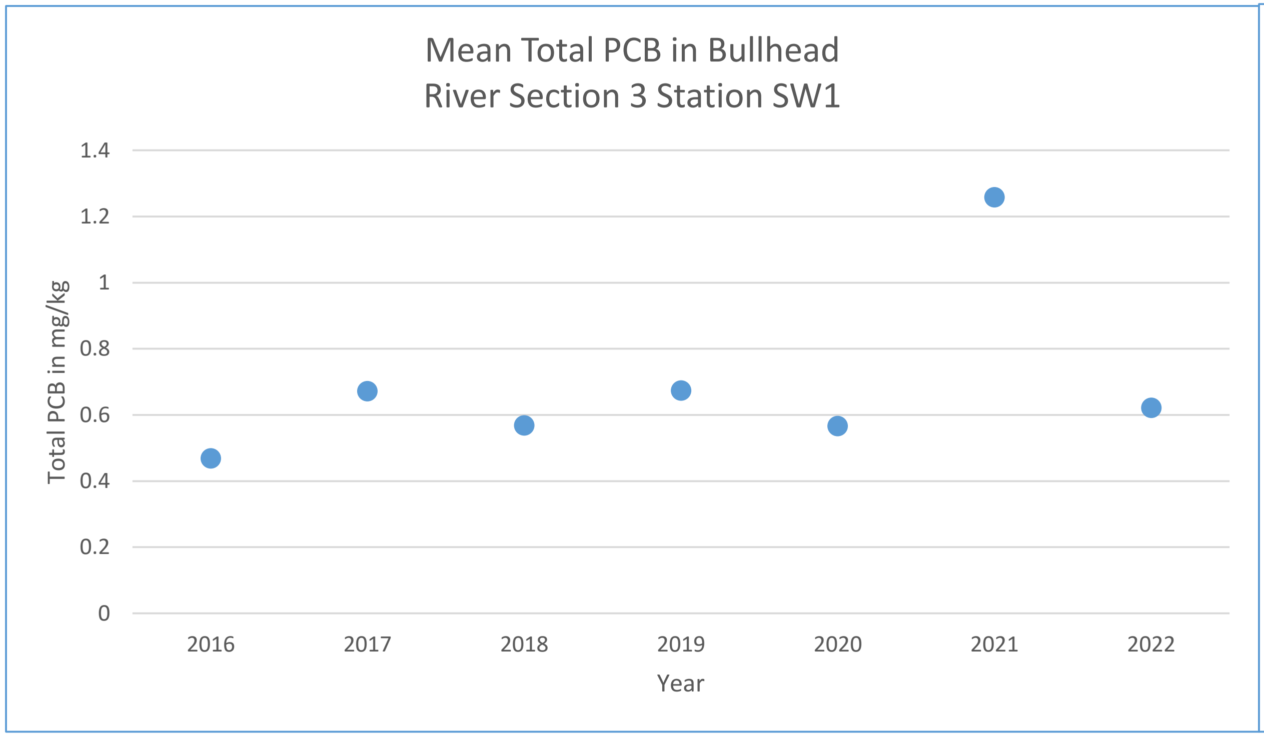


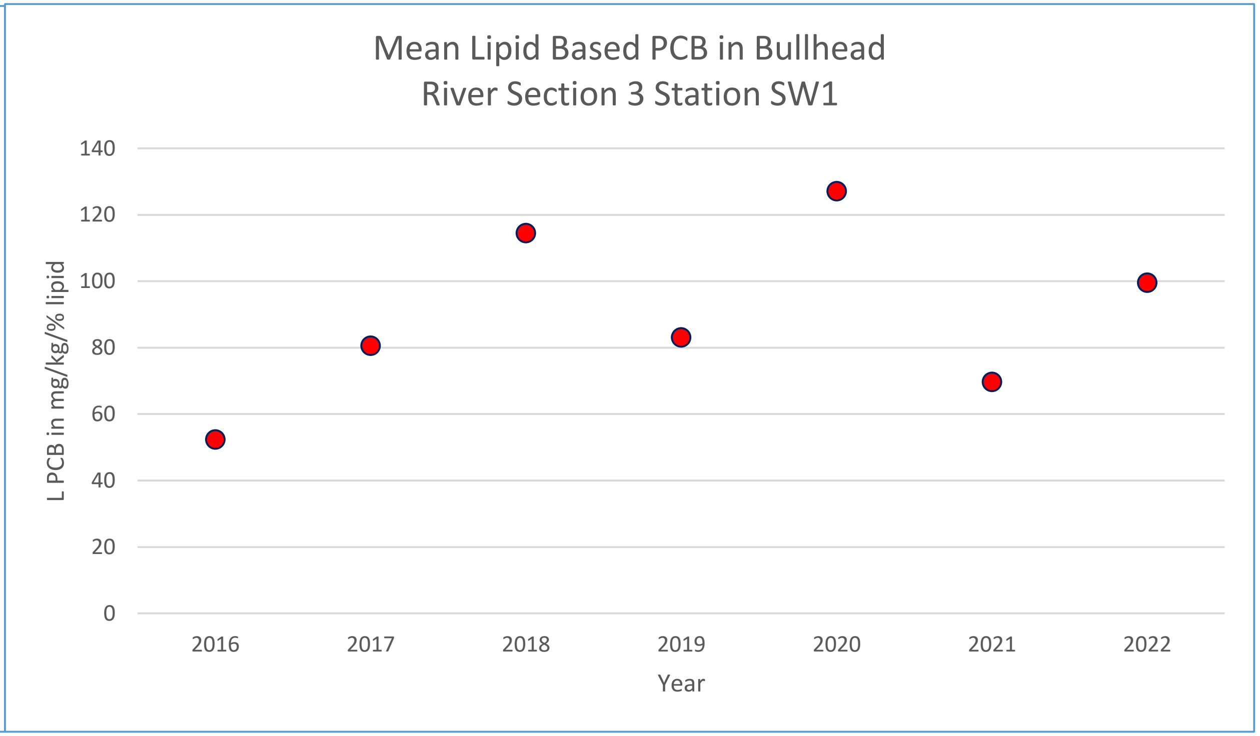
SW1 Bullhead Total PCB and Lipid Based PCB





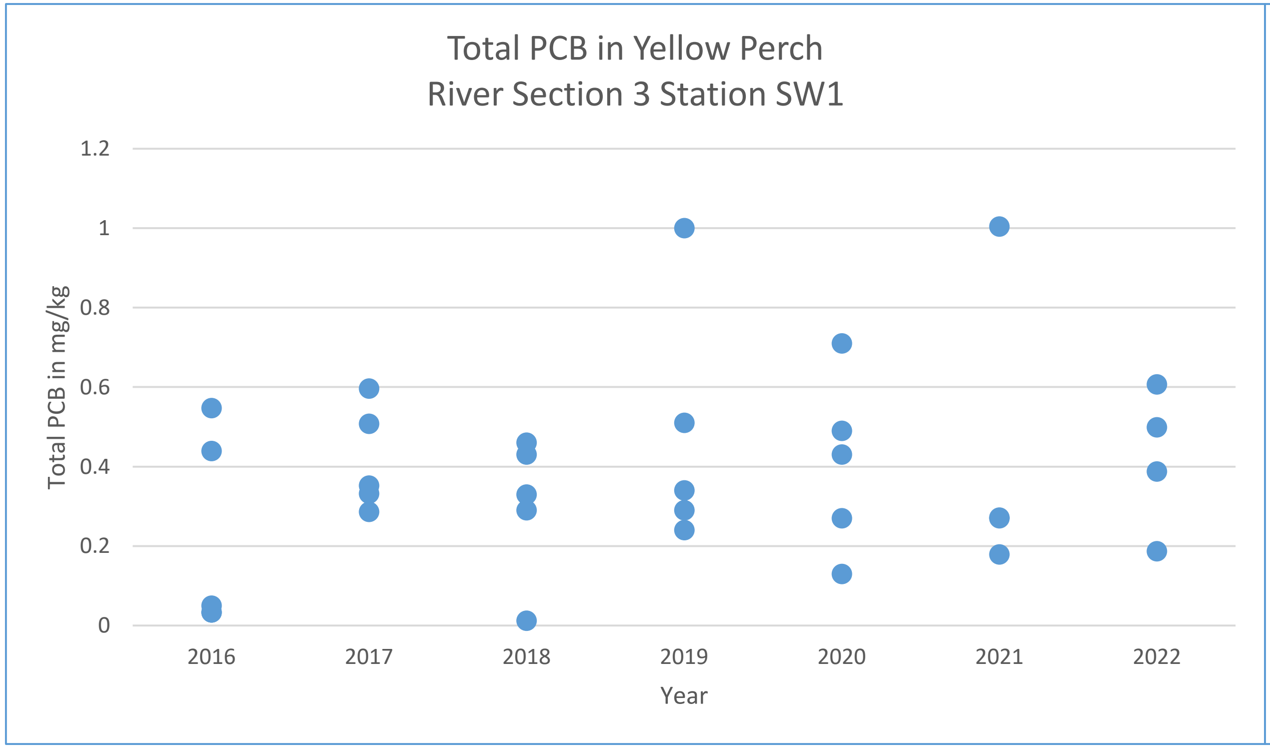
SW1 Bullhead Mean Total PCB and Mean Lipid Based PCB

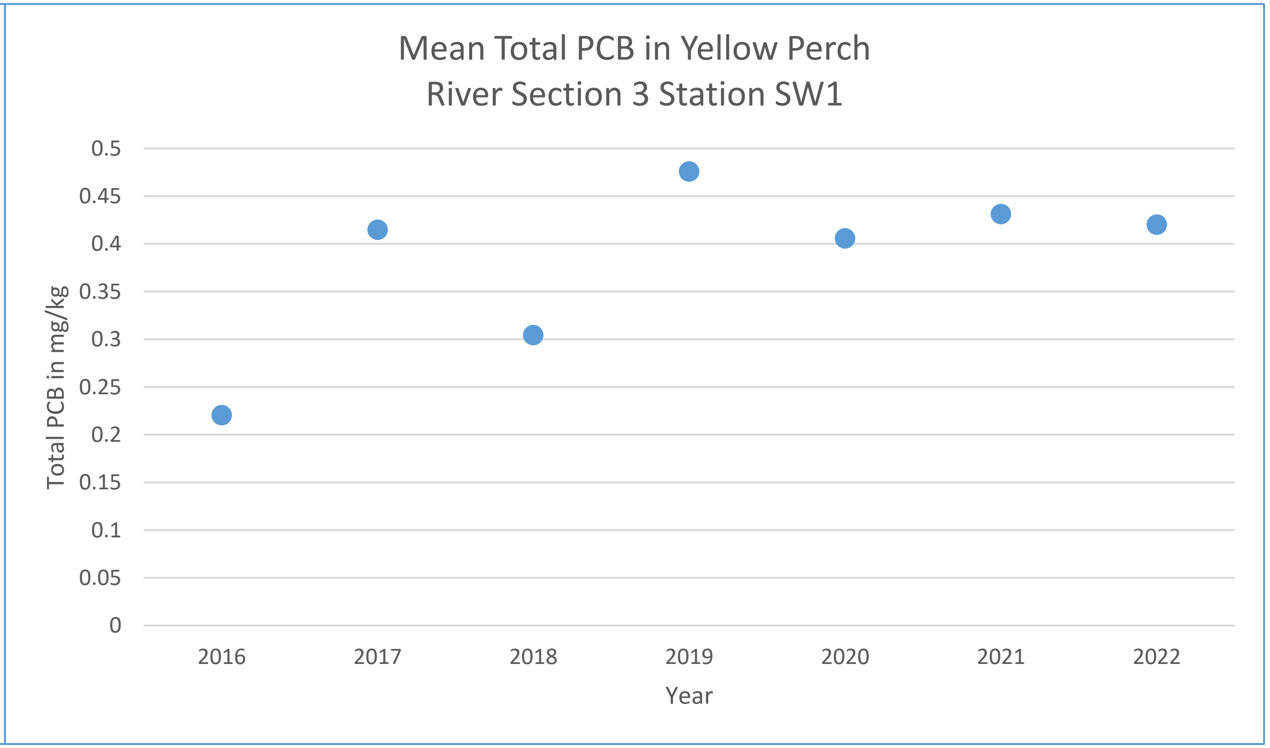




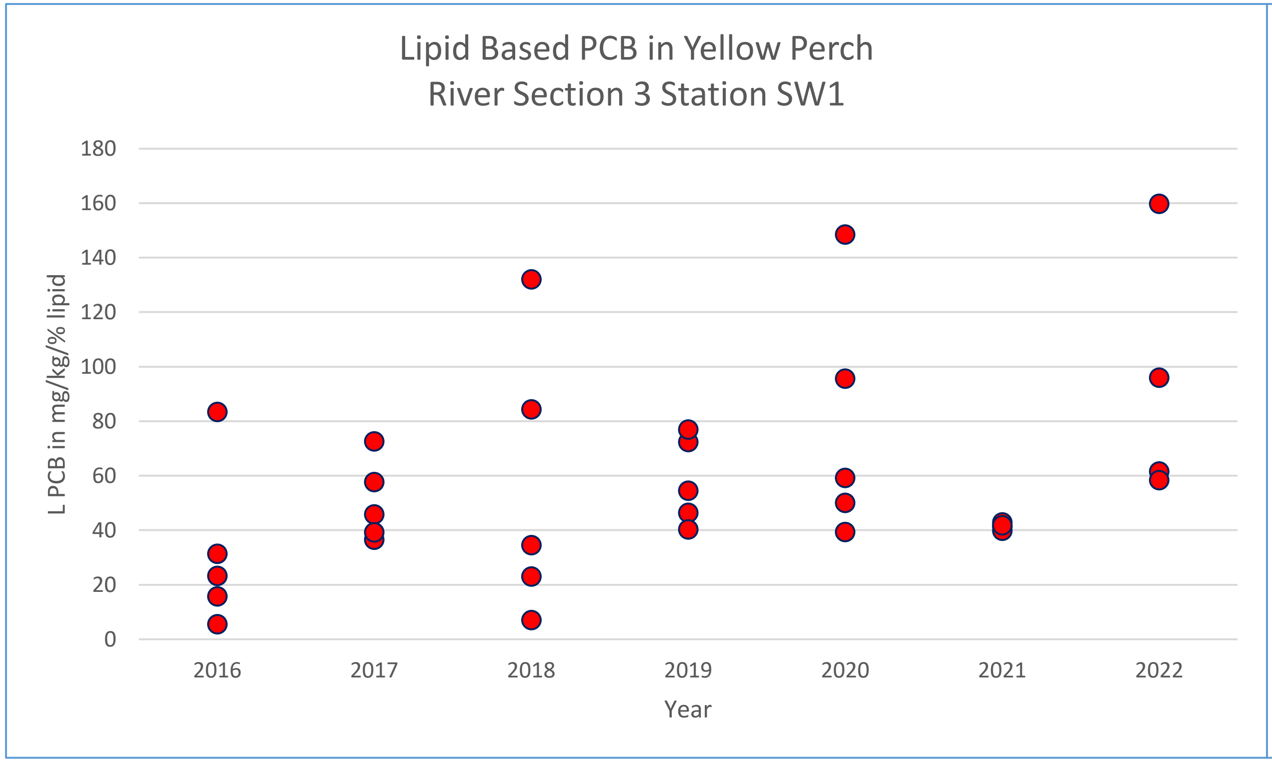
SW1 Yellow Perch Data

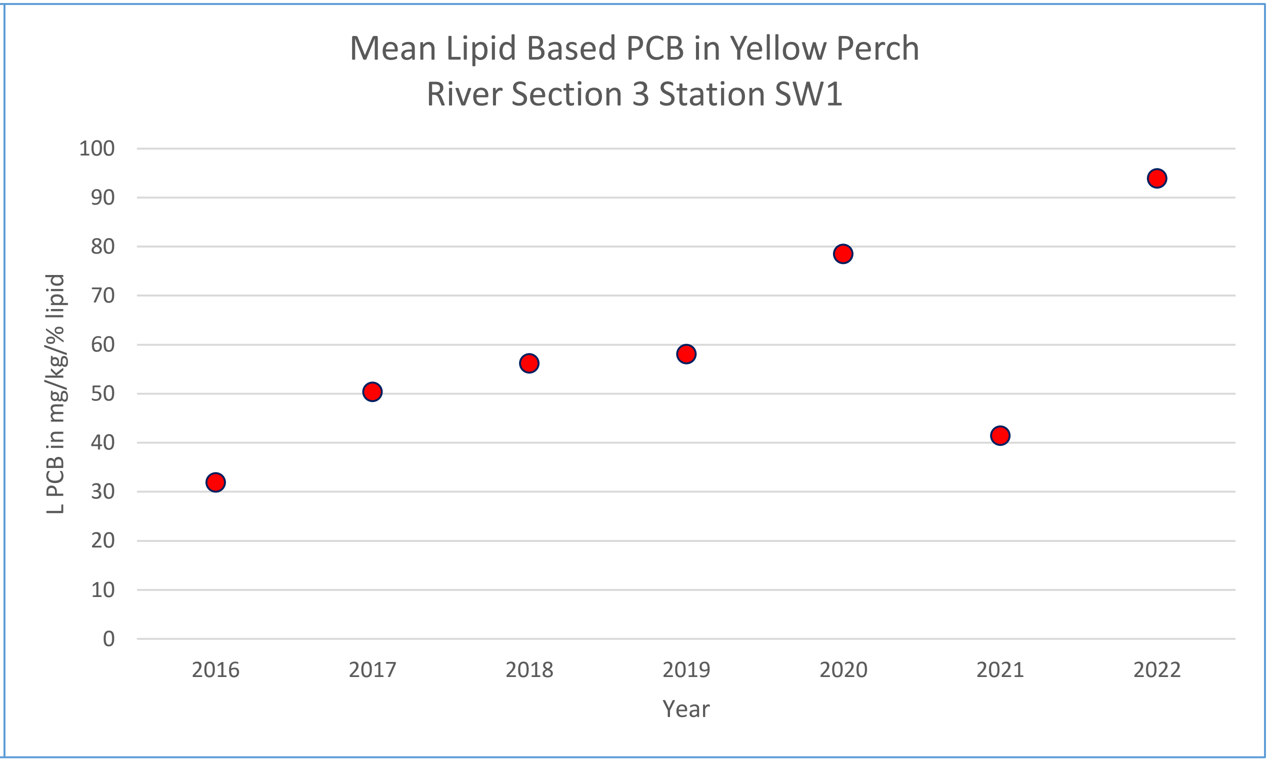
SW1 Yellow Perch Total PCB



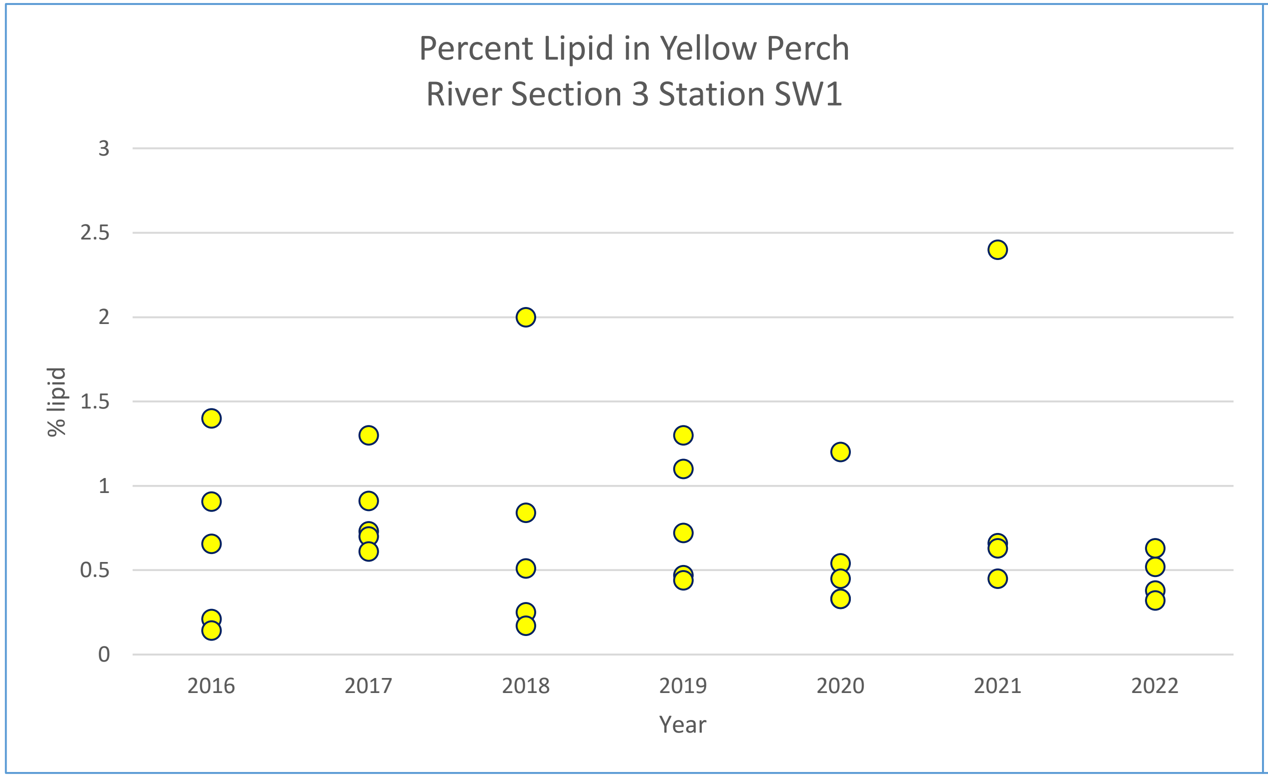


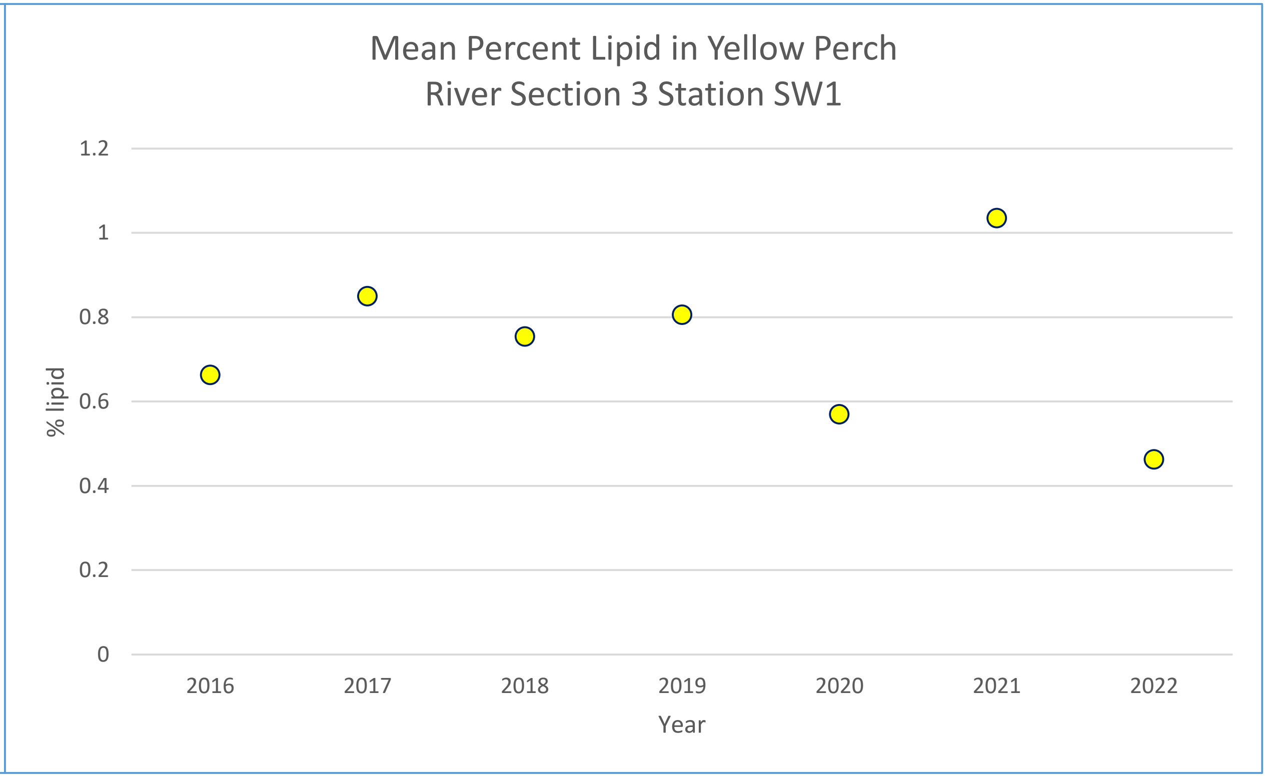
SW1 Yellow Perch Lipid Based PCB



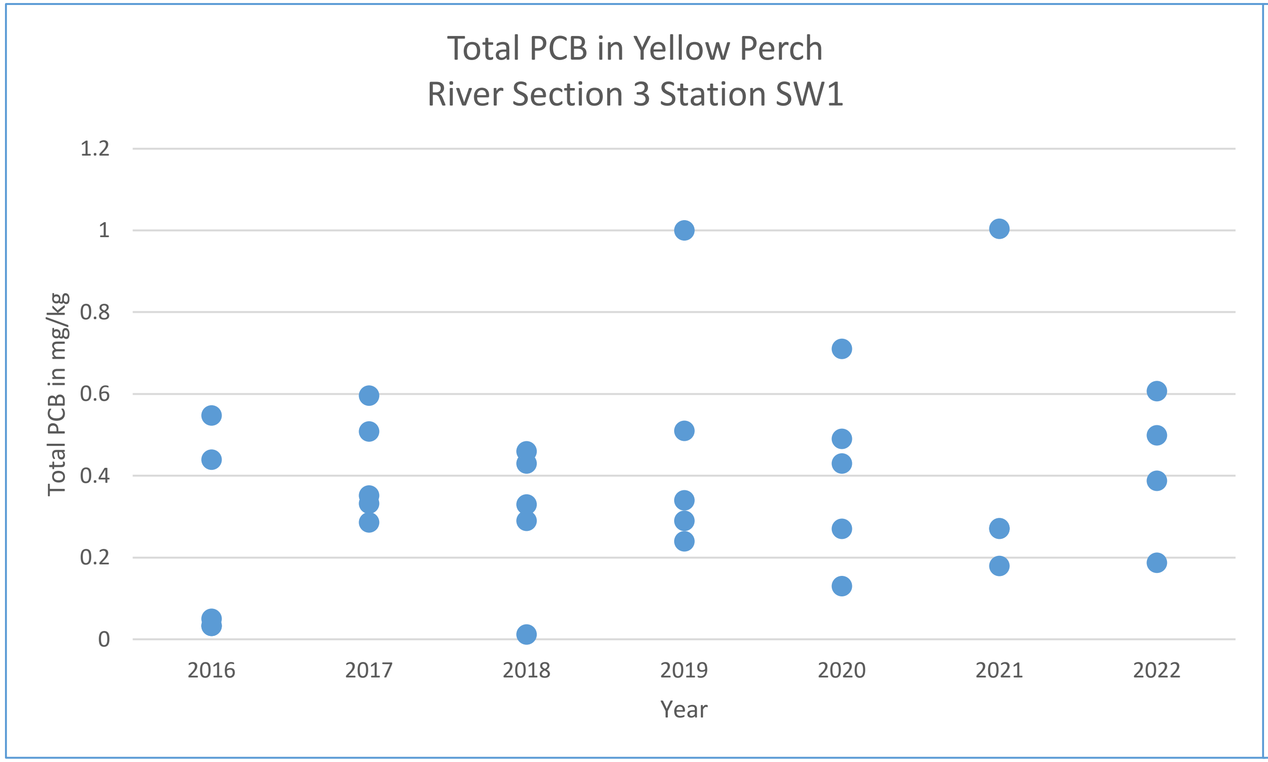


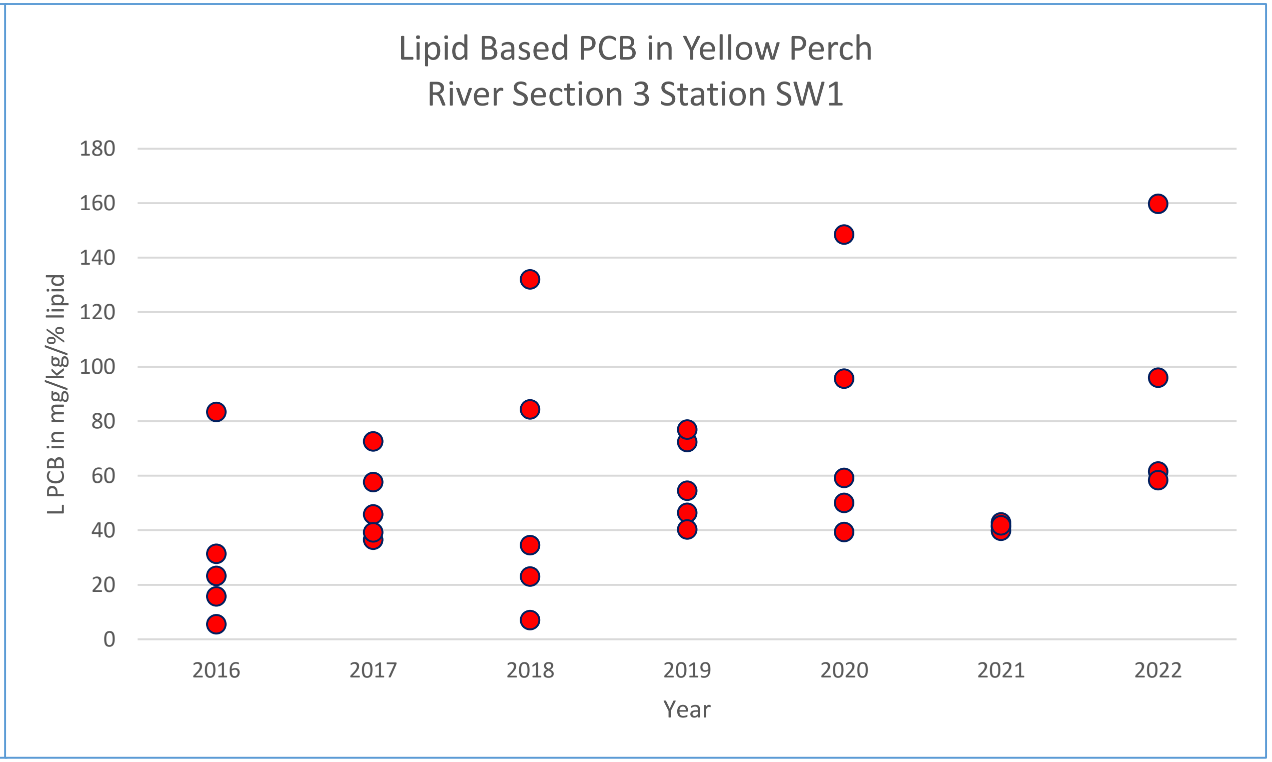
SW1 Yellow Perch Percent Lipid



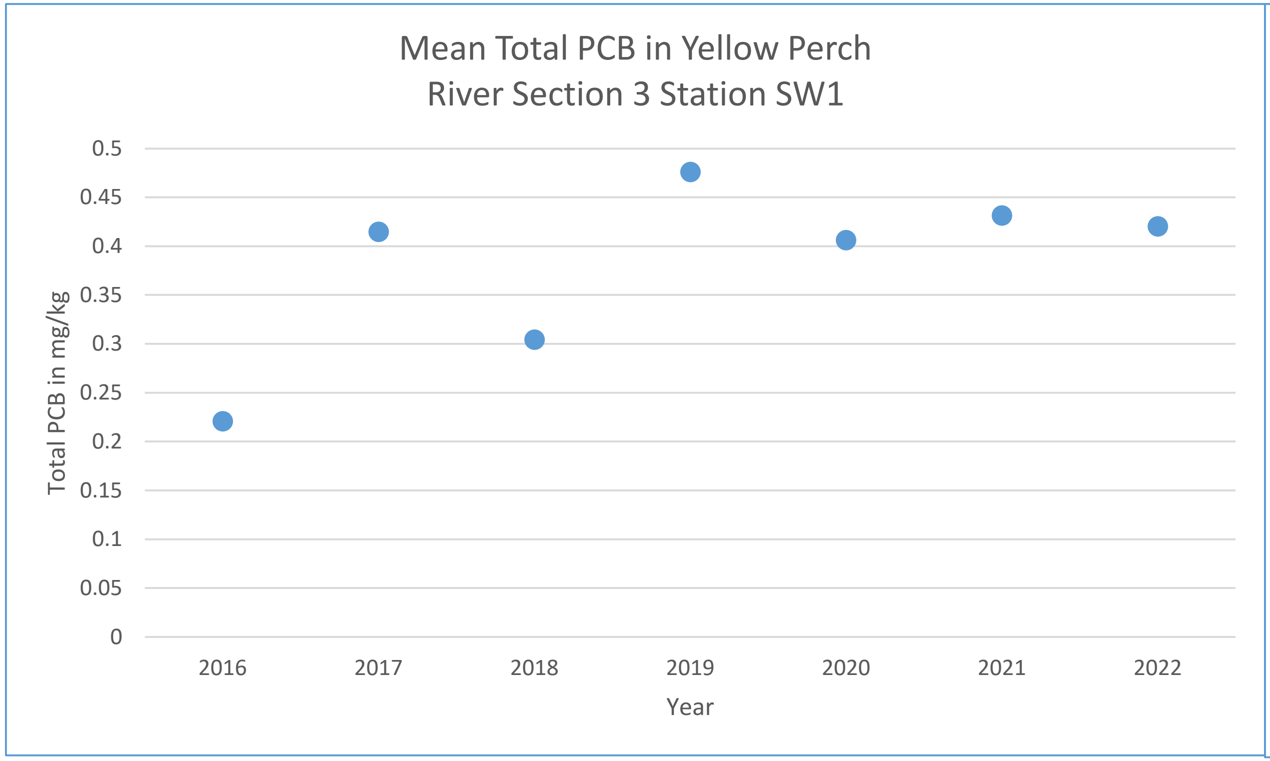


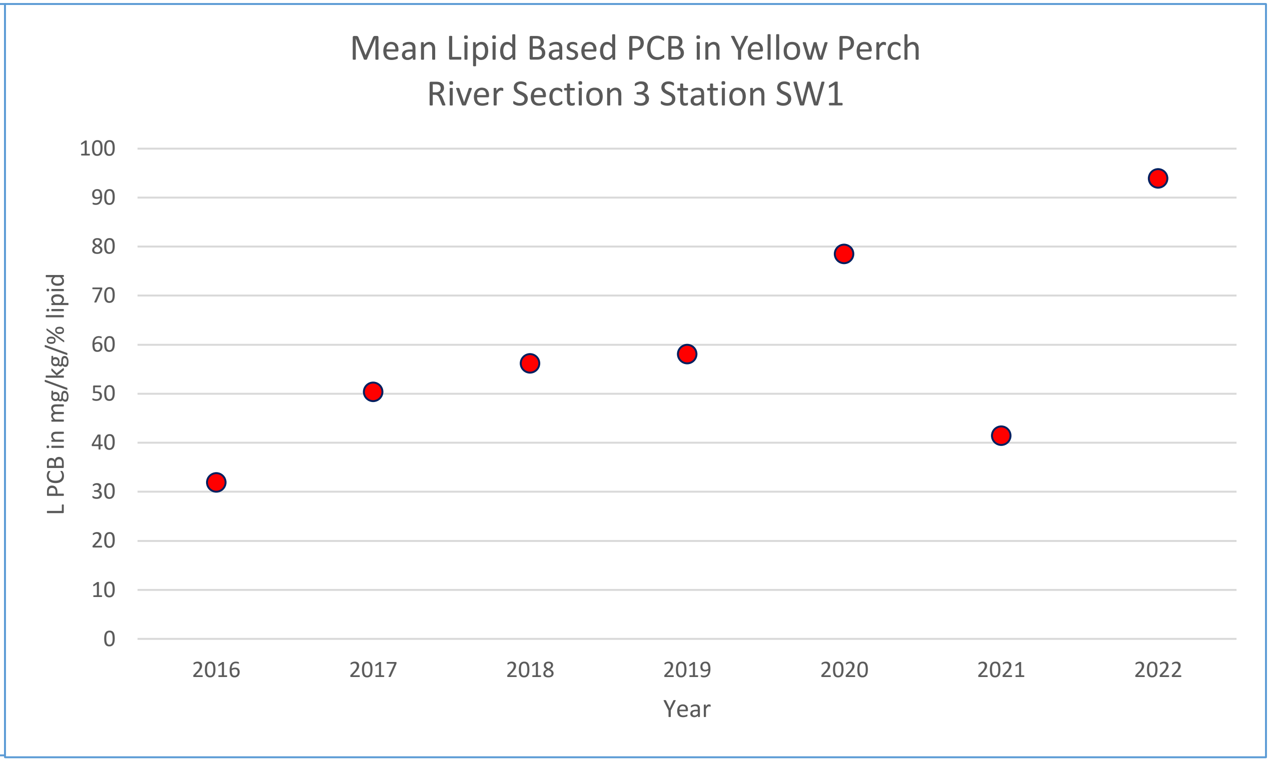
SW1 Yellow Perch Total PCB and Lipid Based PCB





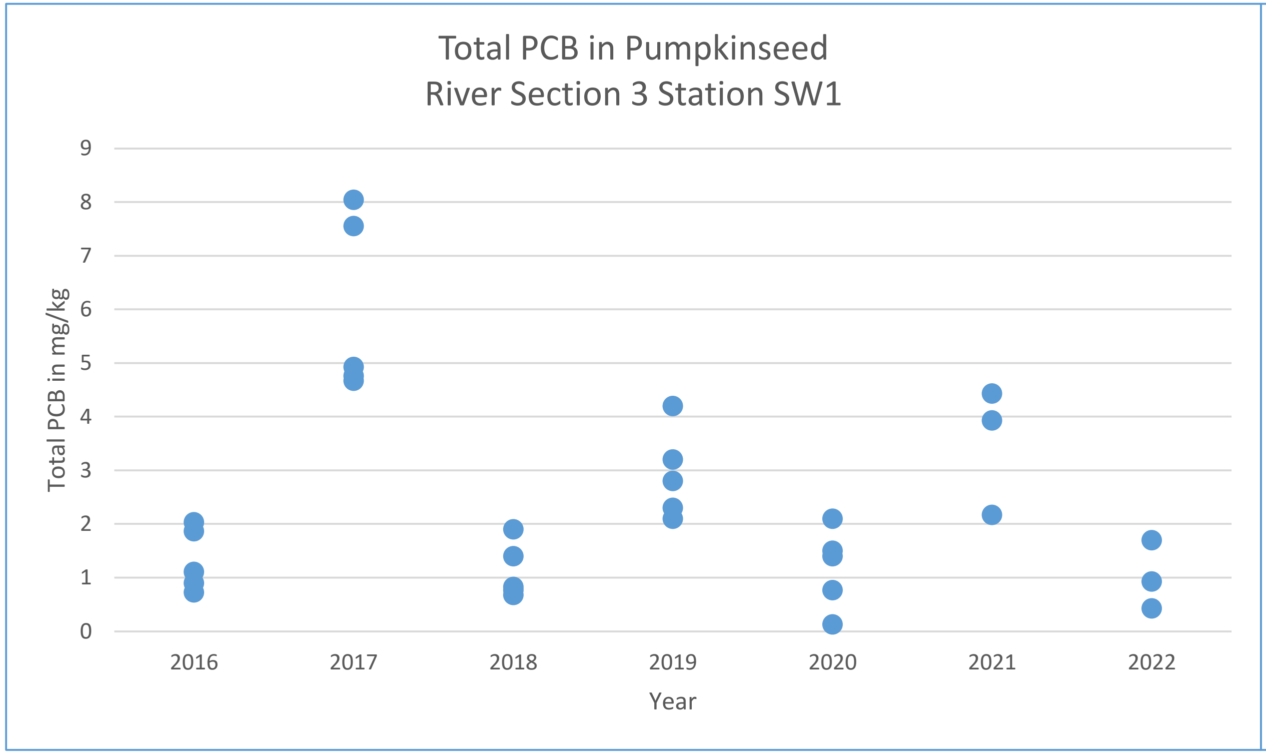
SW1 Yellow Perch Mean Total PCB and Mean Lipid Based PCB

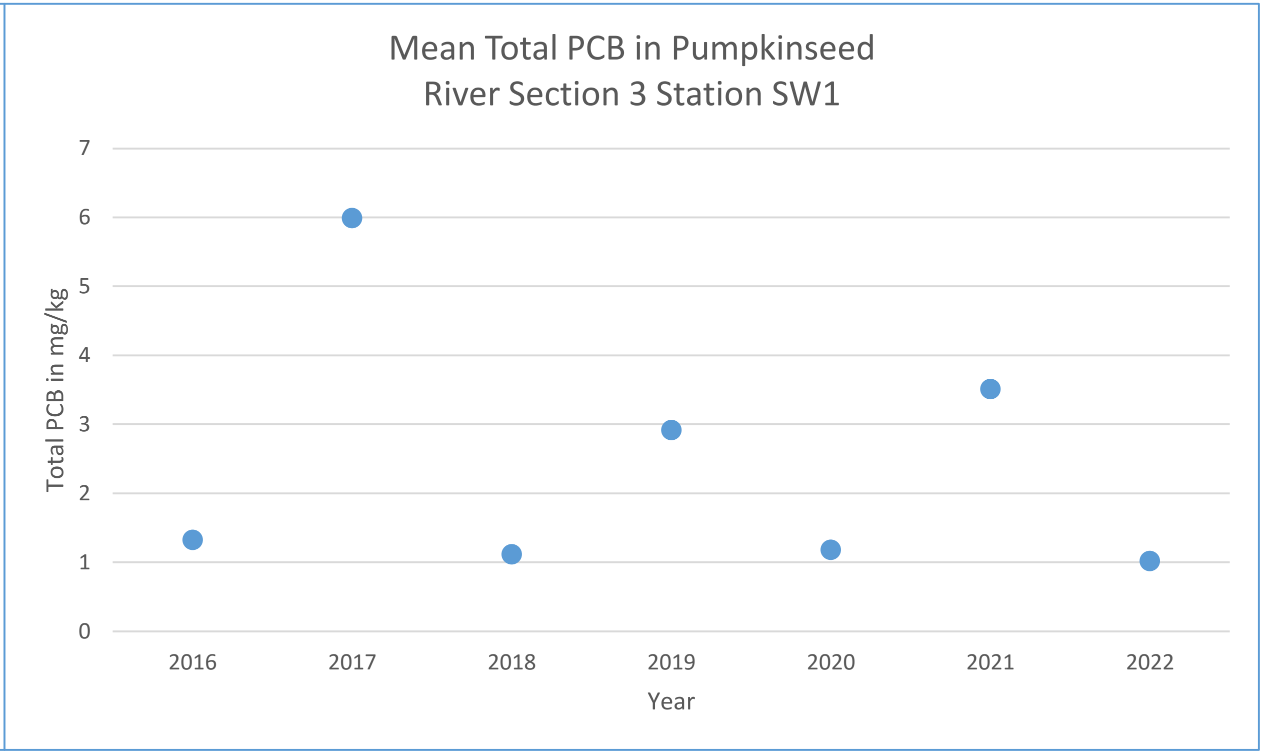




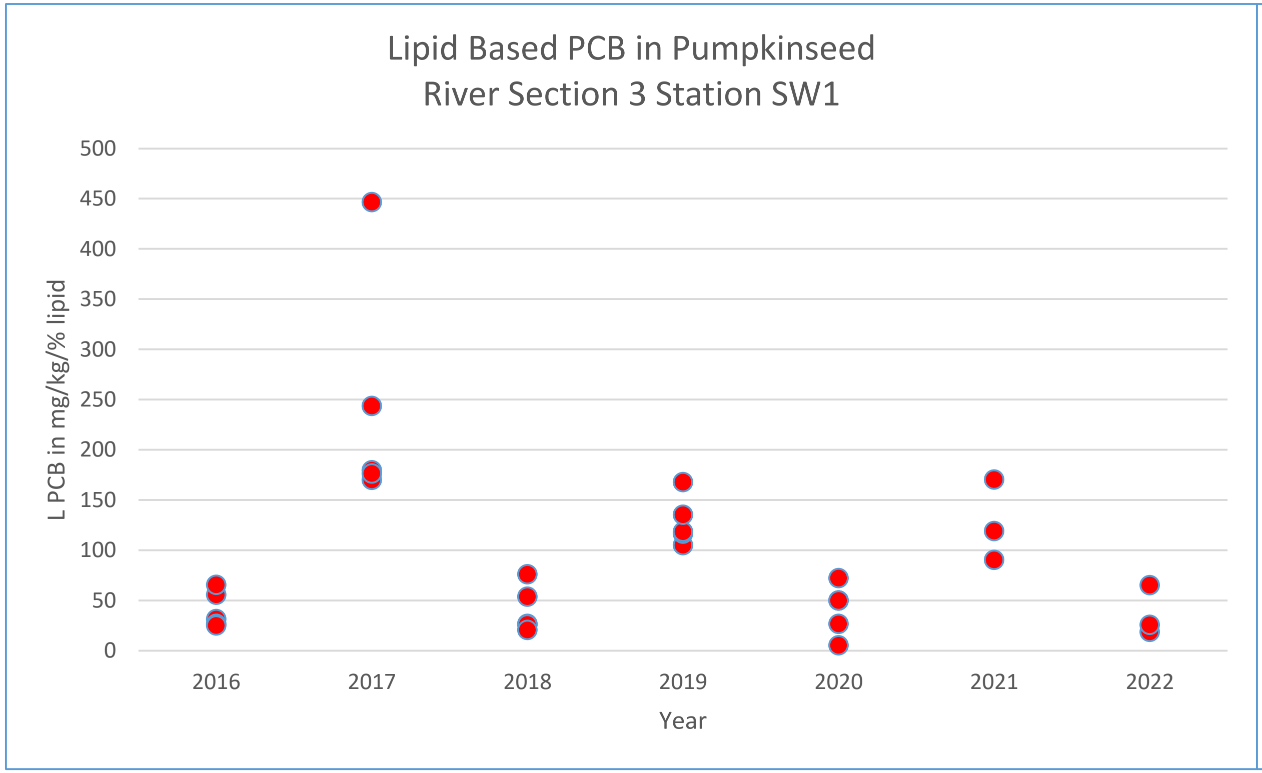
SW1 Pumpkinseed Data

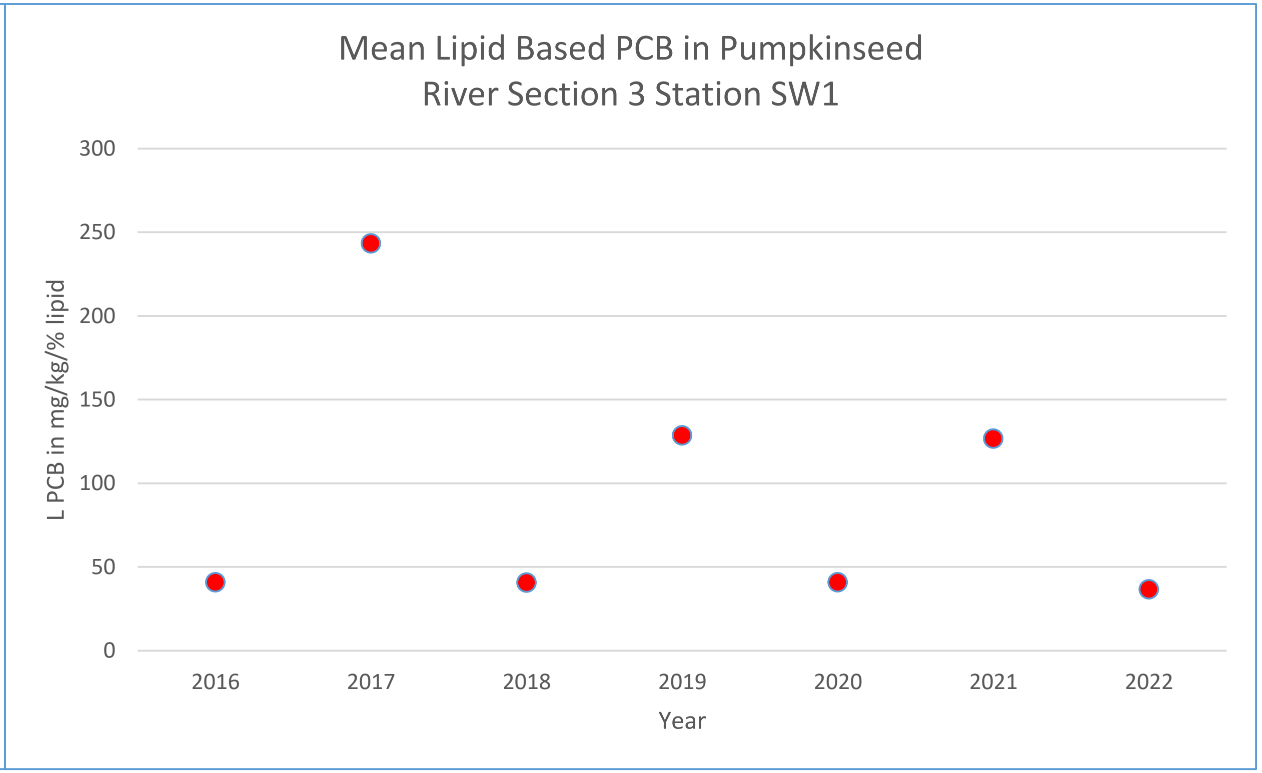
SW1 Pumpkinseed Total PCB



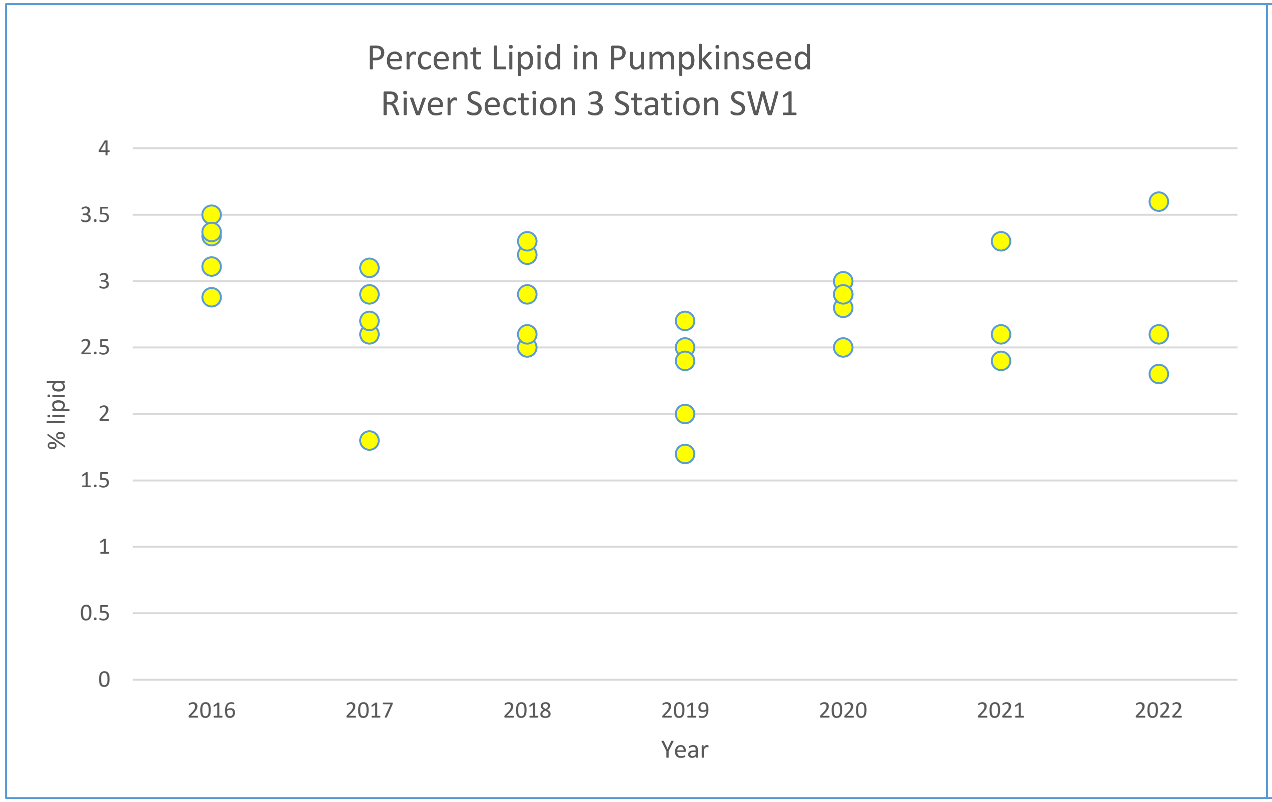


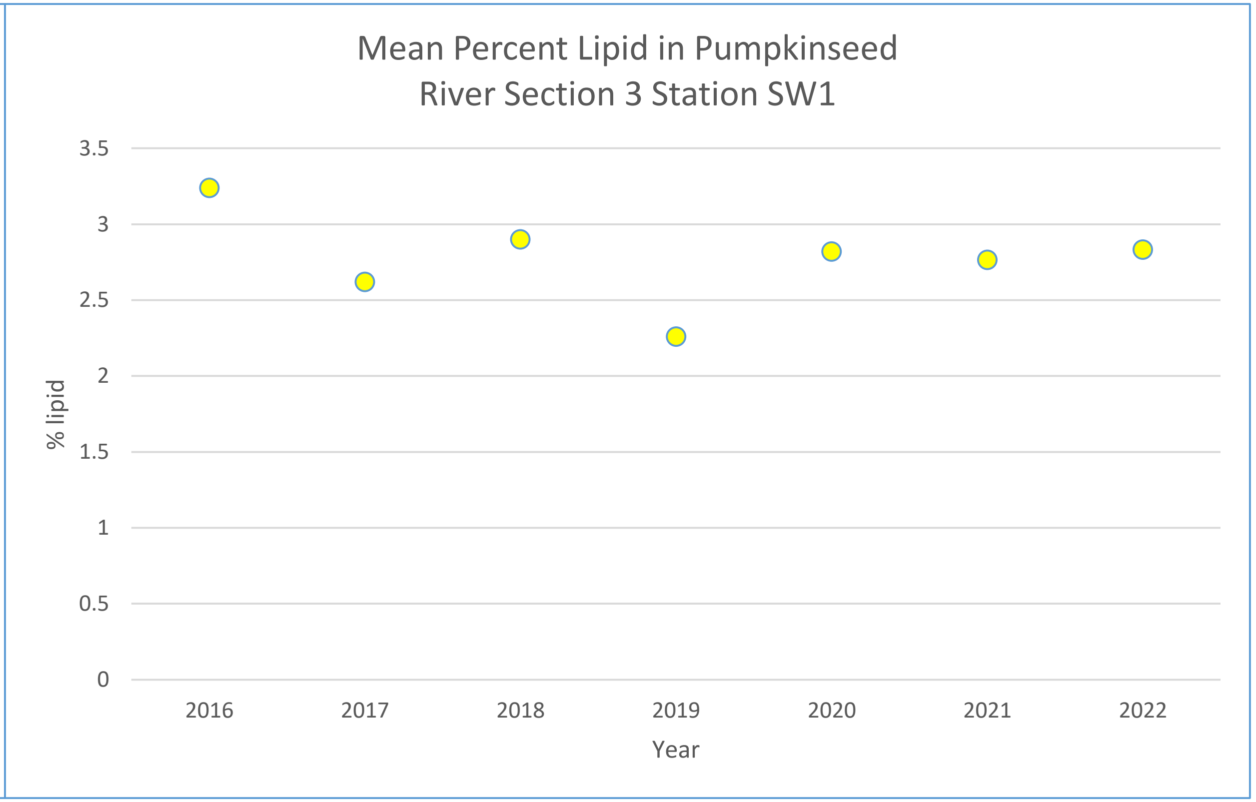
SW1 Pumpkinseed Lipid Based PCB



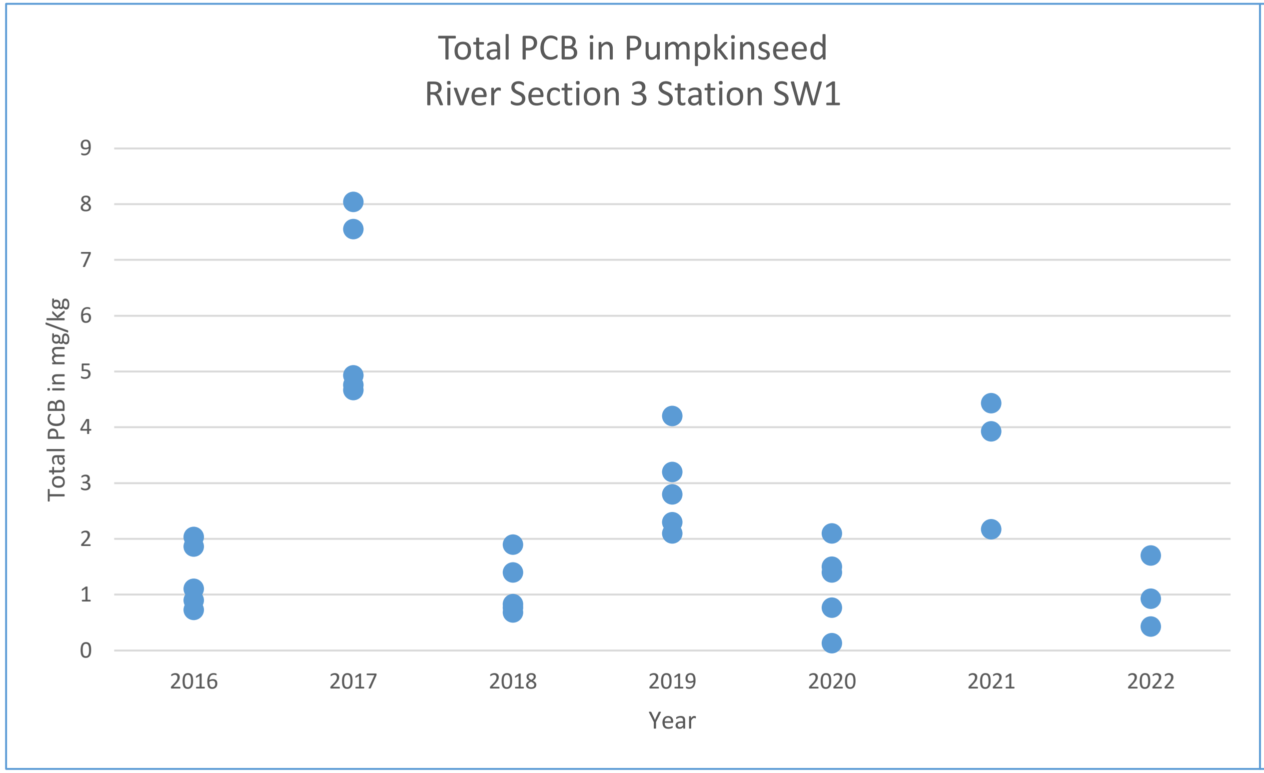


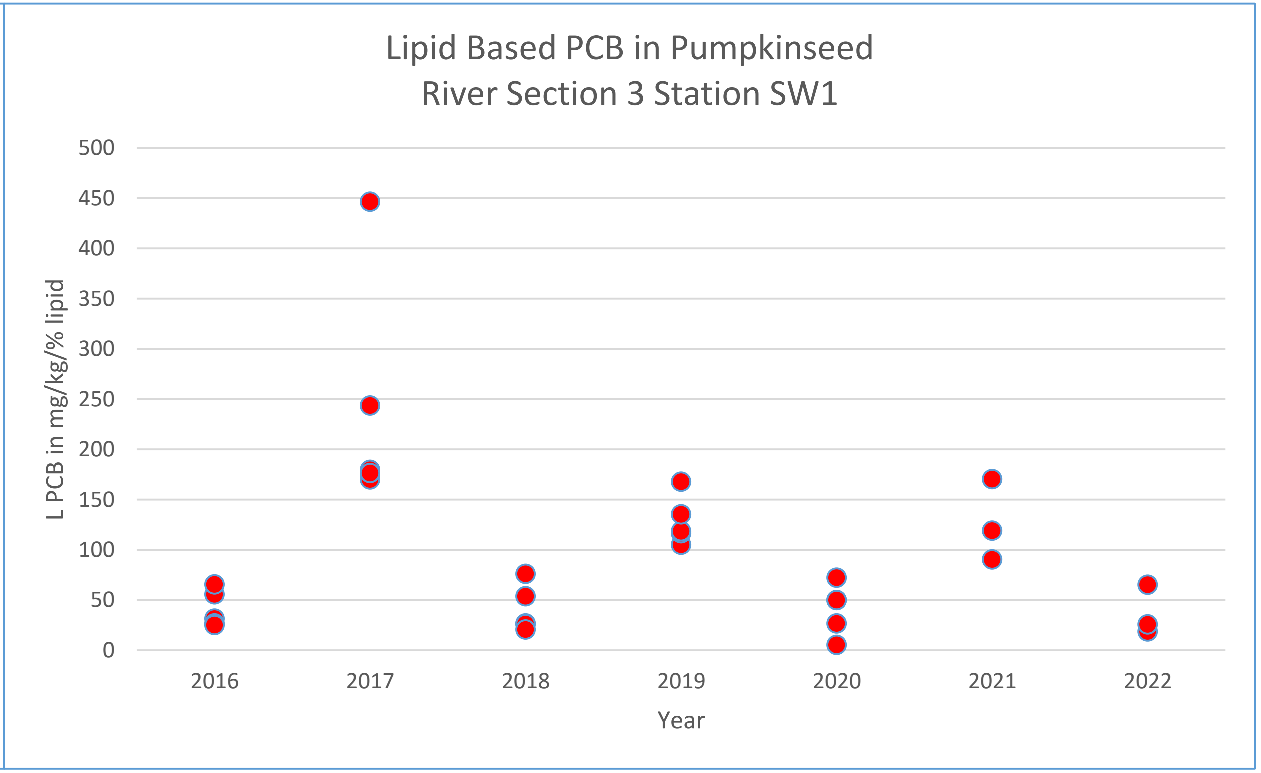
SW1 Pumpkinseed Percent Lipid



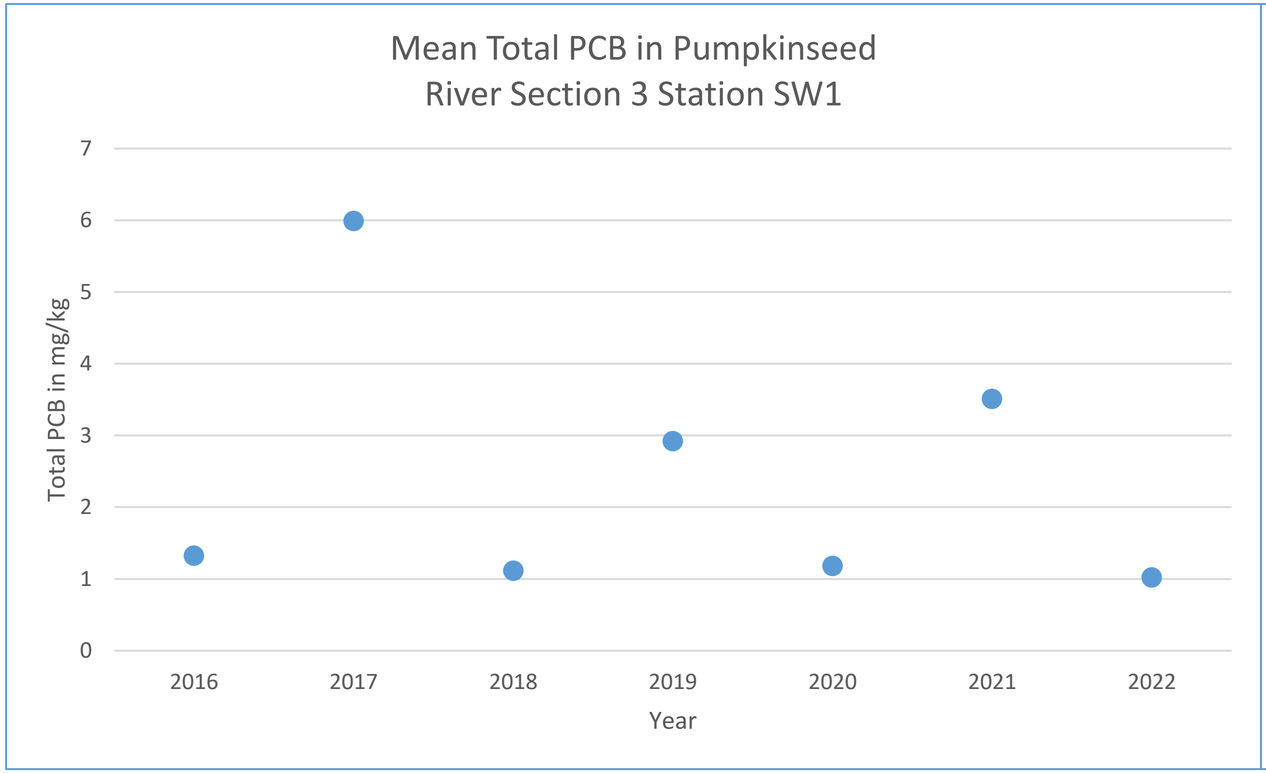


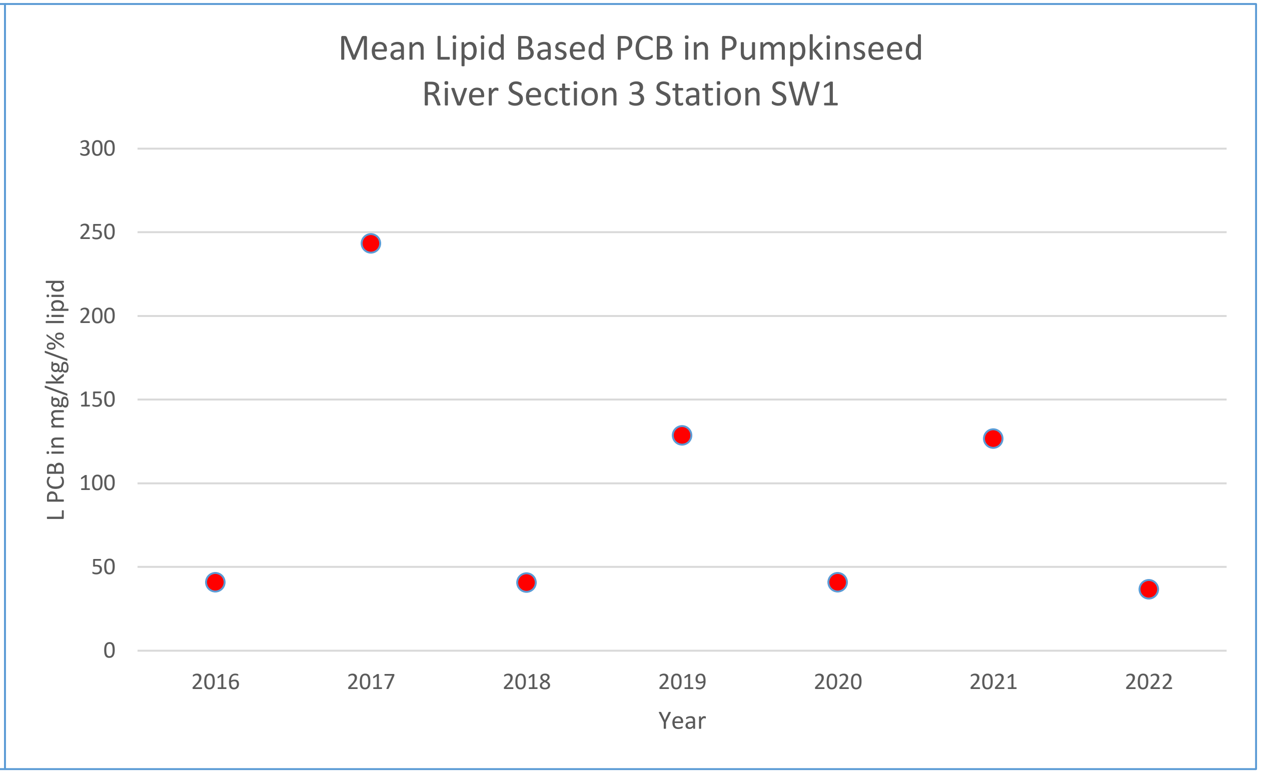
SW1 Pumpkinseed Total PCB and Lipid Based PCB





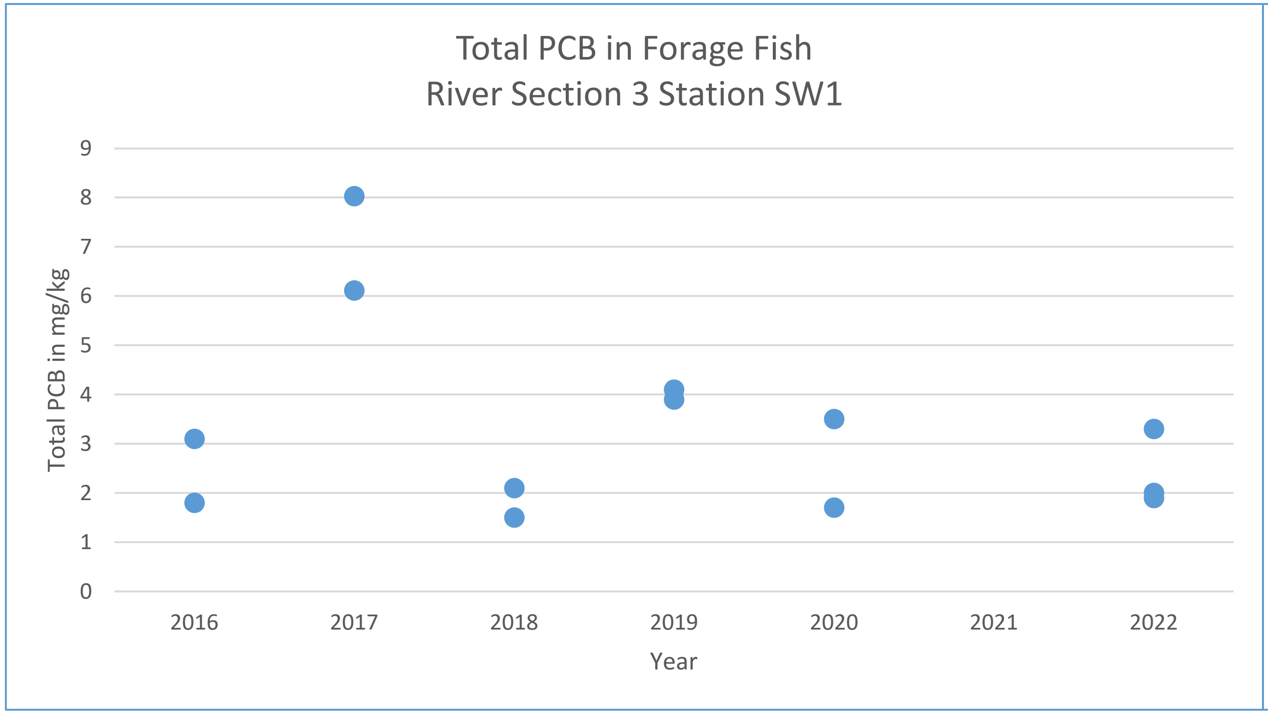
SW1 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

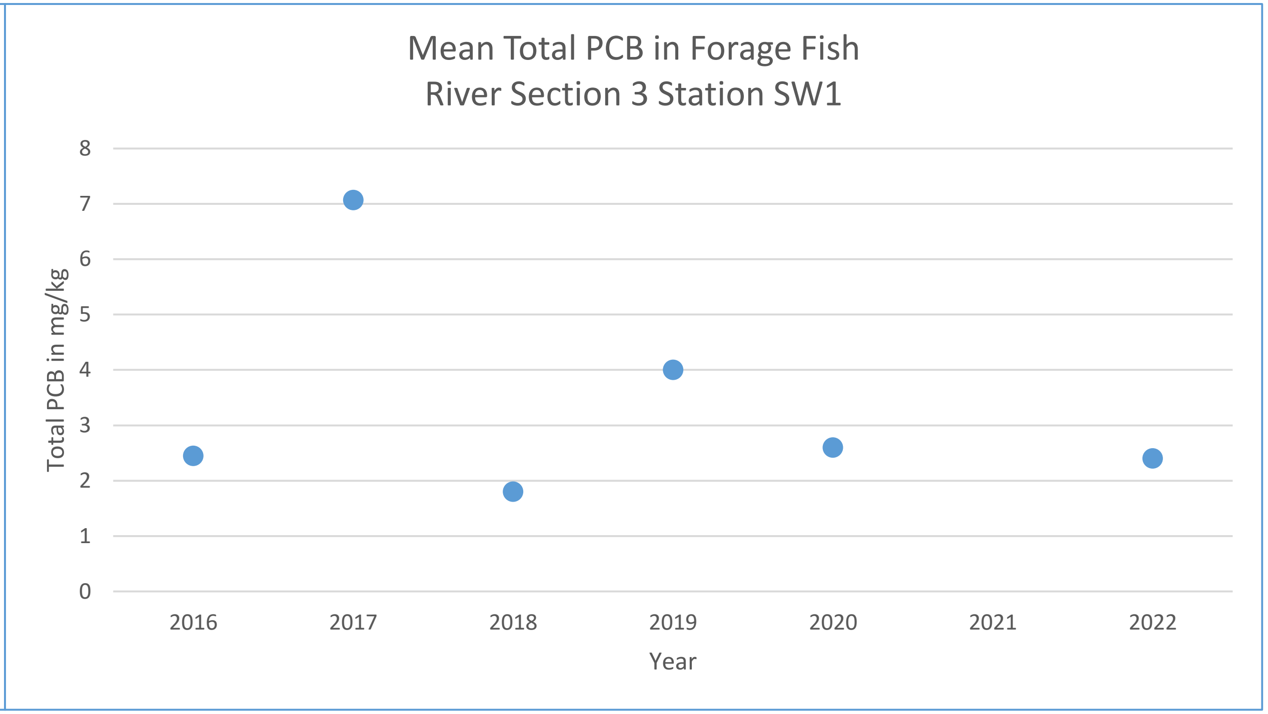




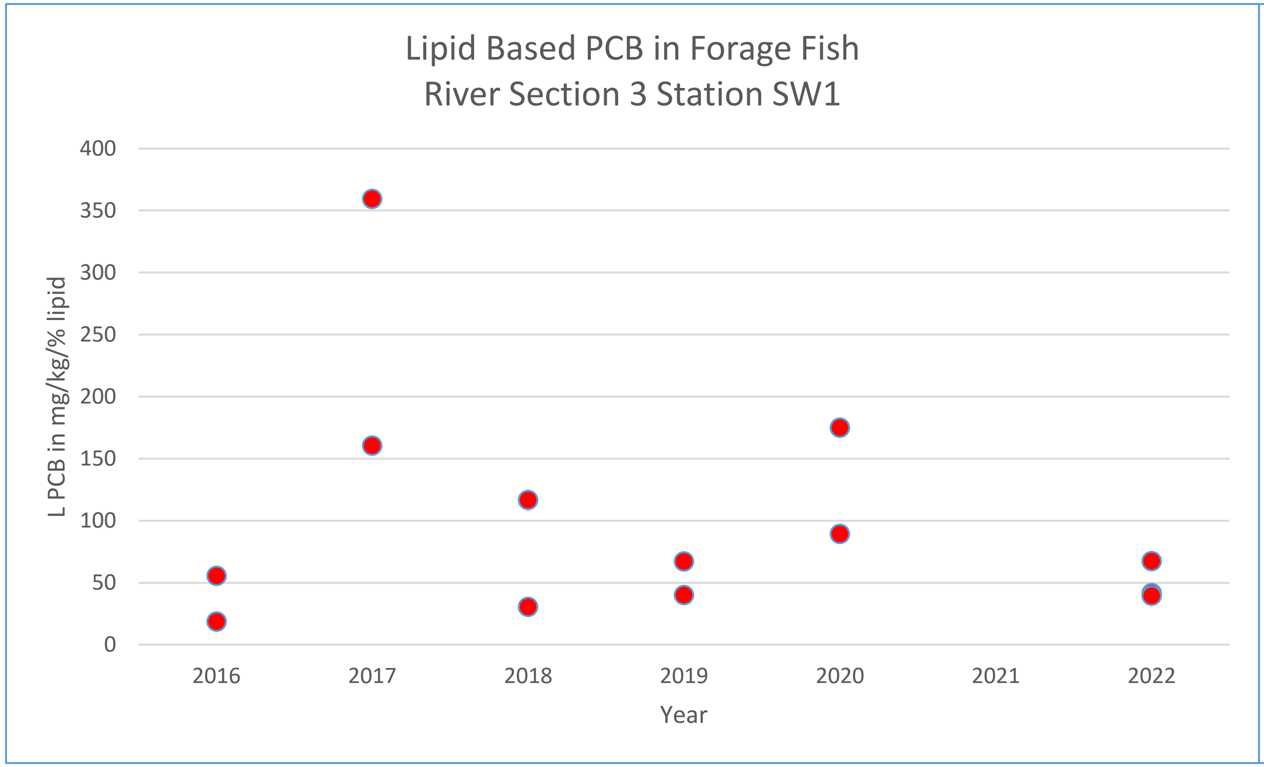
SW1 Forage Fish Data

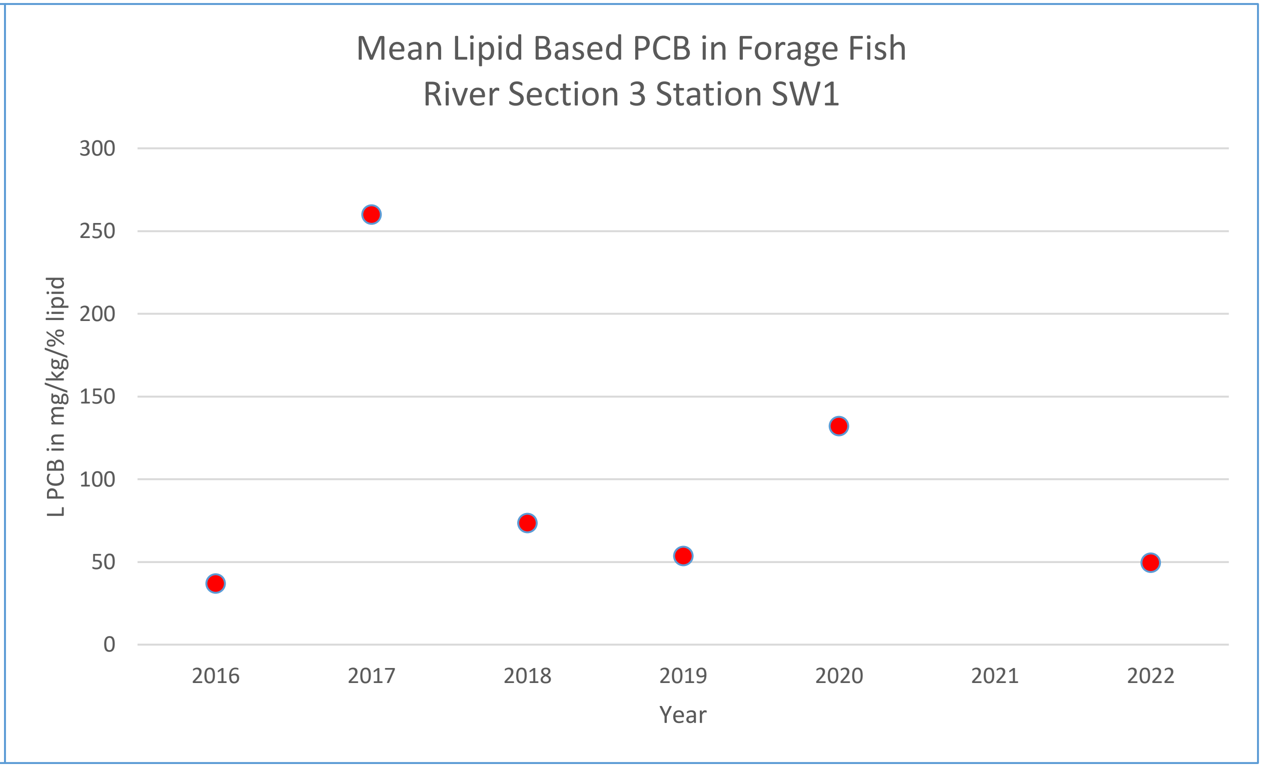
SW1 Forage Fish Total PCB



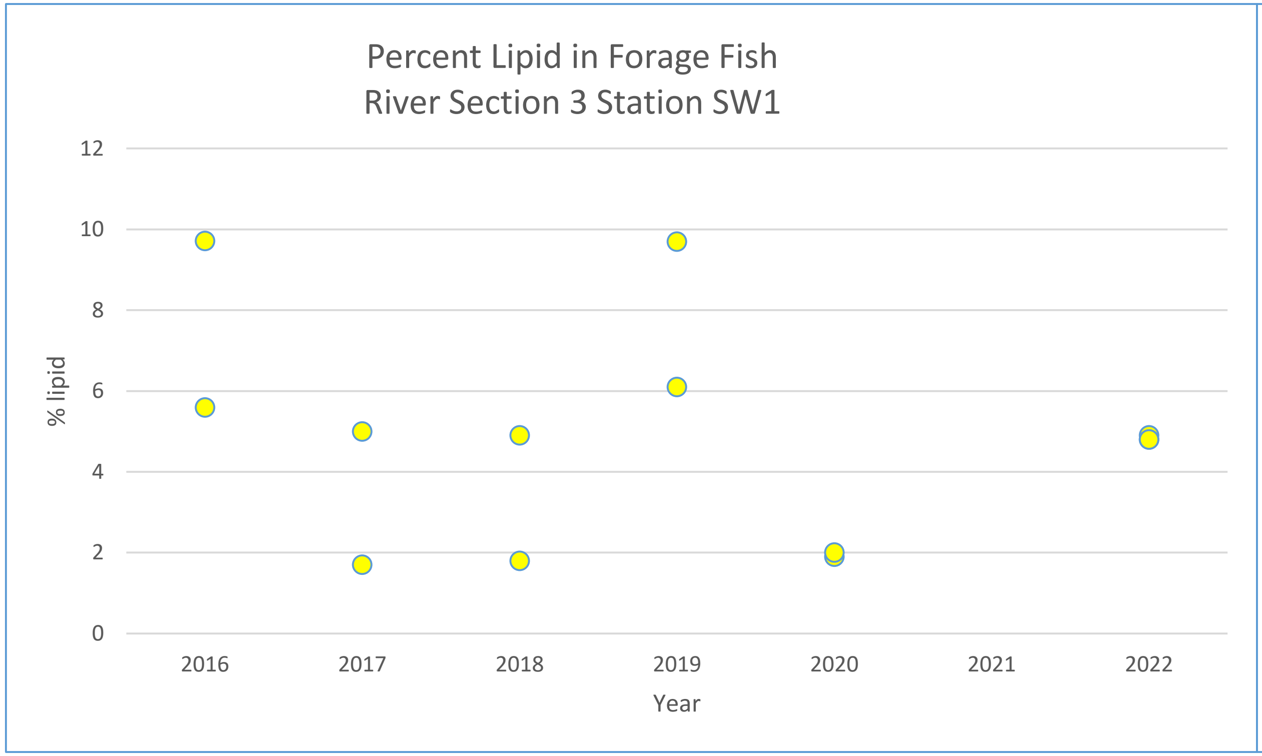


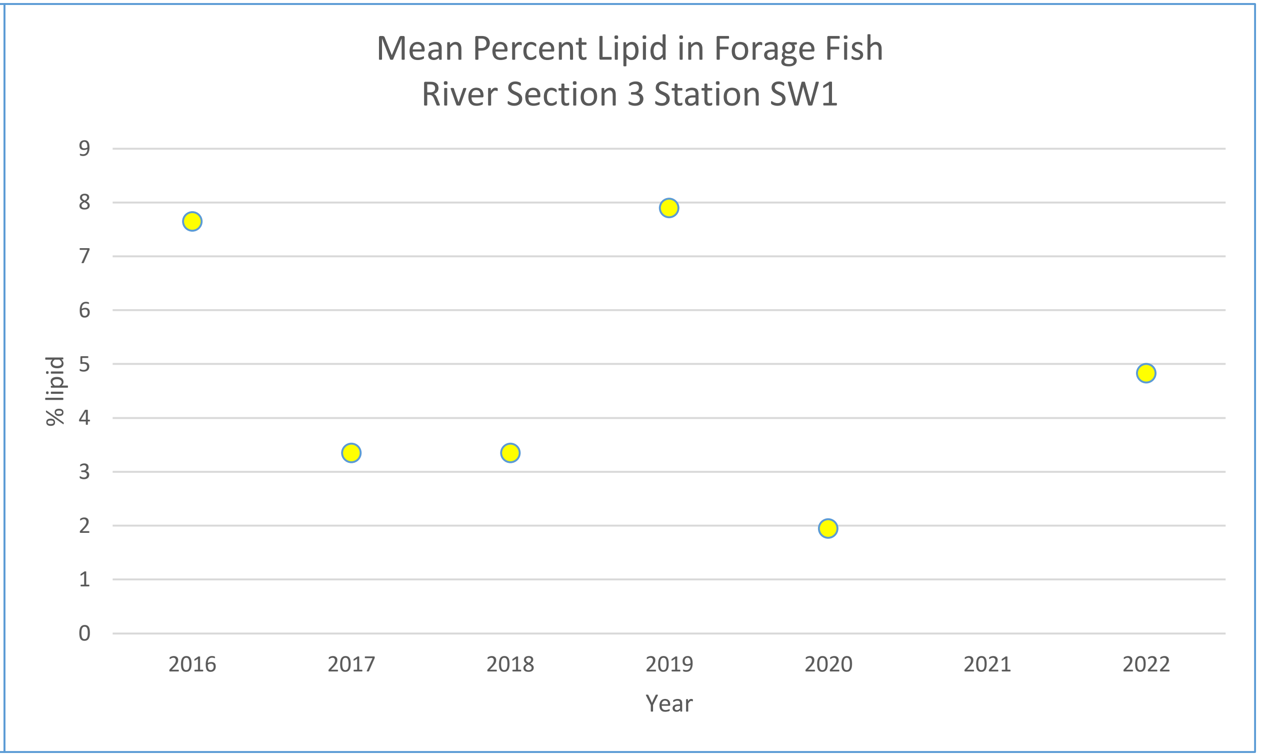
SW1 Forage Fish Lipid Based PCB



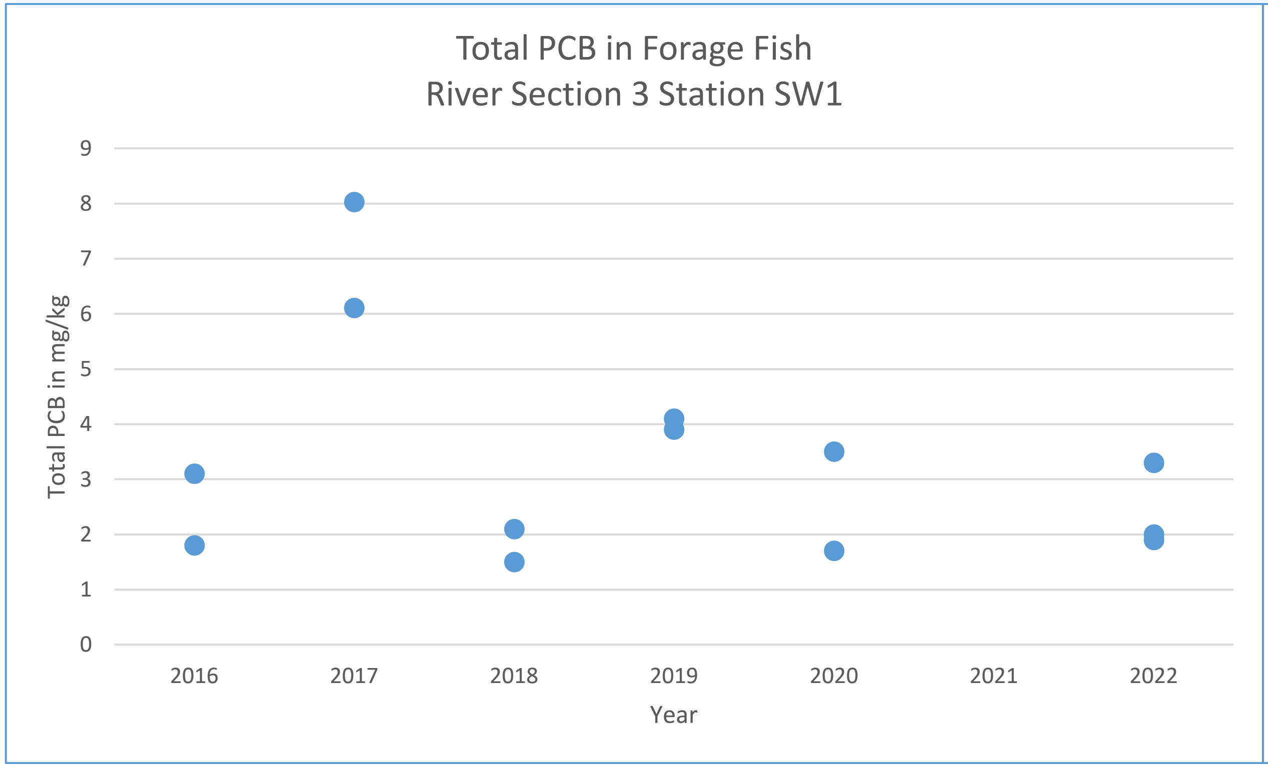


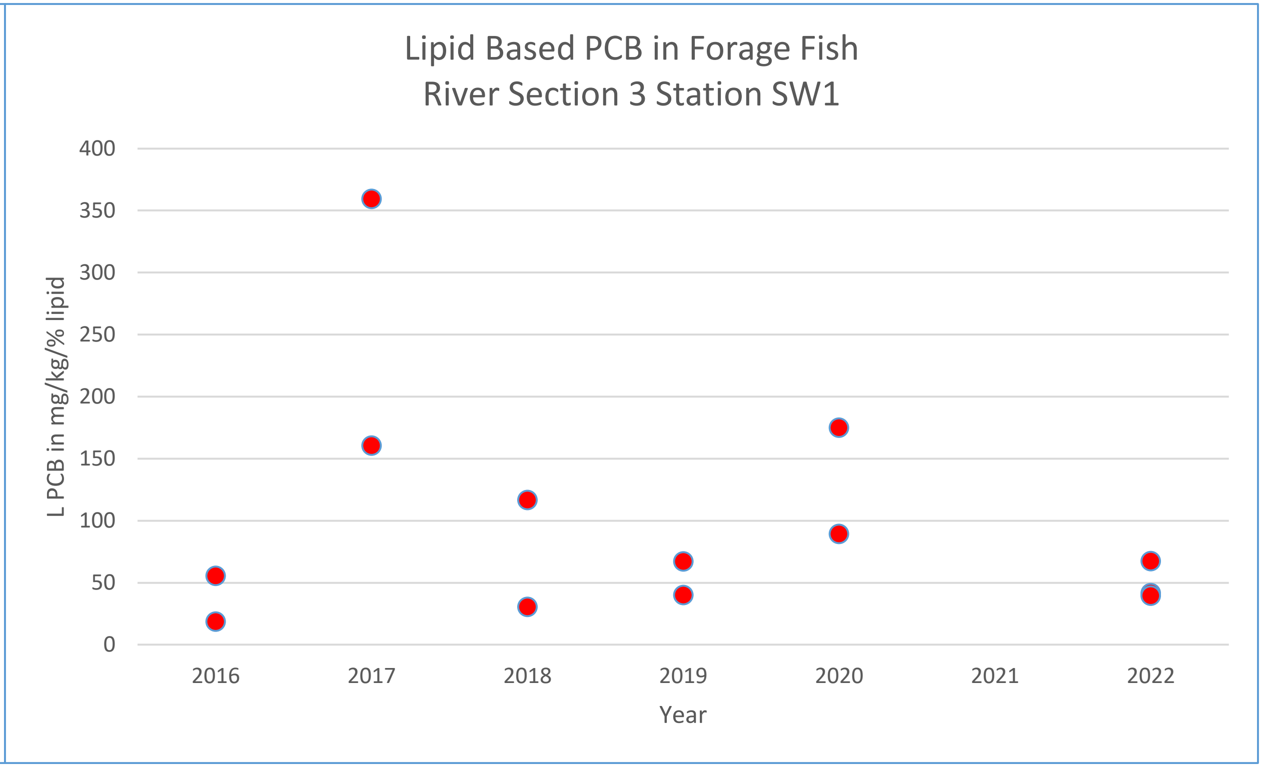
SW1 Forage Fish Percent Lipid



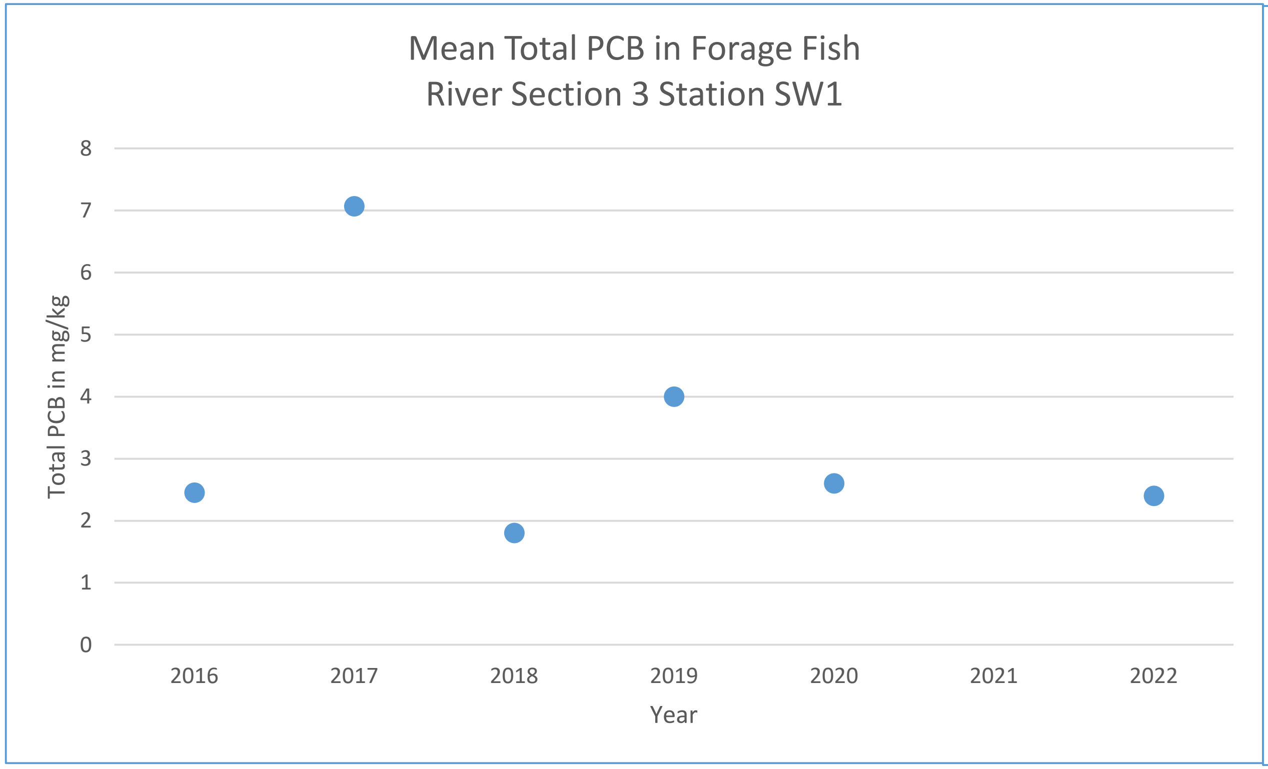


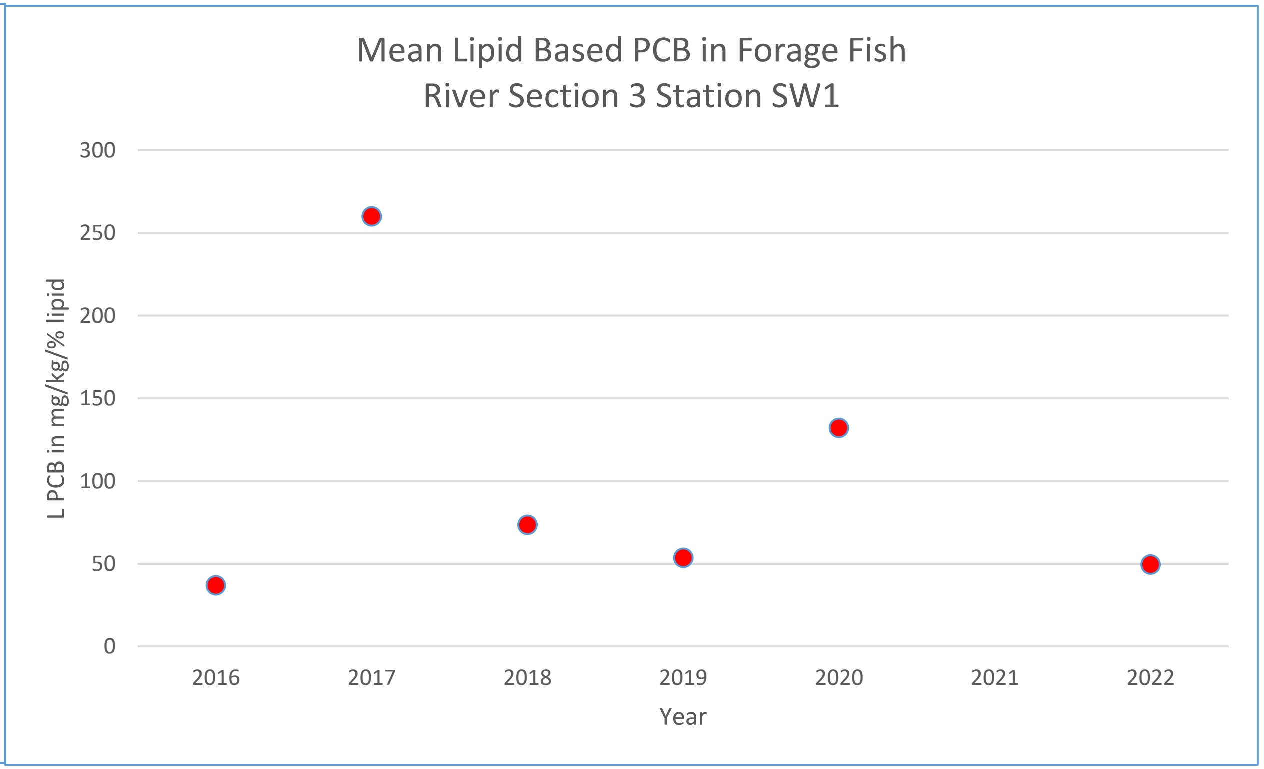
SW1 Forage Fish Total PCB and Lipid Based PCB





SW1 Forage Fish Mean Total PCB and Mean Lipid Based PCB



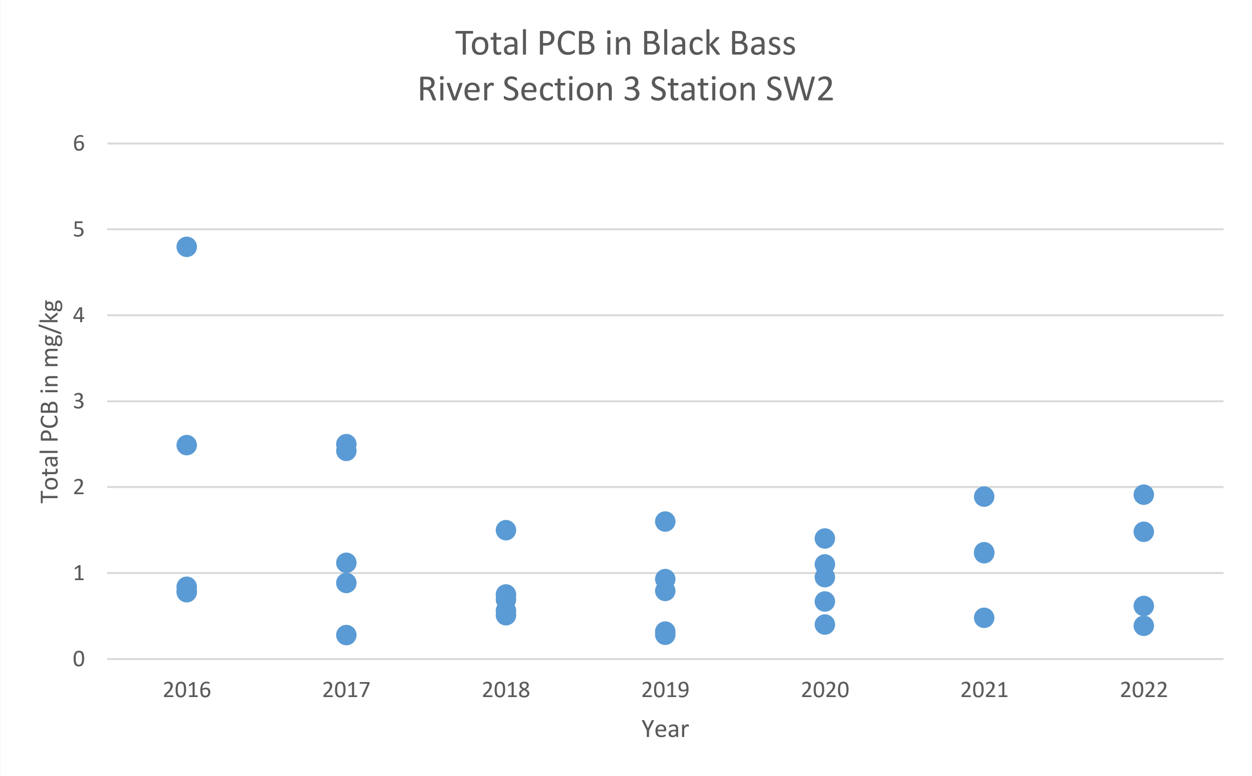


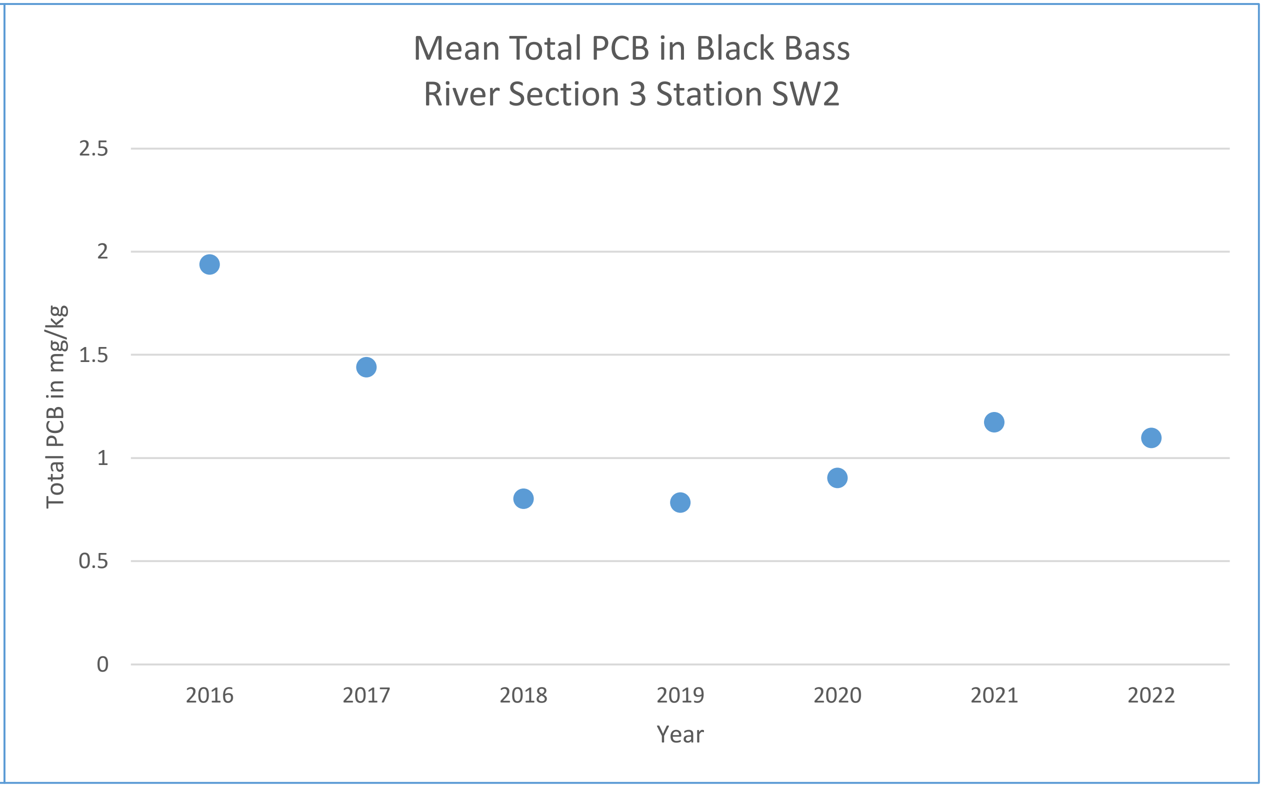
Station SW2

Stations SW2 and SW3

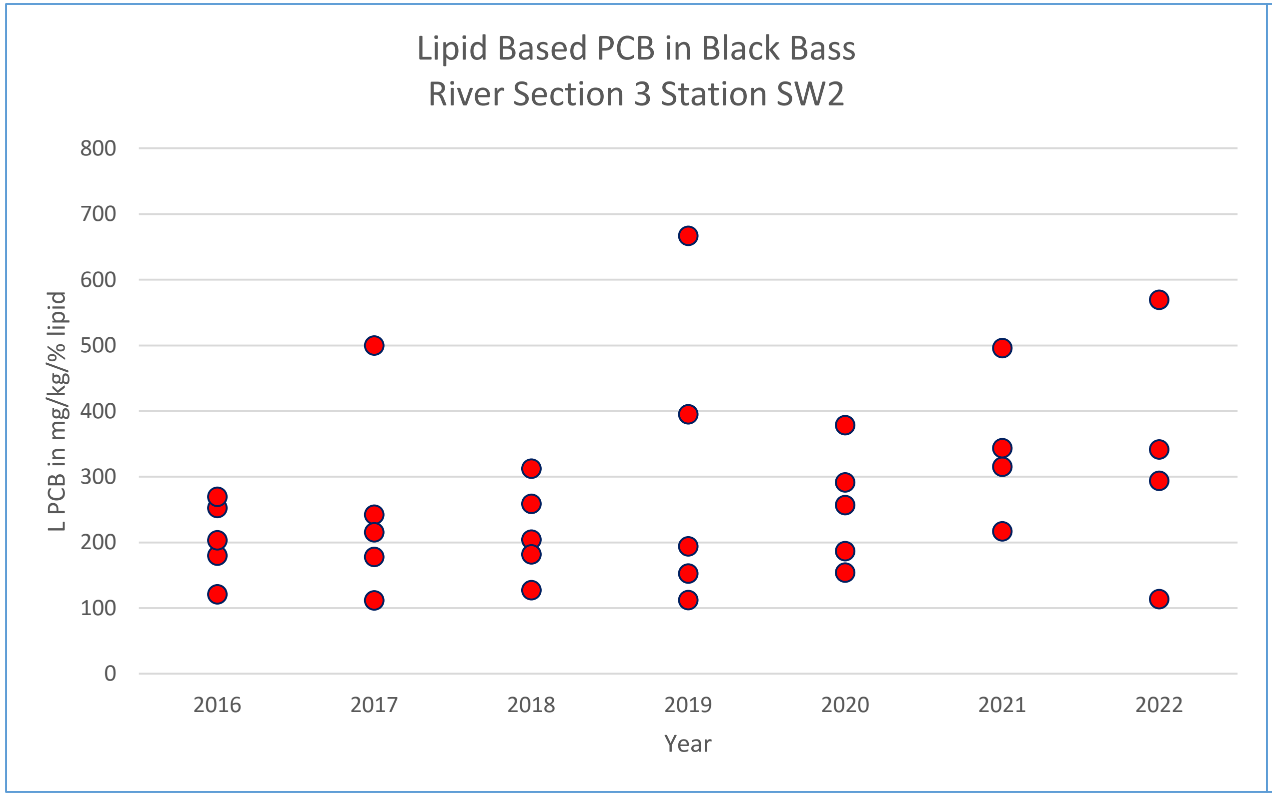
SW2 Black Bass Data

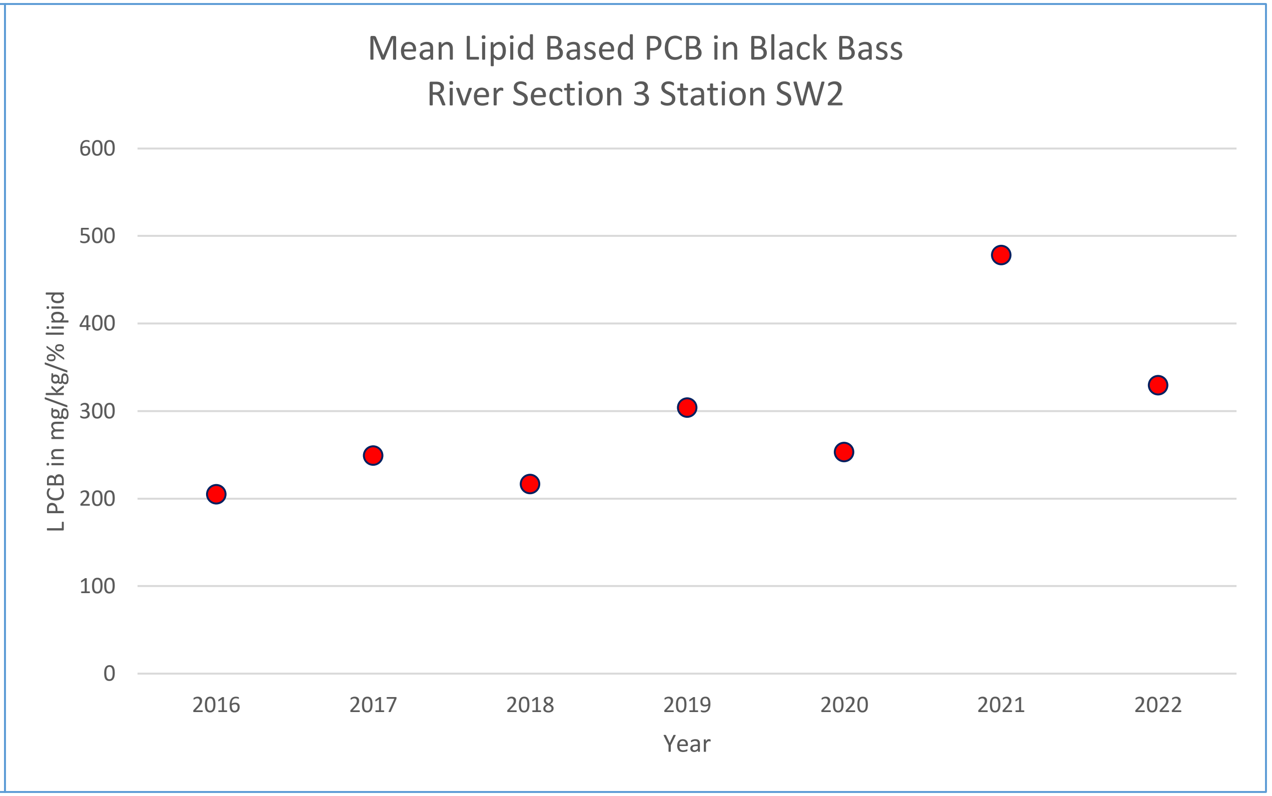
SW2 Black Bass Total PCB



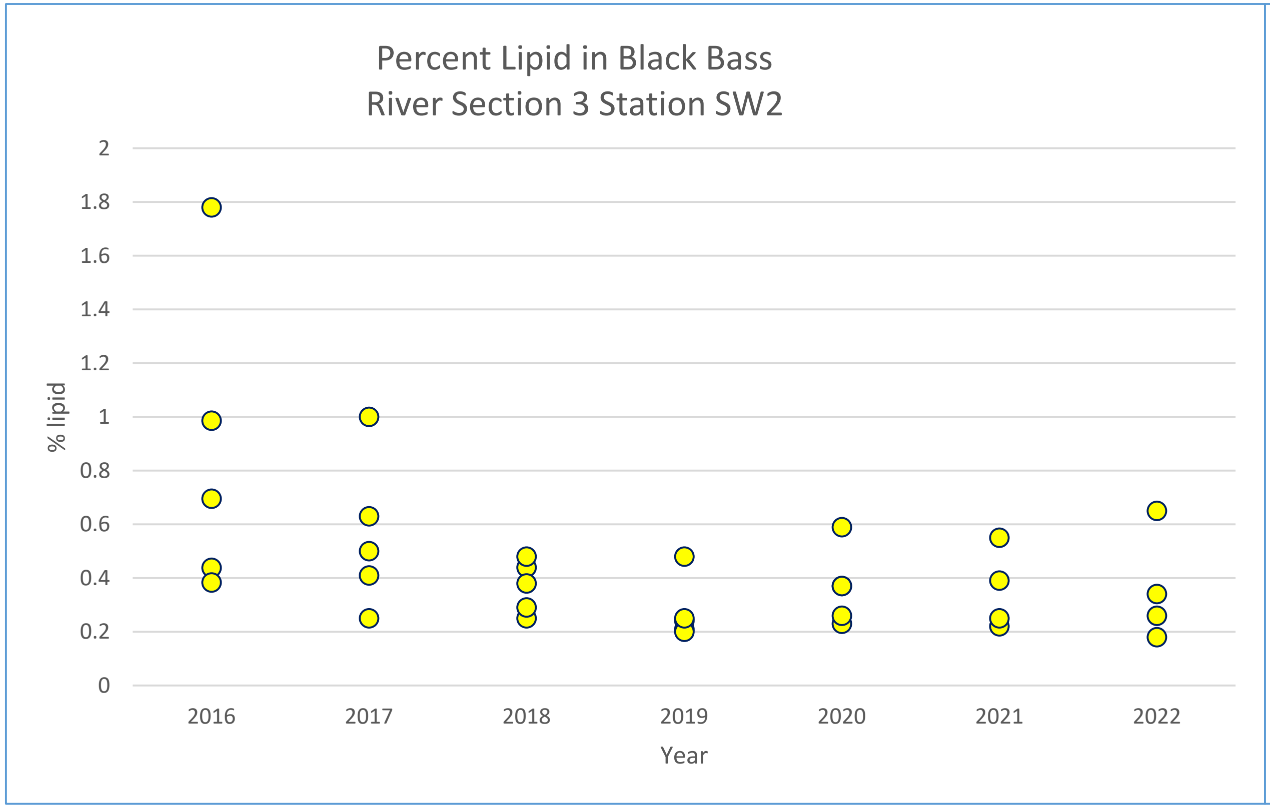


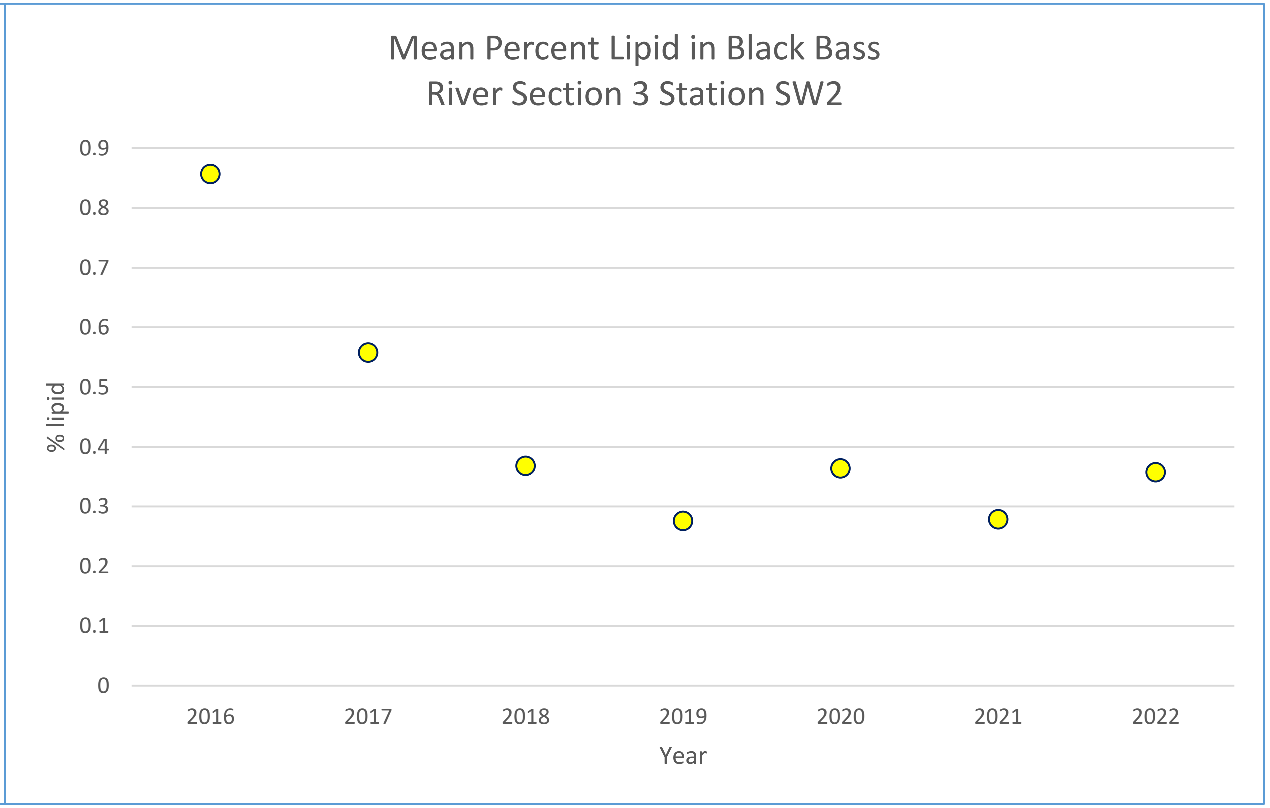
SW2 Black Bass Lipid Based PCB



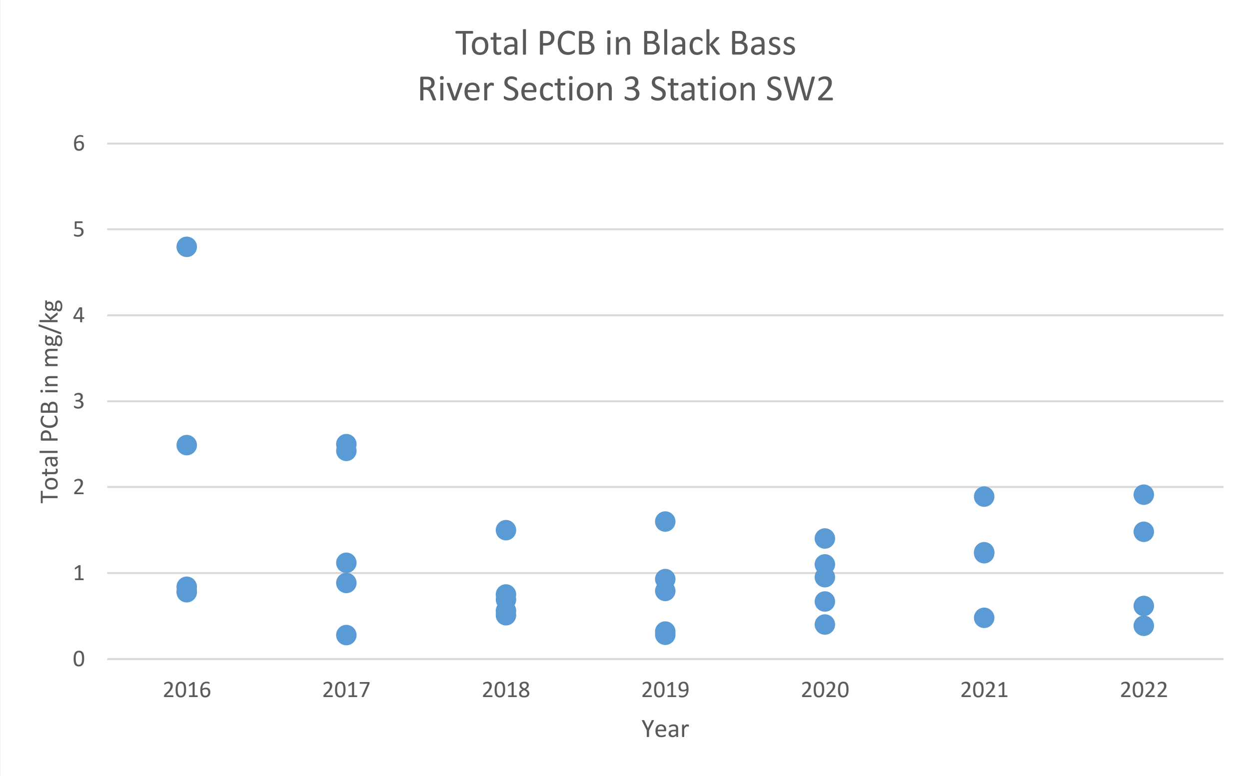


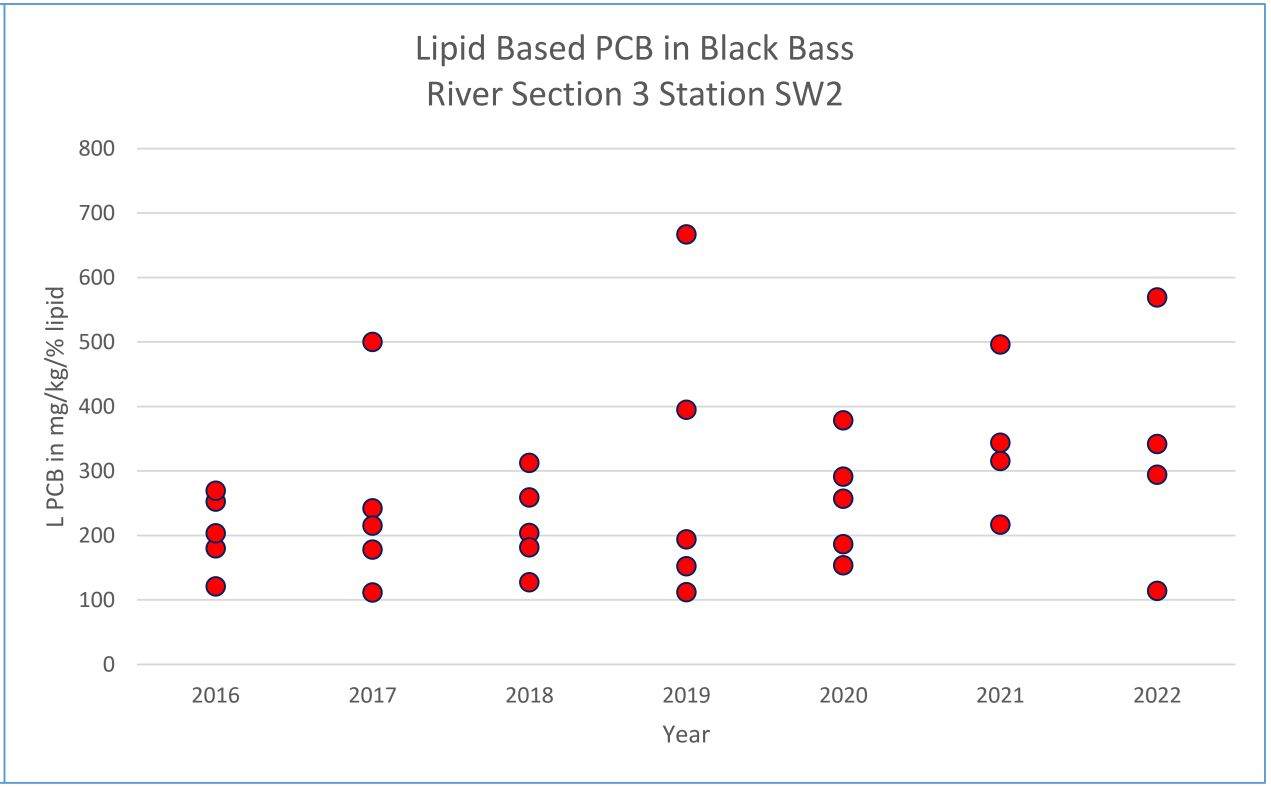
SW2 Black Bass Percent Lipid



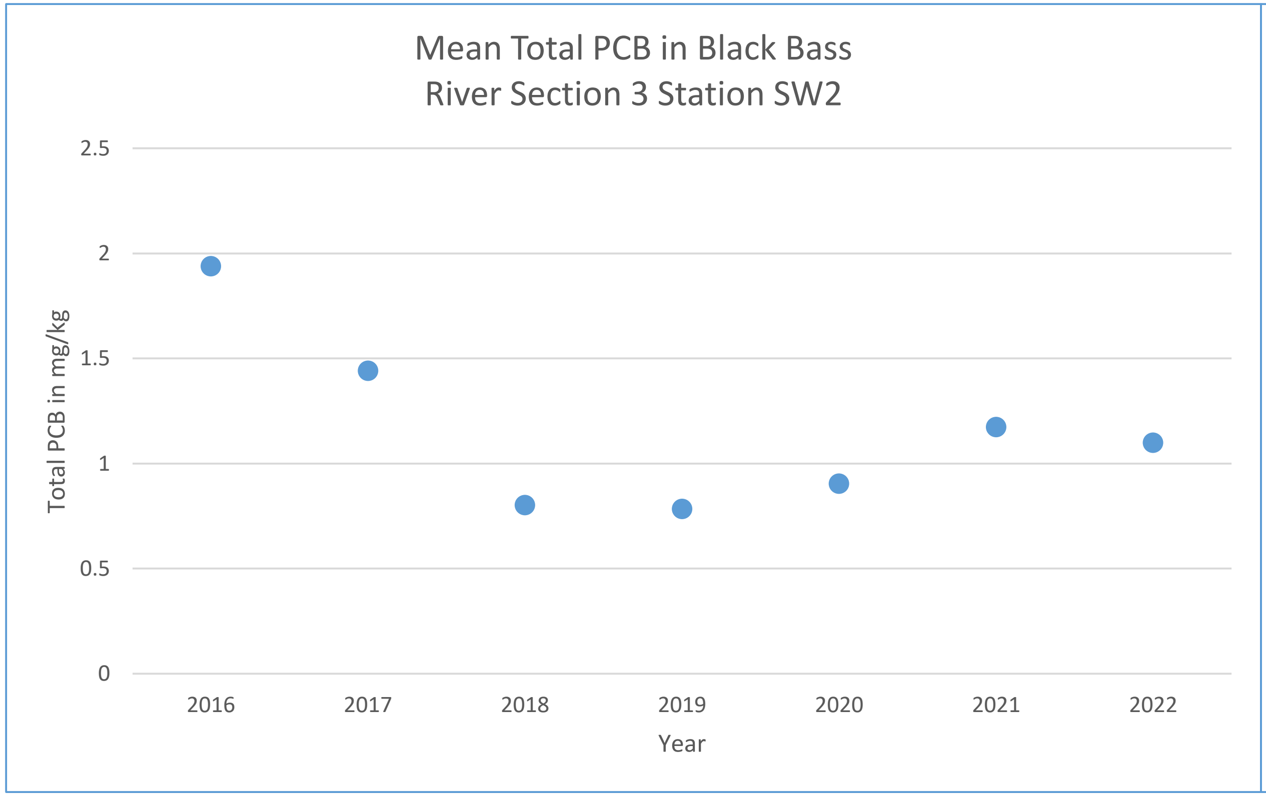


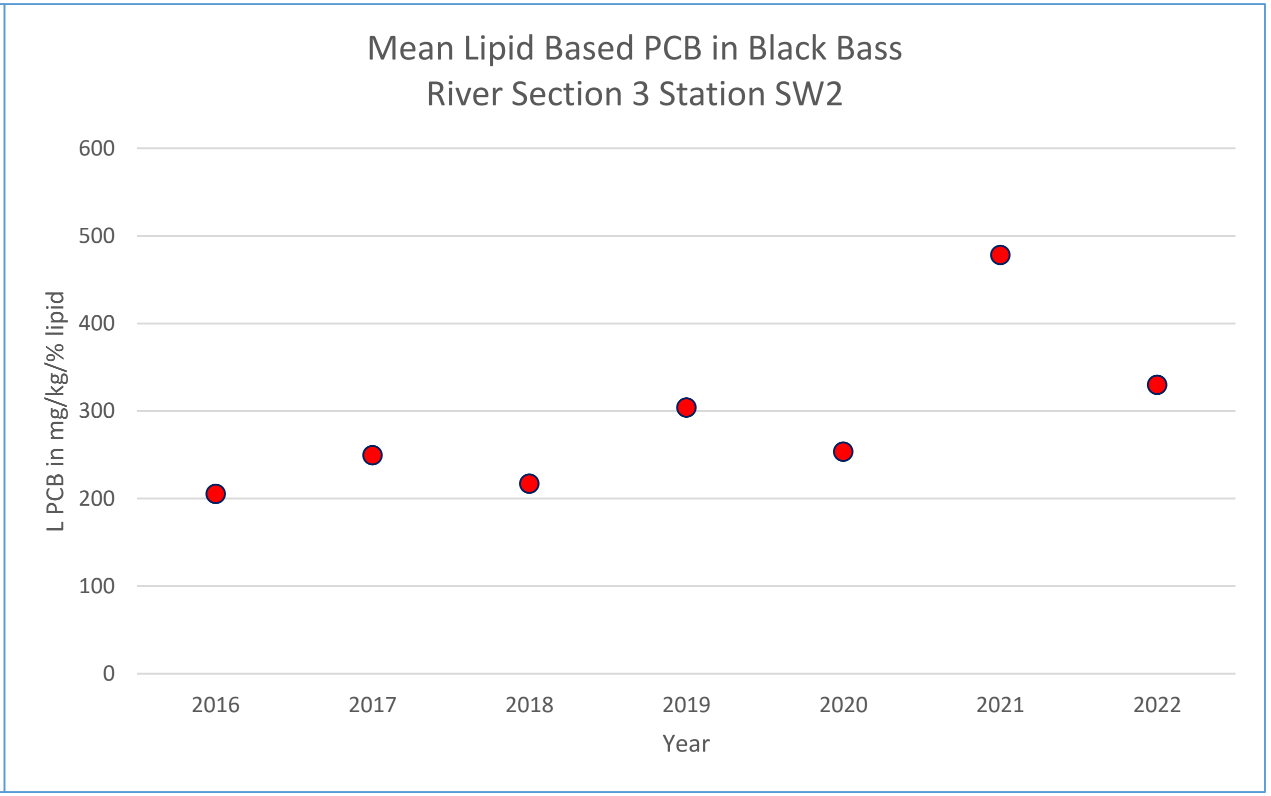
SW2 Black Bass Total PCB and Lipid Based PCB





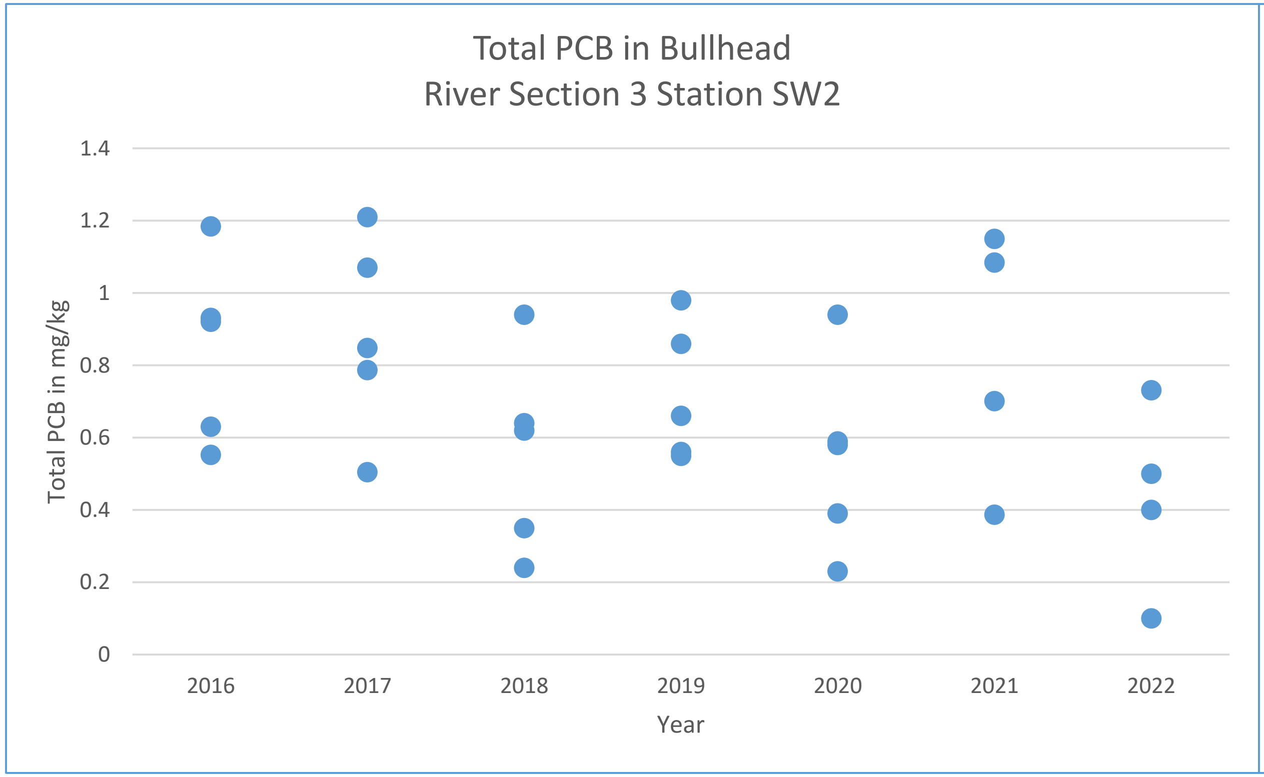
SW2 Black Bass Mean Total PCB and Mean Lipid Based PCB

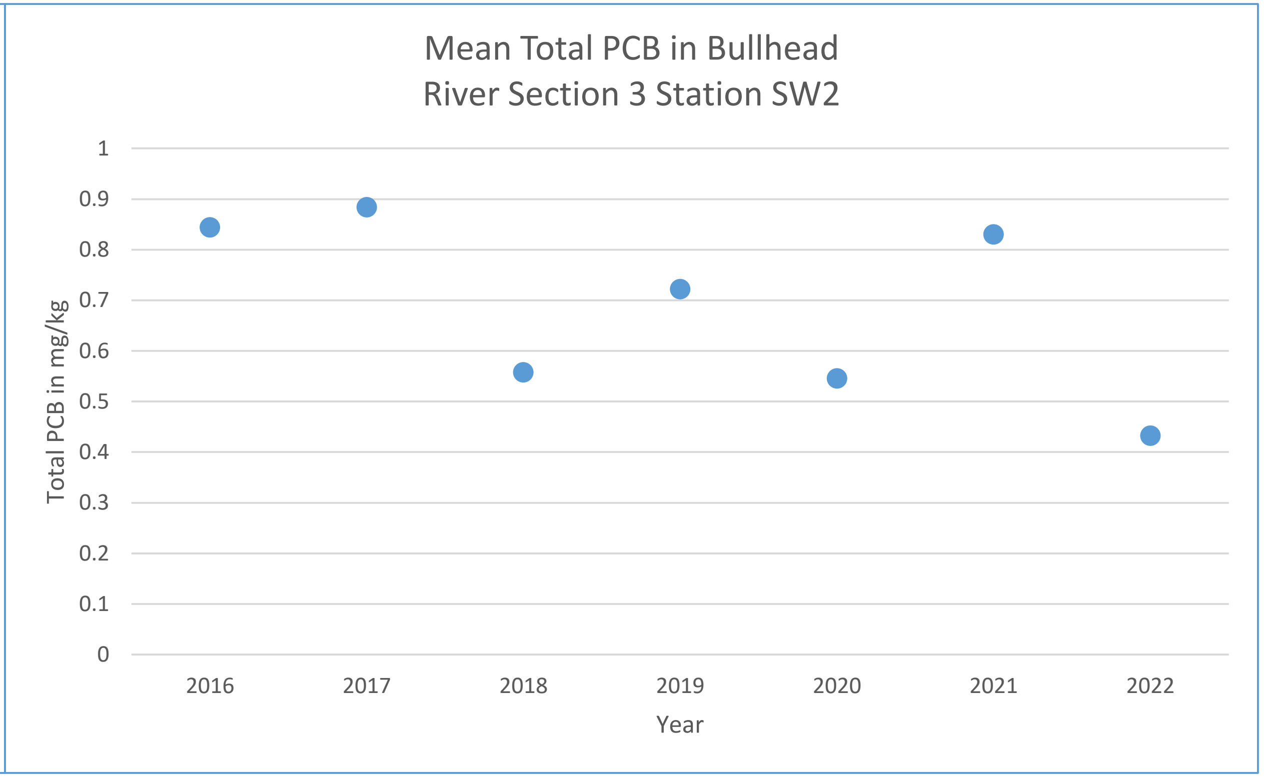




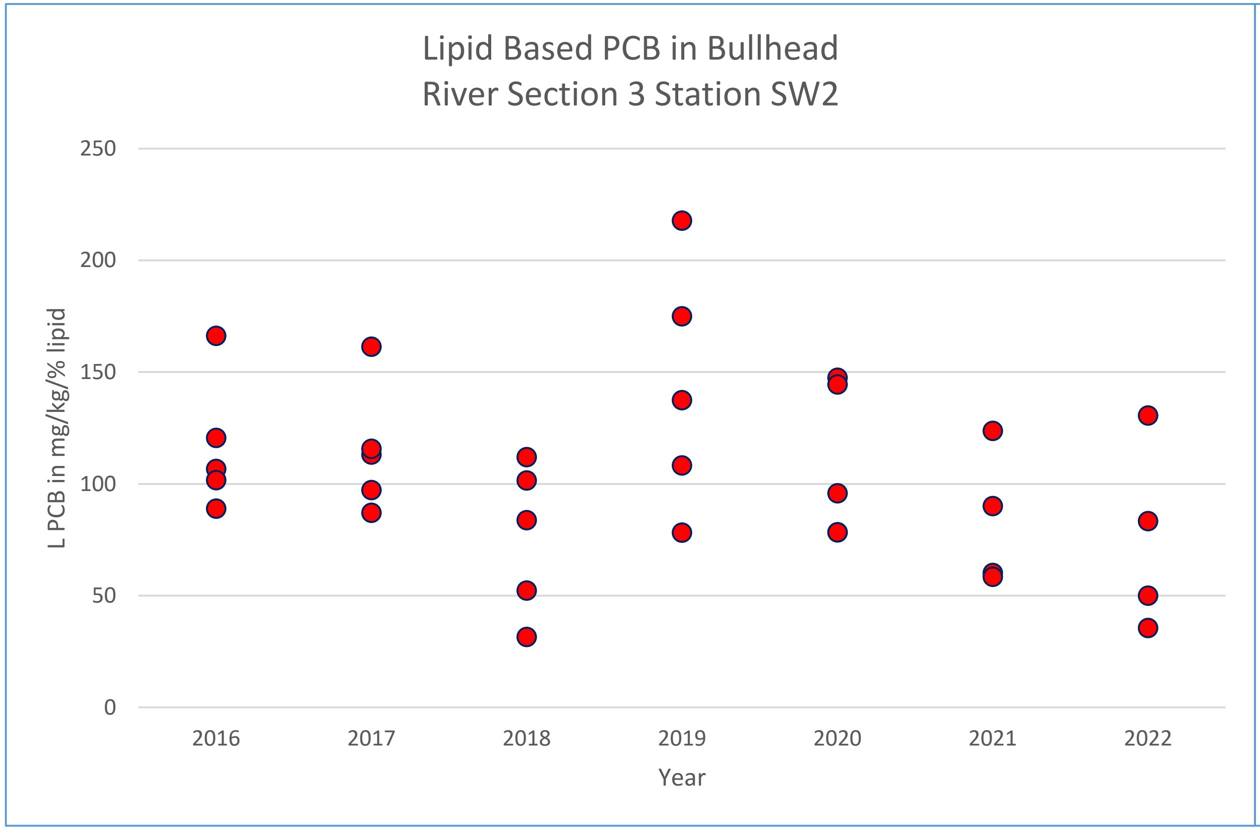
SW2 Bullhead Data

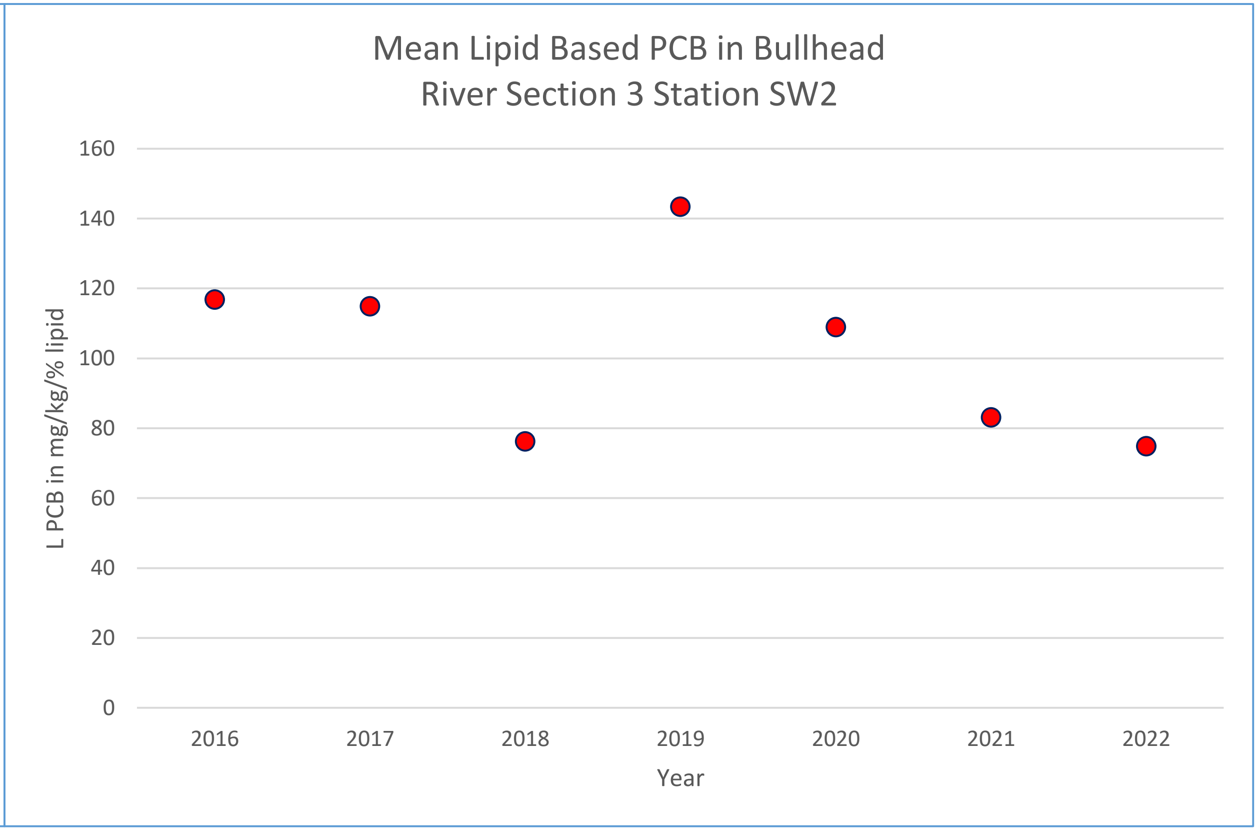
SW2 Bullhead Total PCB



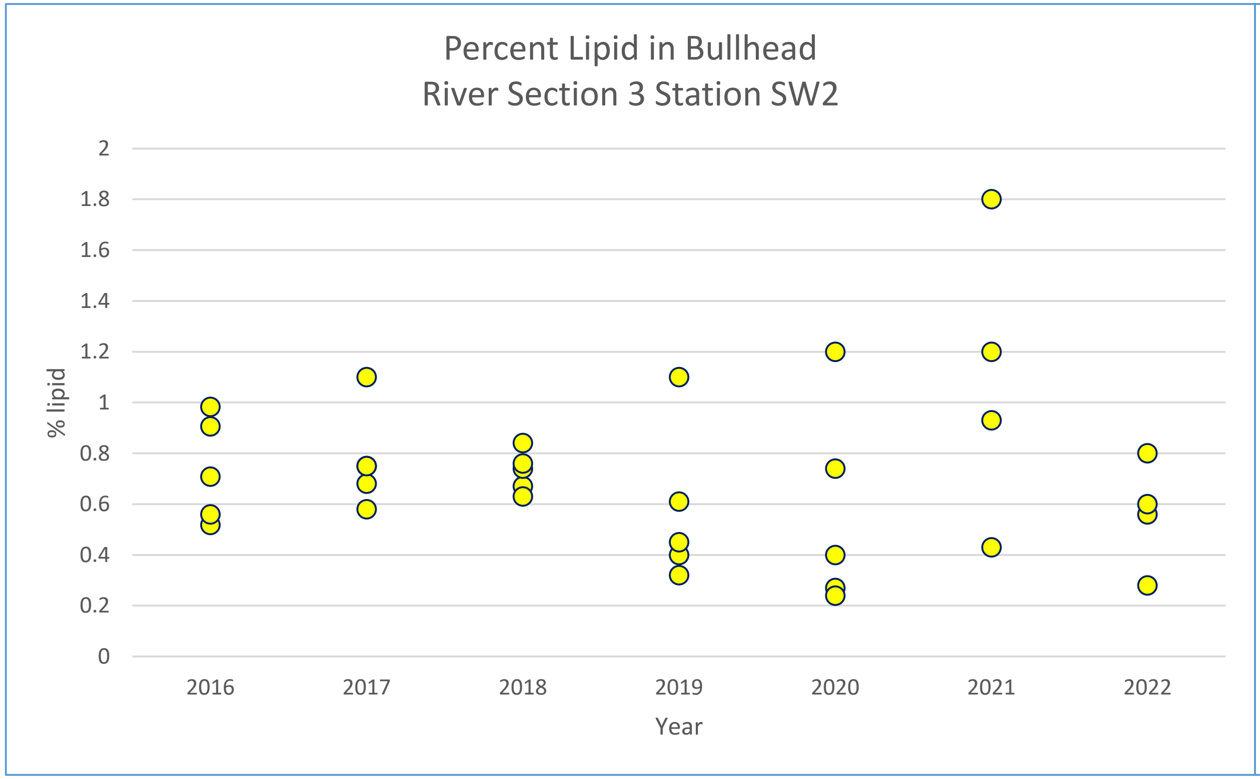


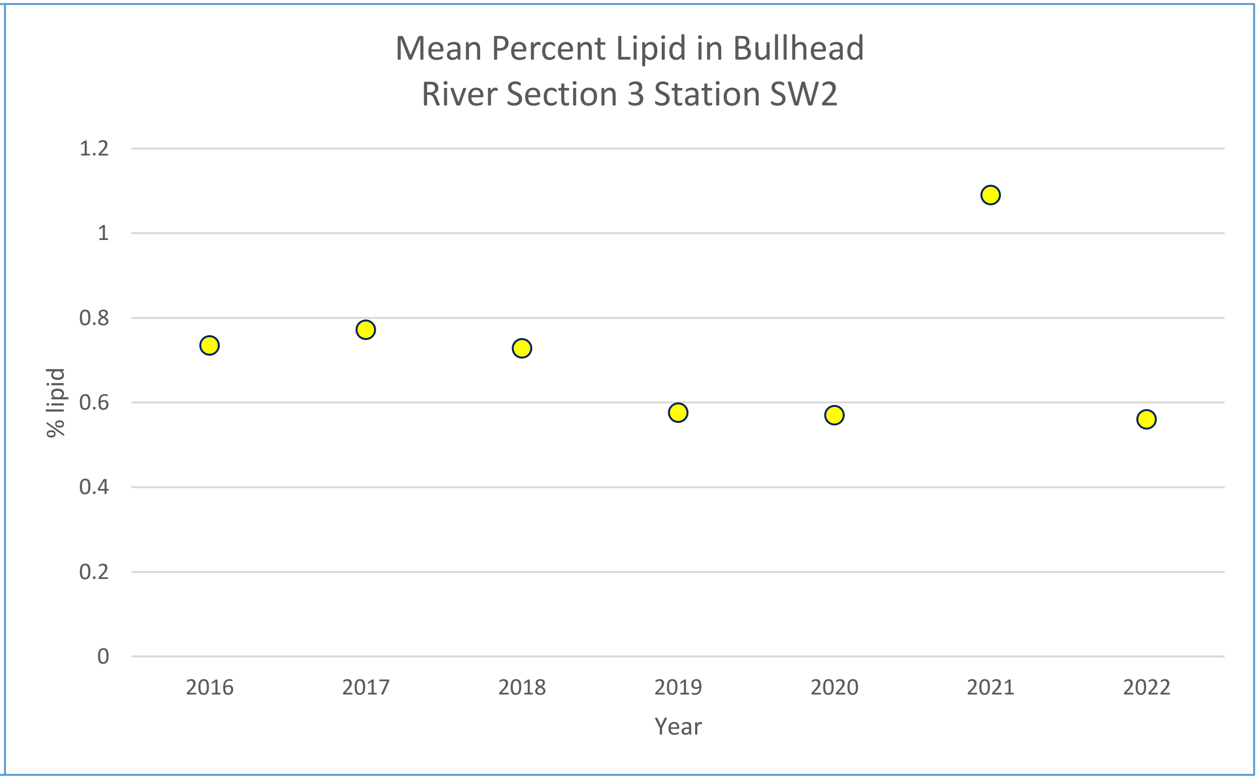
SW2 Bullhead Lipid Based PCB



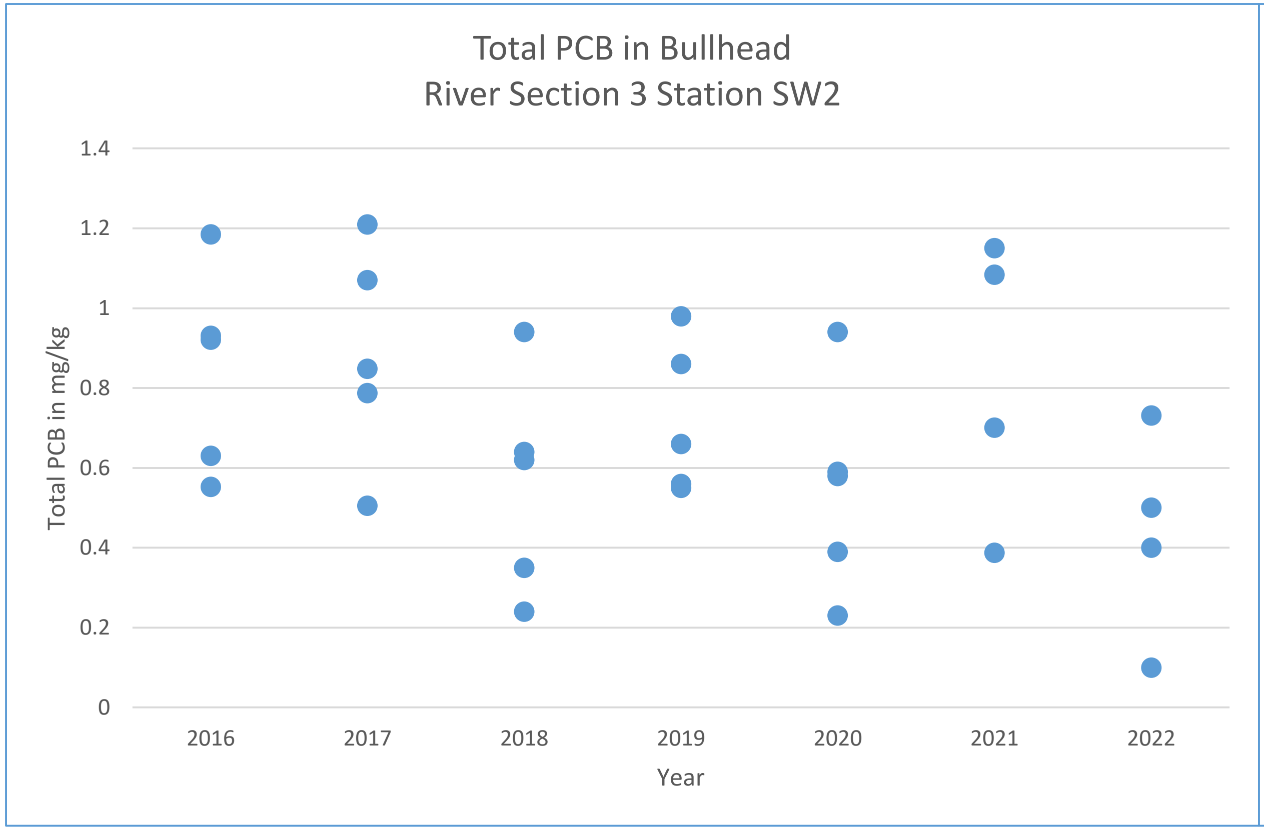


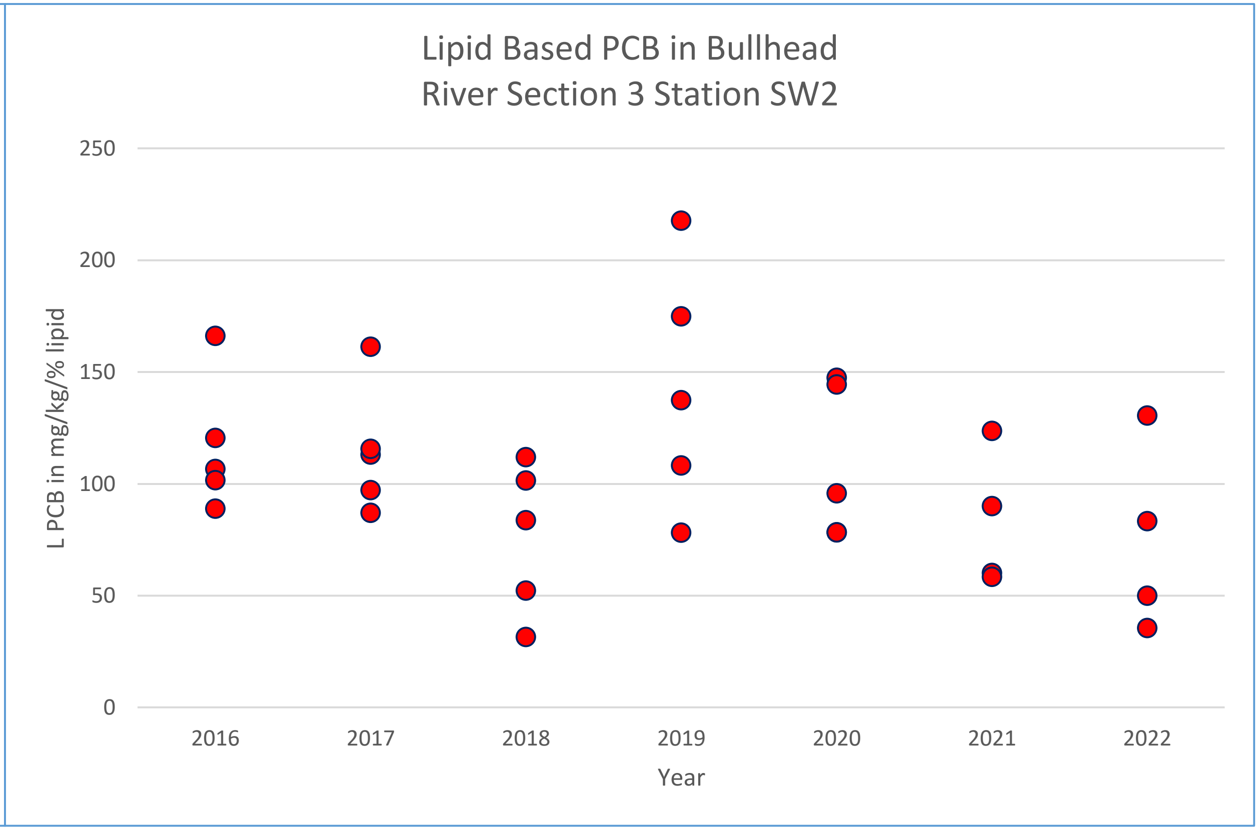
SW2 Bullhead Percent Lipid



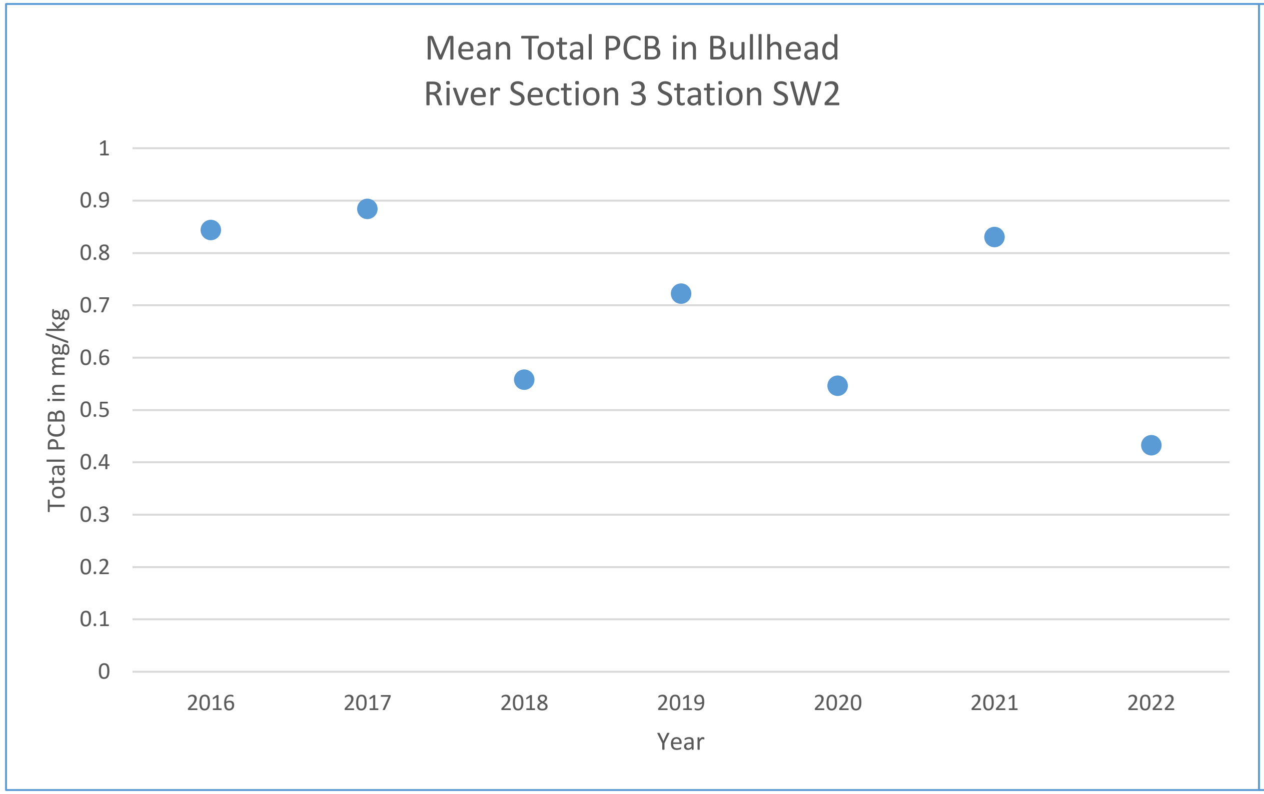


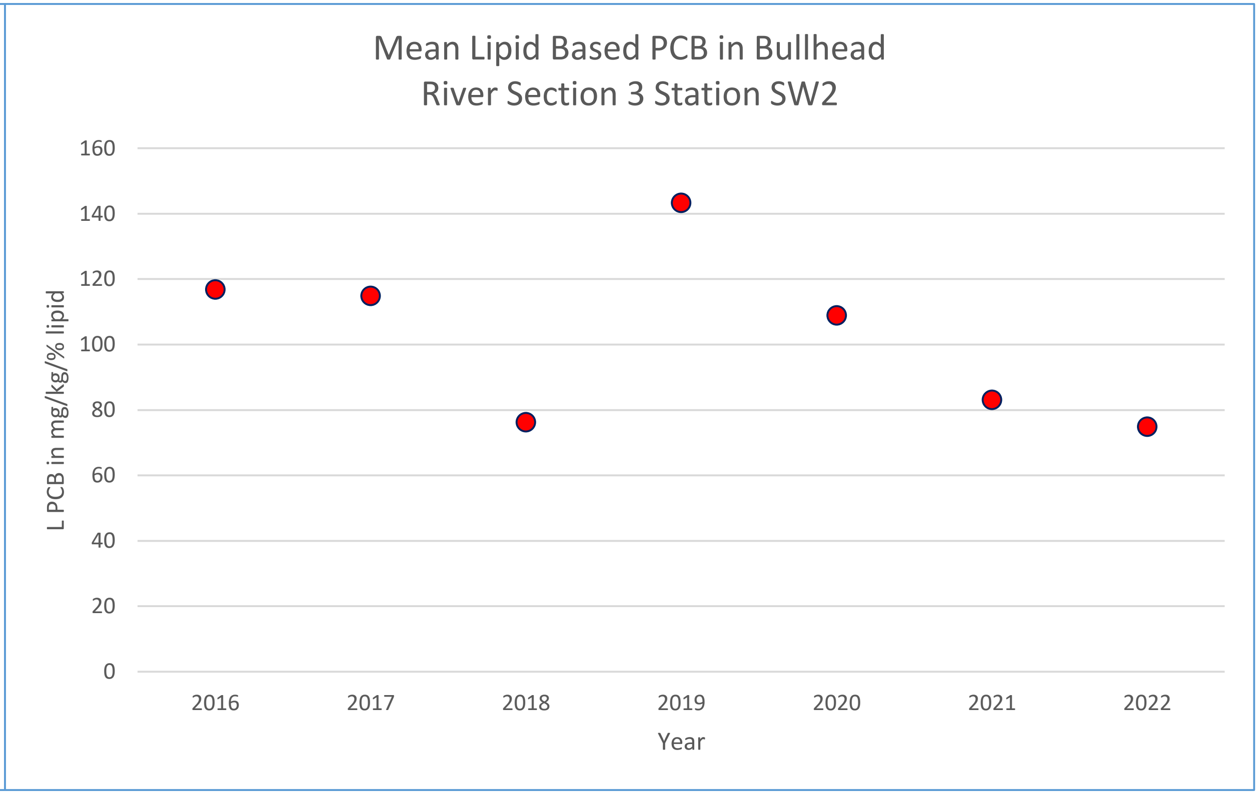
SW2 Bullhead Total PCB and Lipid Based PCB





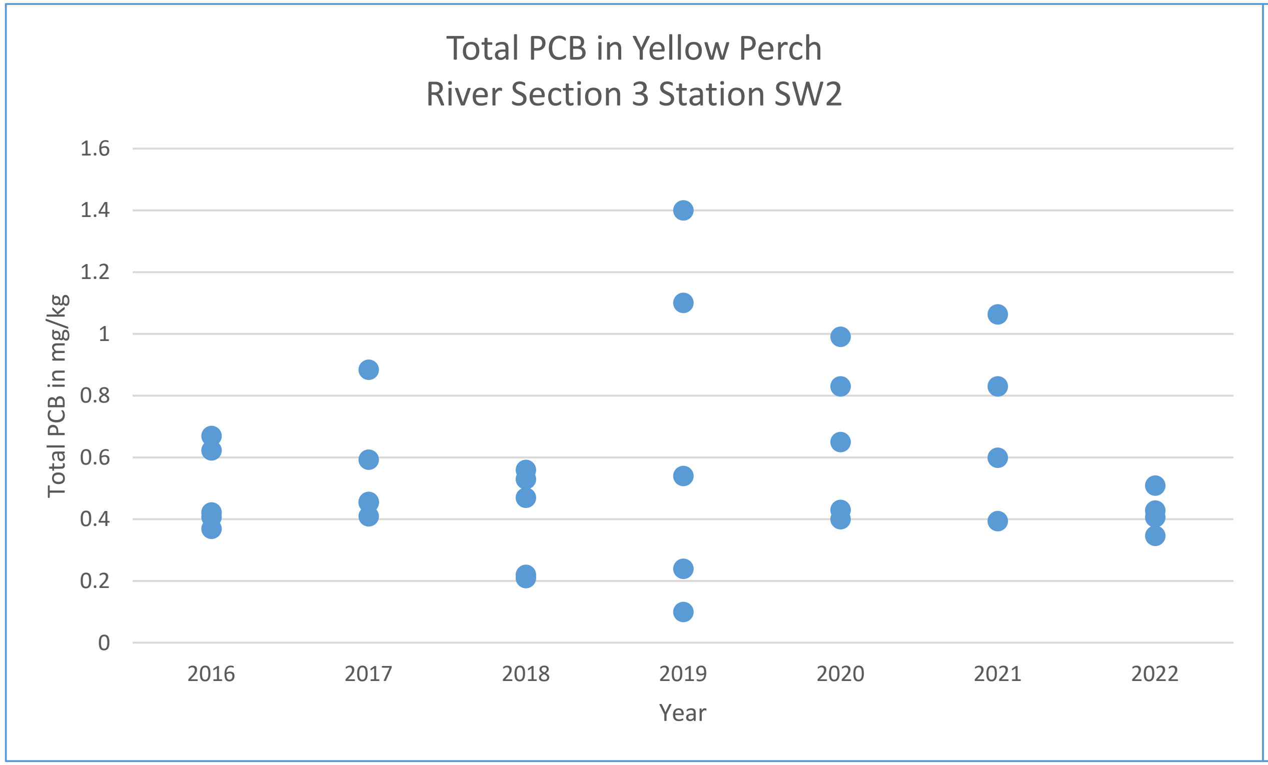
SW2 Bullhead Mean Total PCB and Mean Lipid Based PCB

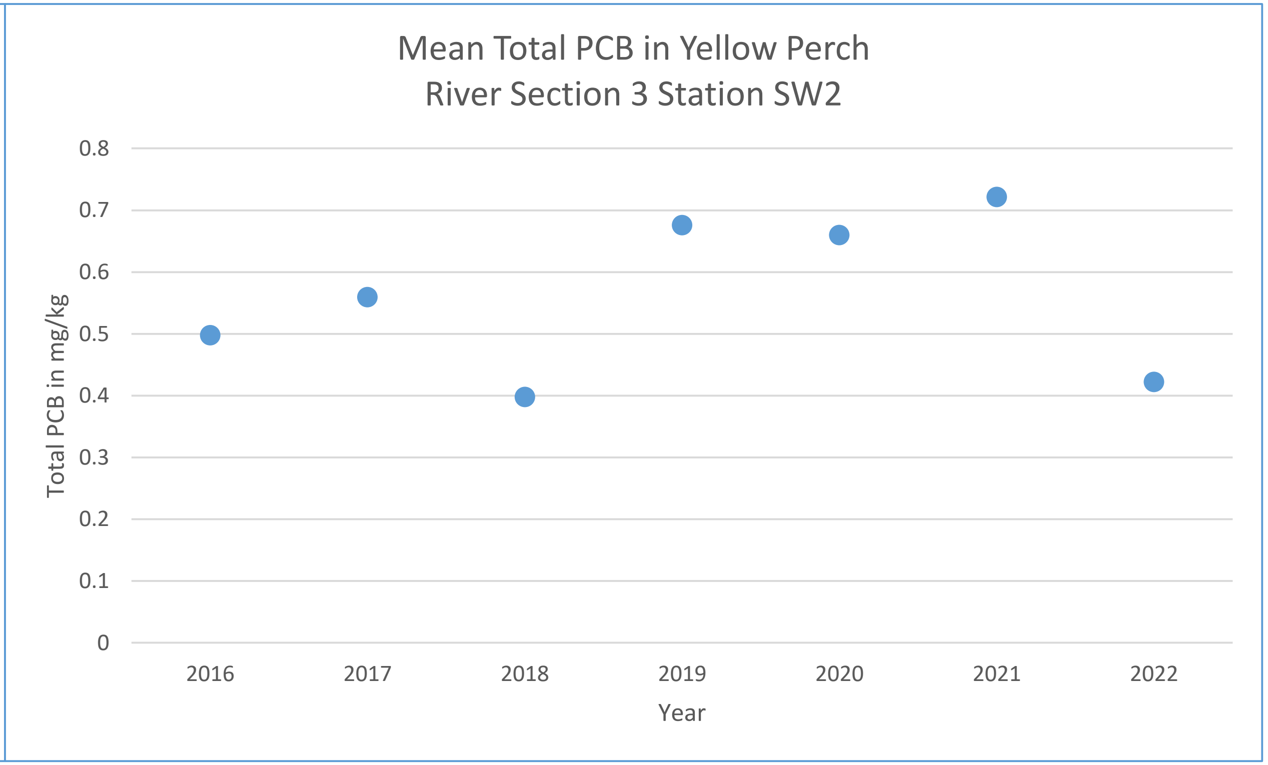




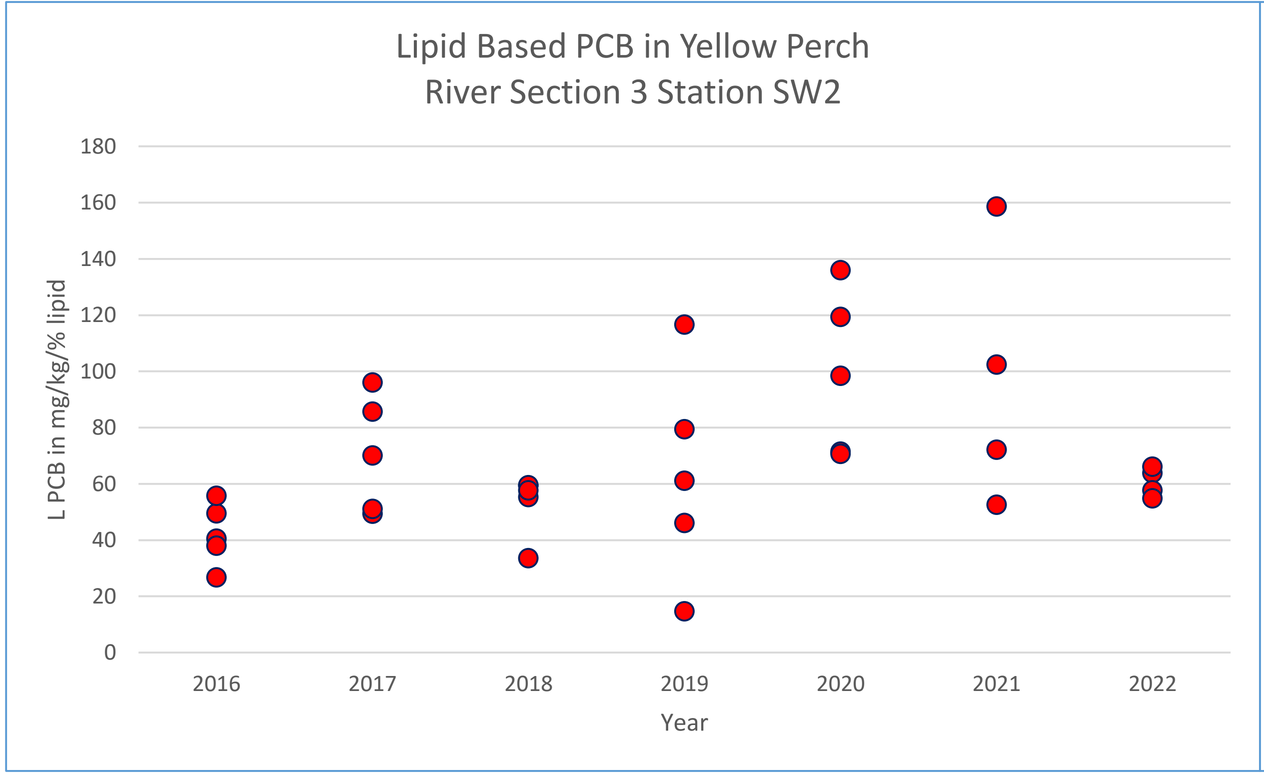
SW2 Yellow Perch Data

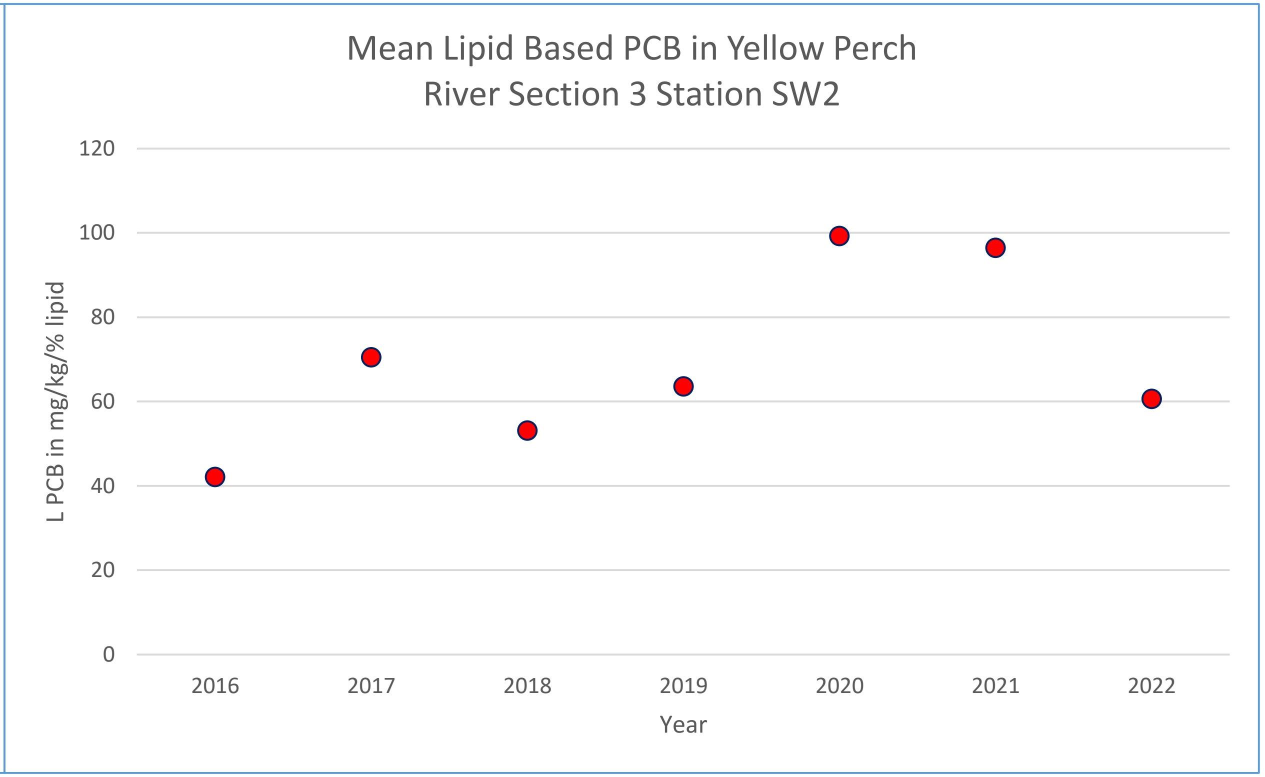
SW2 Yellow Perch Total PCB



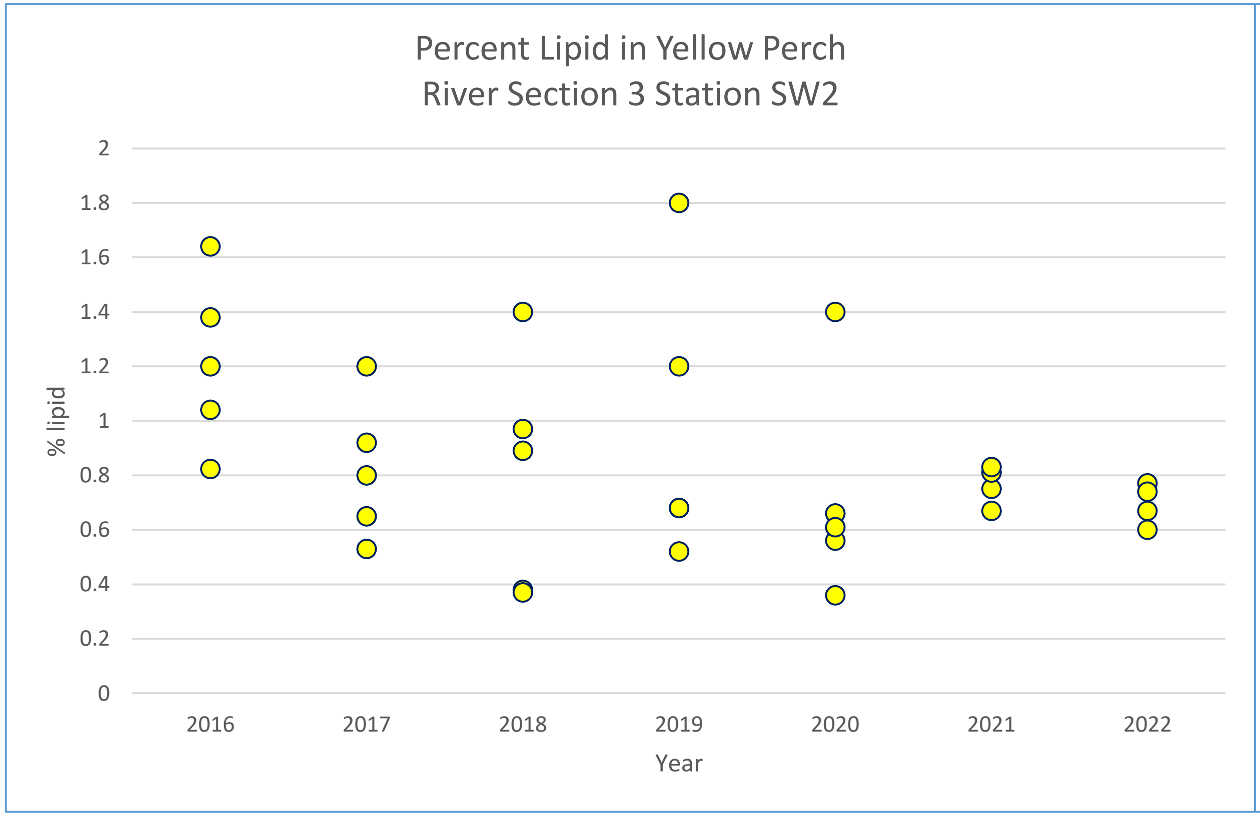


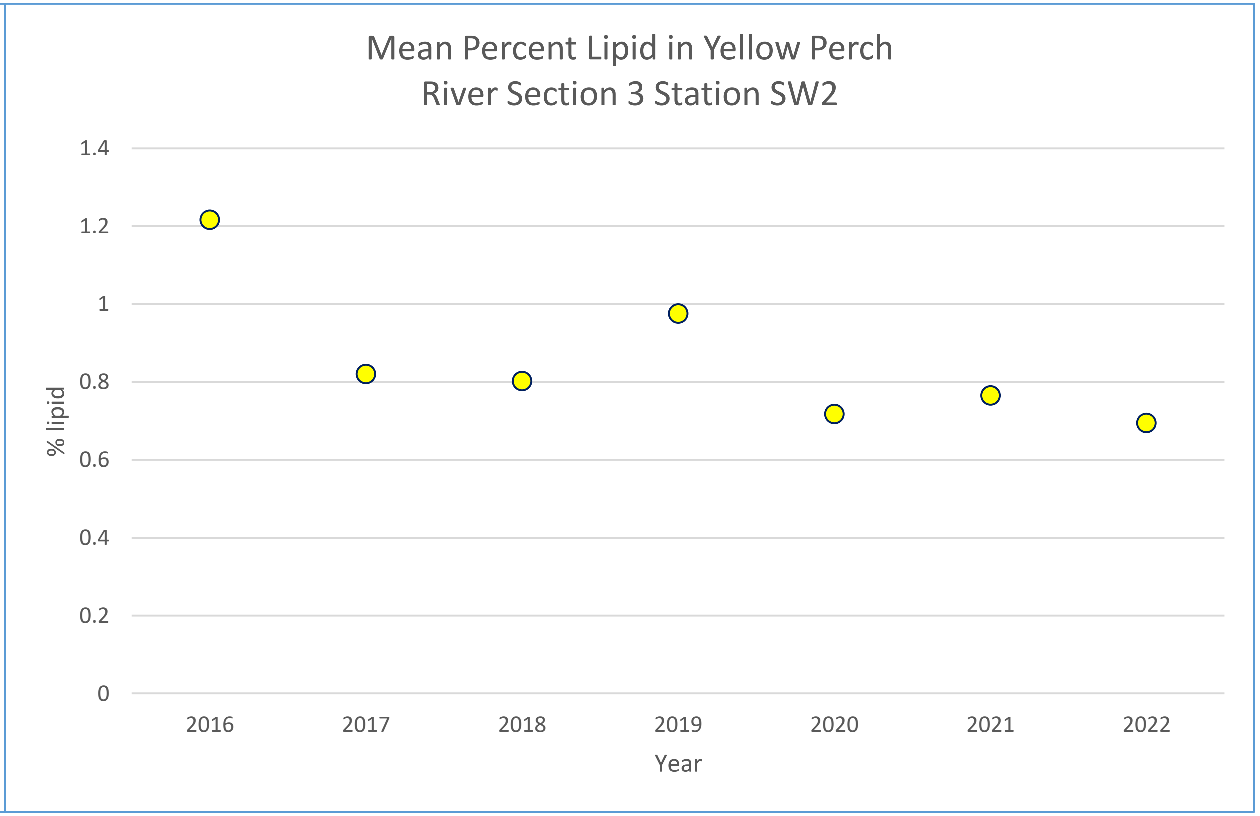
SW2 Yellow Perch Lipid Based PCB



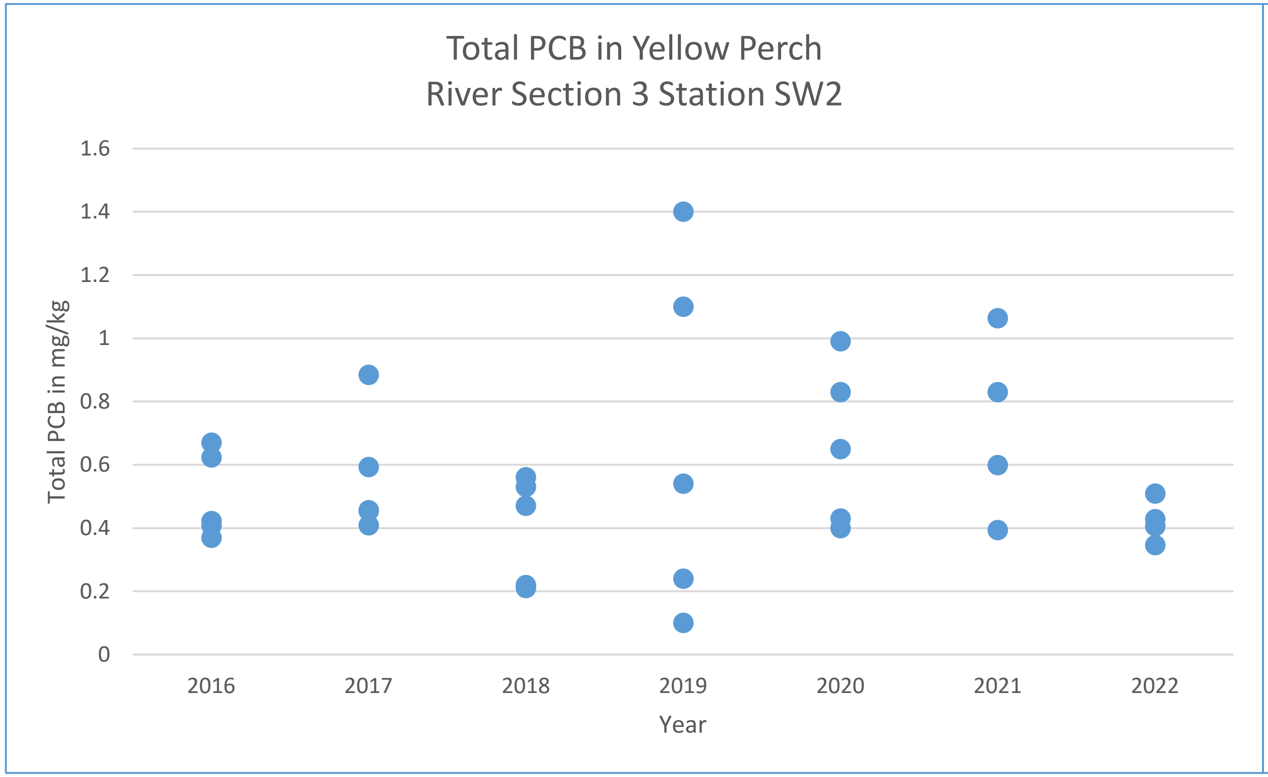


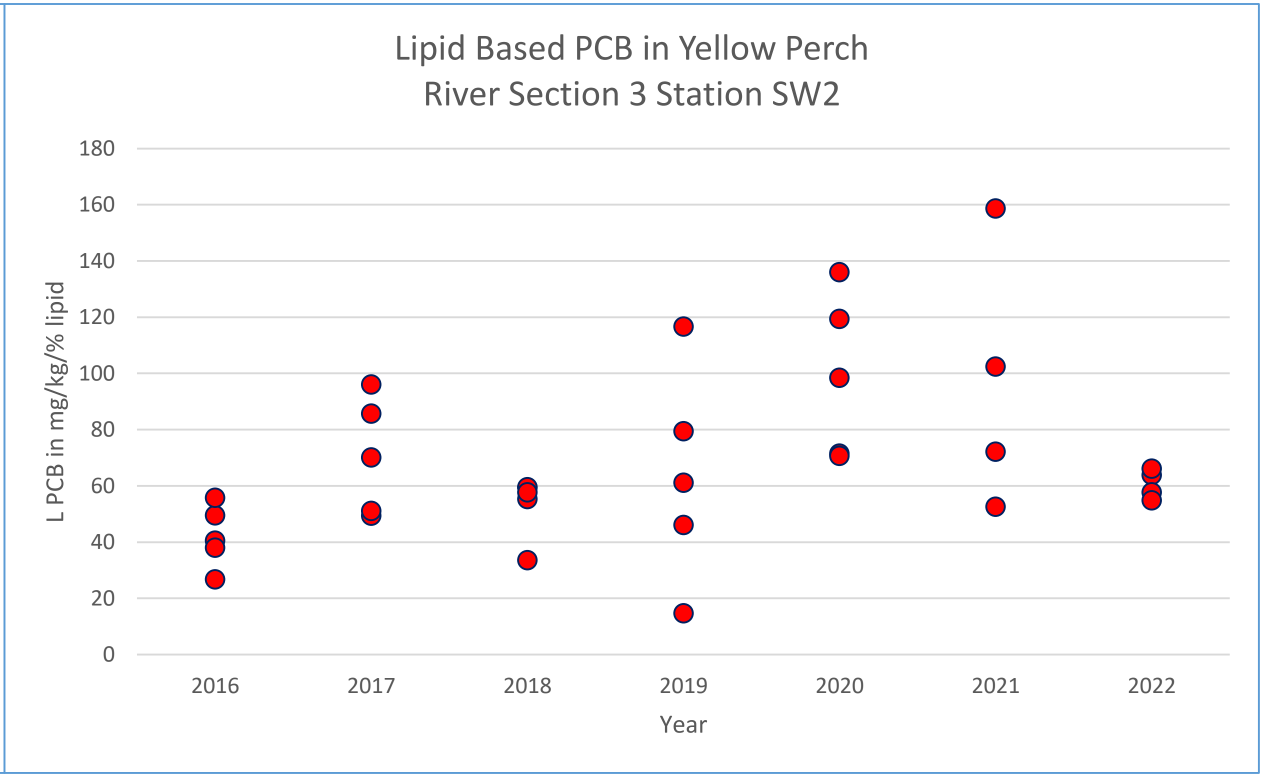
SW2 Yellow Perch Percent Lipid



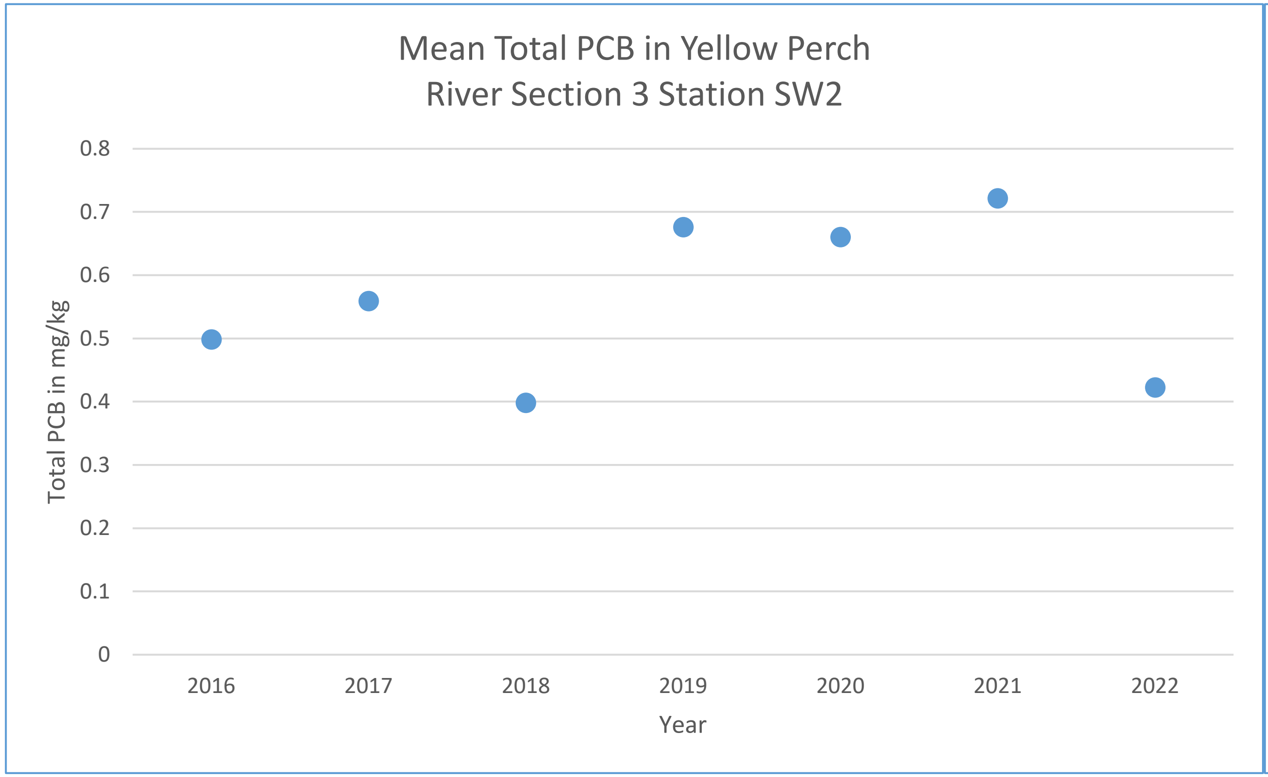


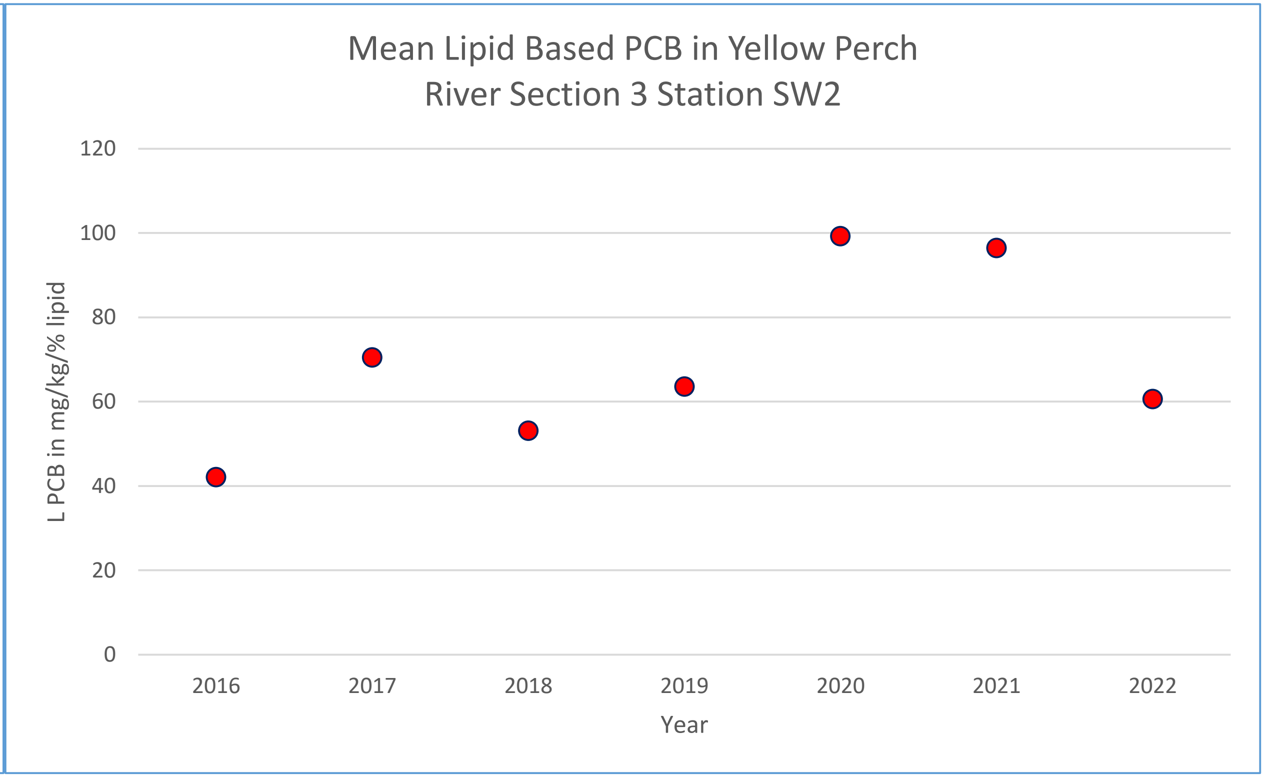
SW2 Yellow Perch Total PCB and Lipid Based PCB





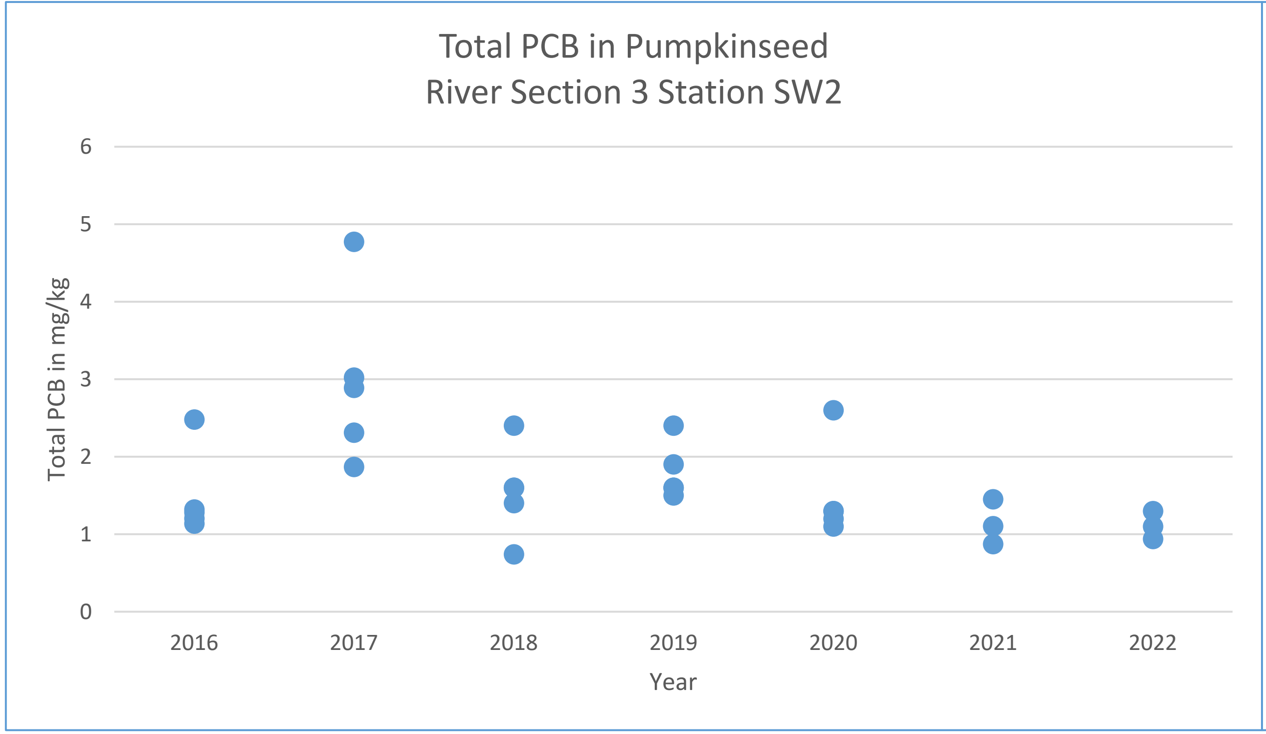
SW2 Yellow Perch Mean Total PCB and Mean Lipid Based PCB

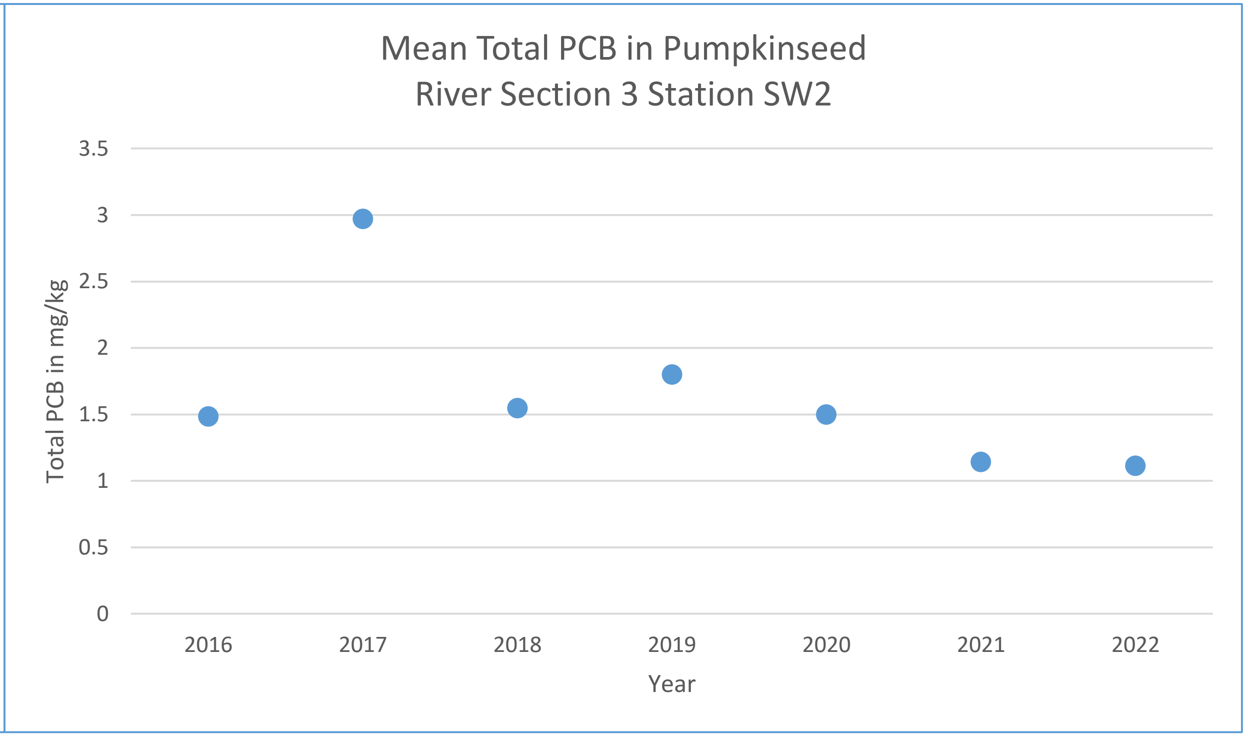




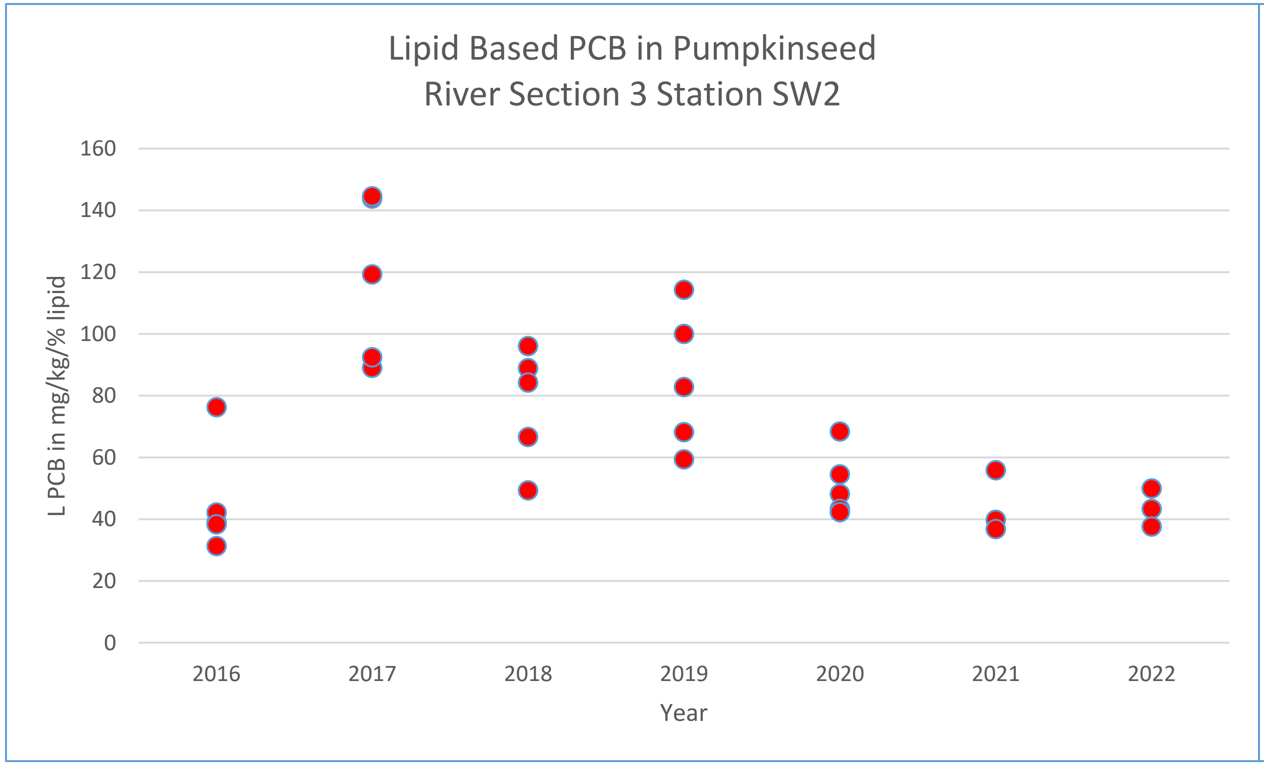
SW2 Pumpkinseed Data

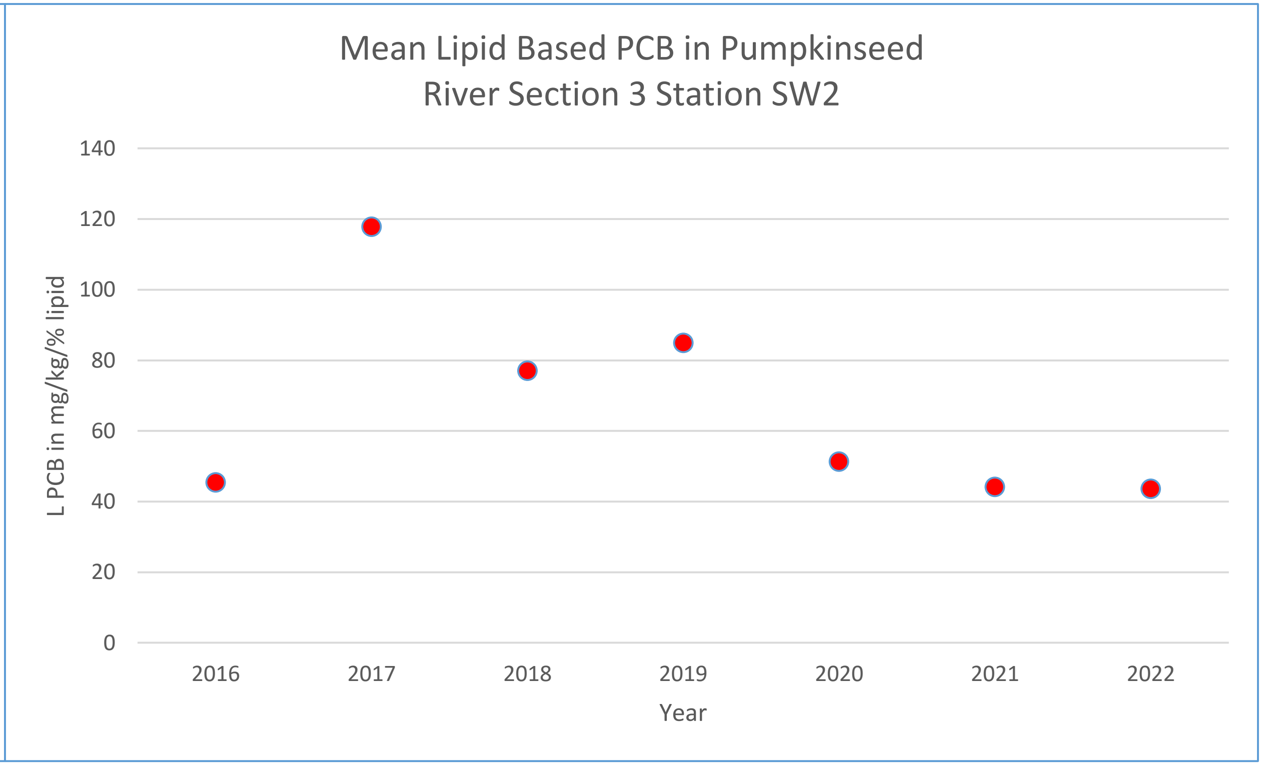
SW2 Pumpkinseed Total PCB



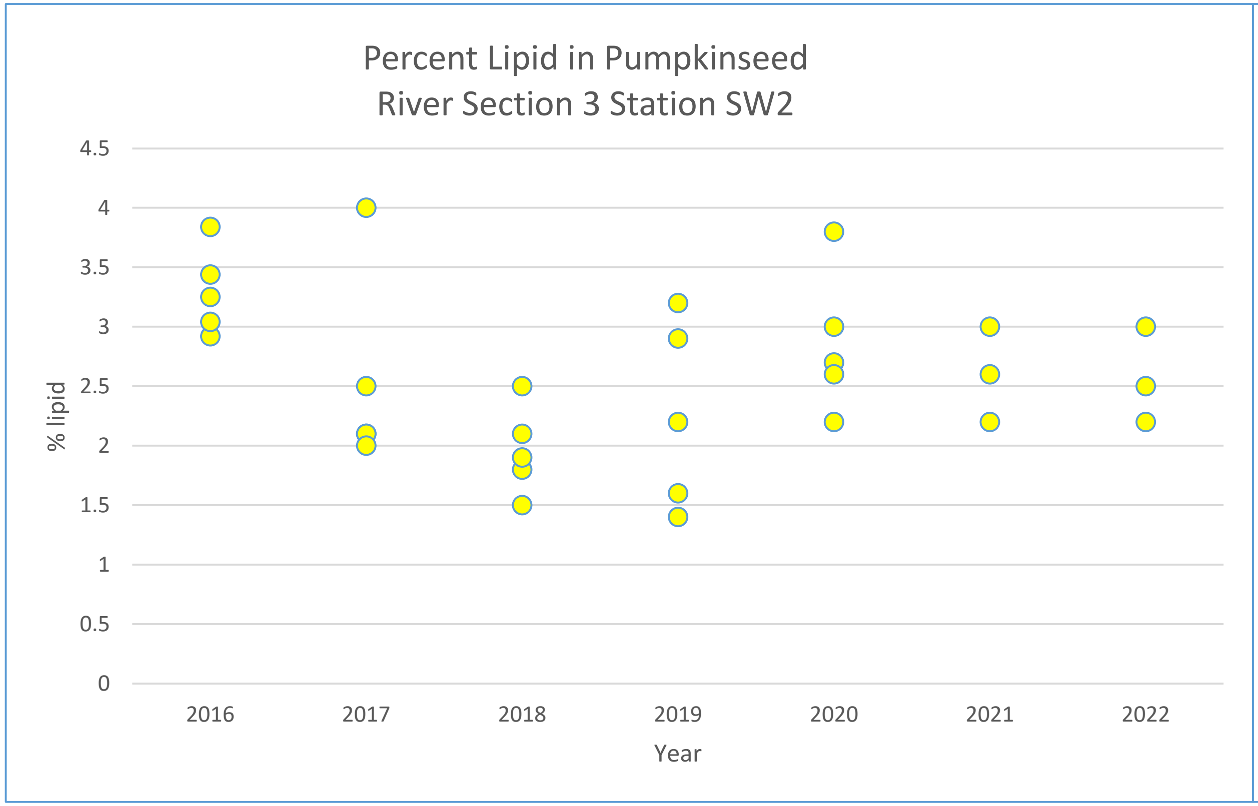


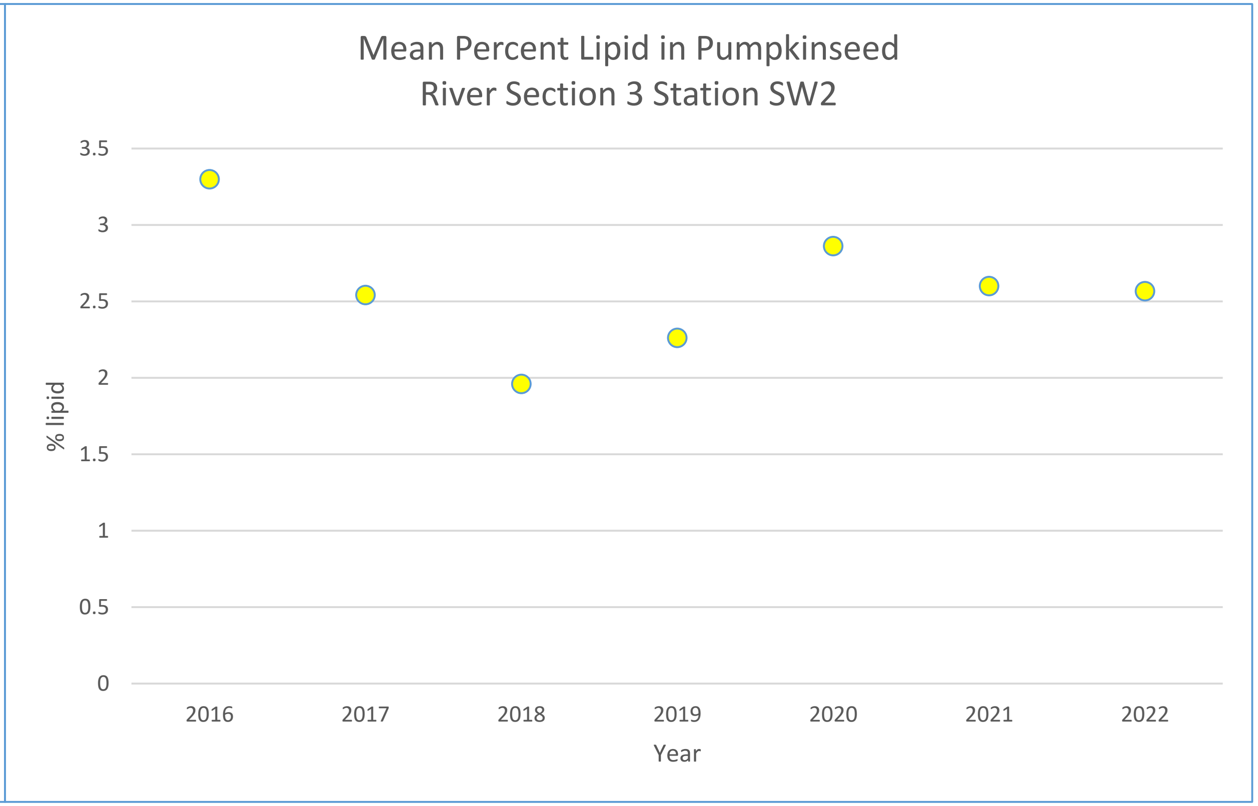
SW2 Pumpkinseed Lipid Based PCB



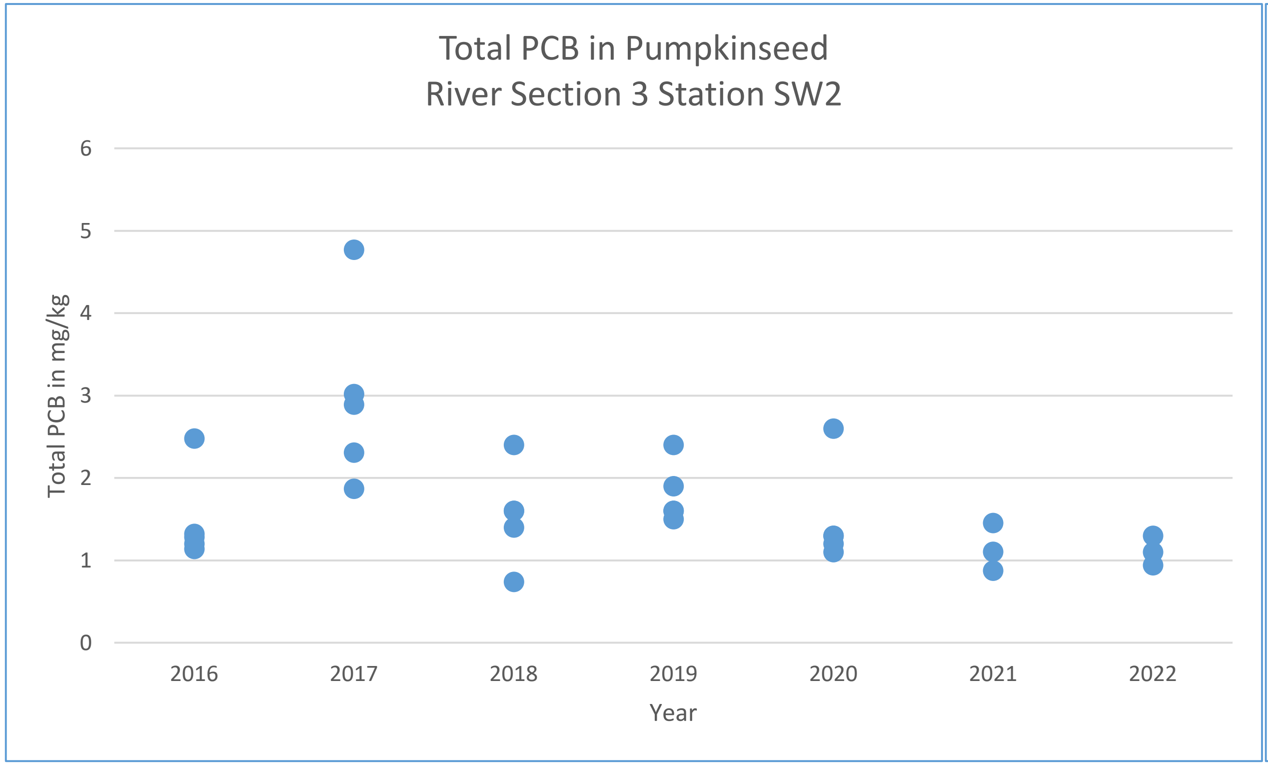


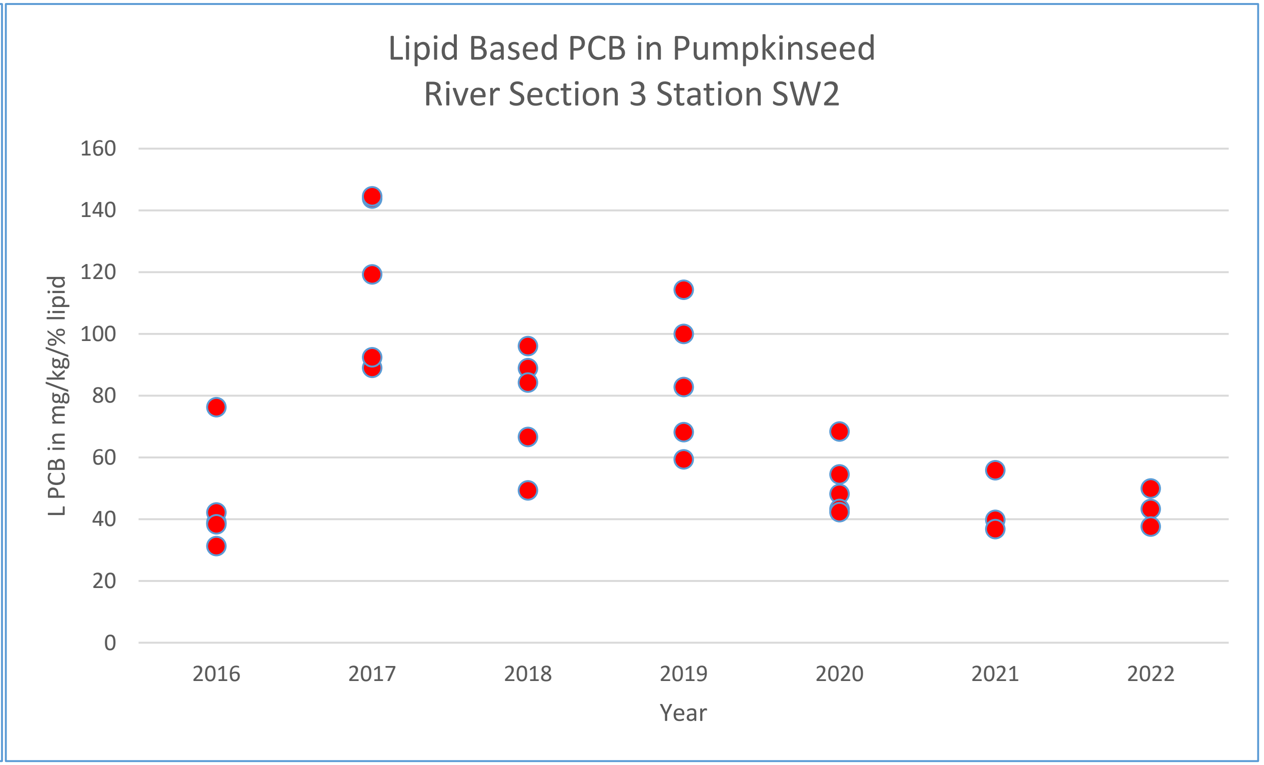
SW2 Pumpkinseed Percent Lipid



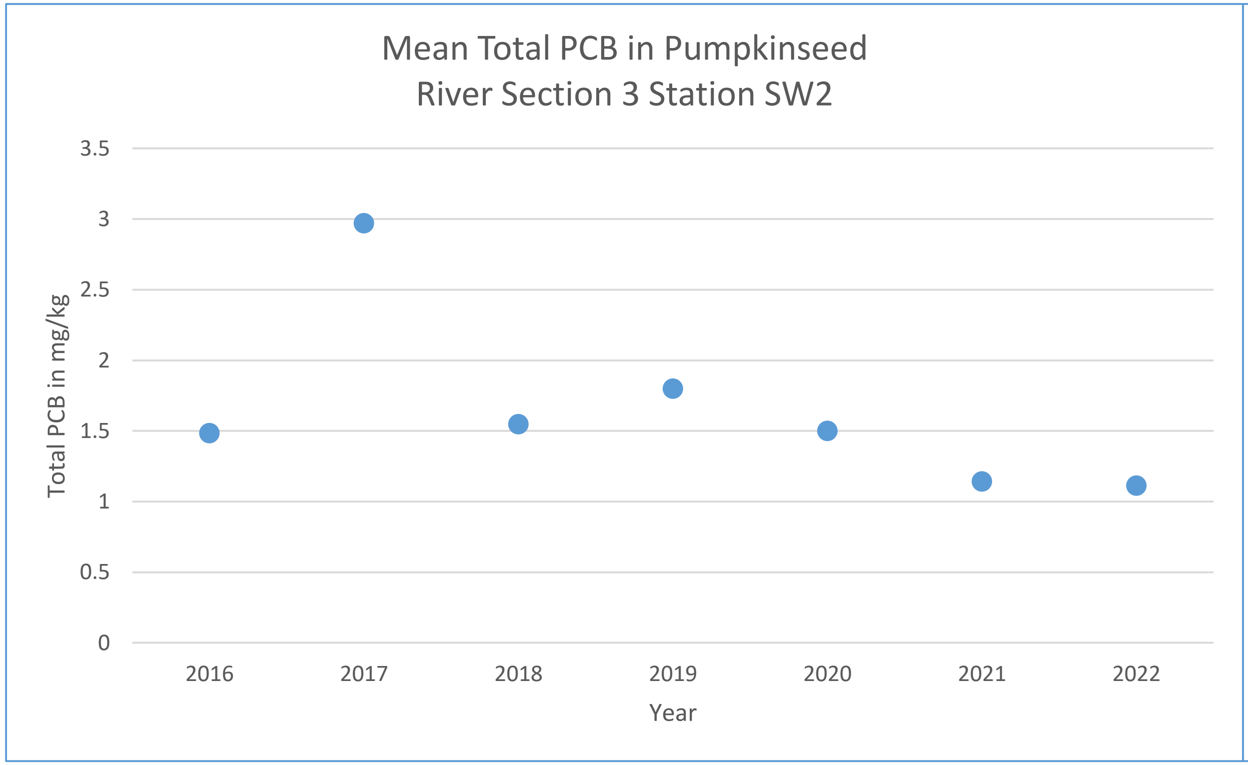


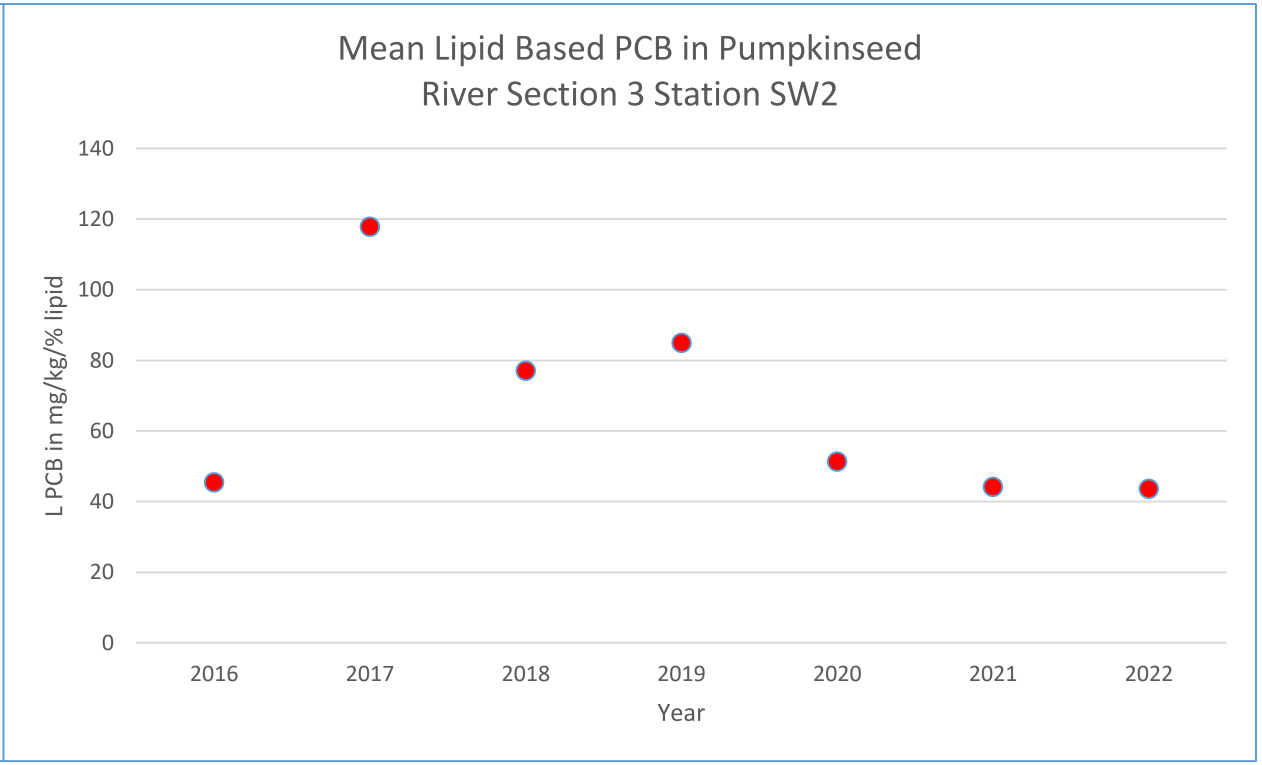
SW2 Pumpkinseed Total PCB and Lipid Based PCB





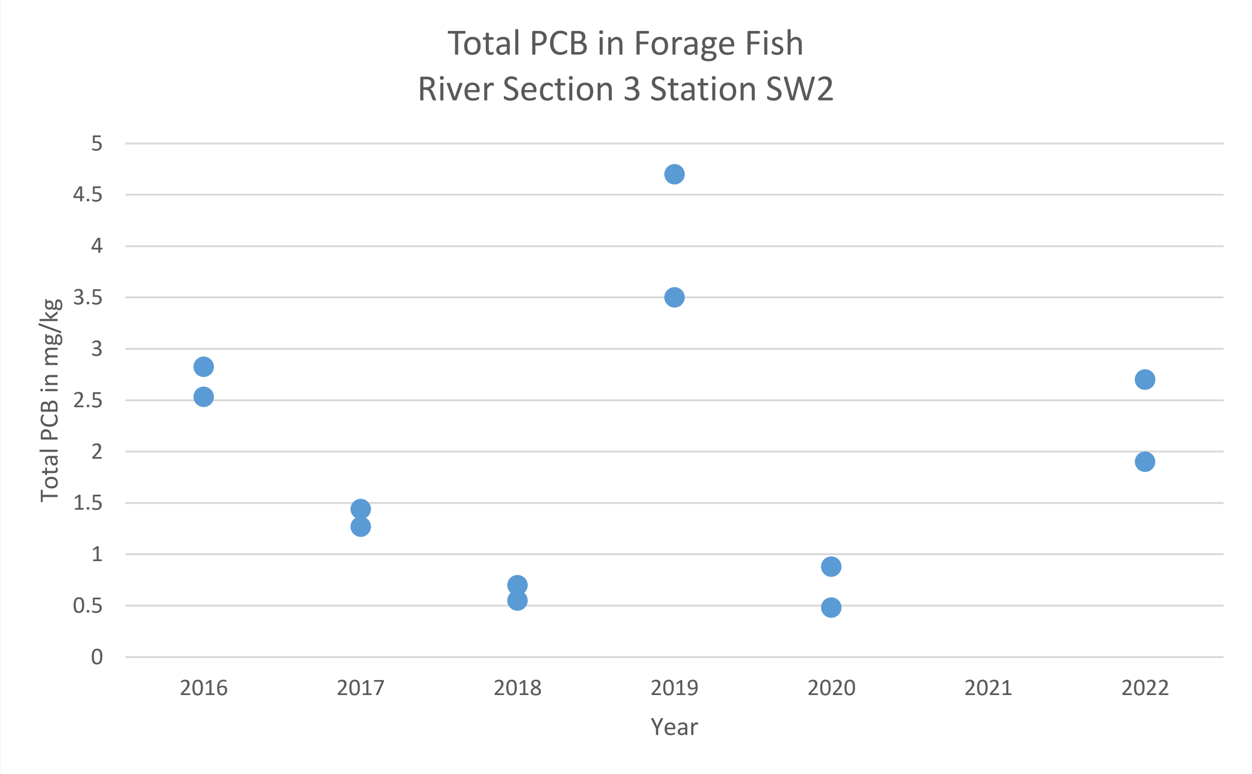
SW2 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

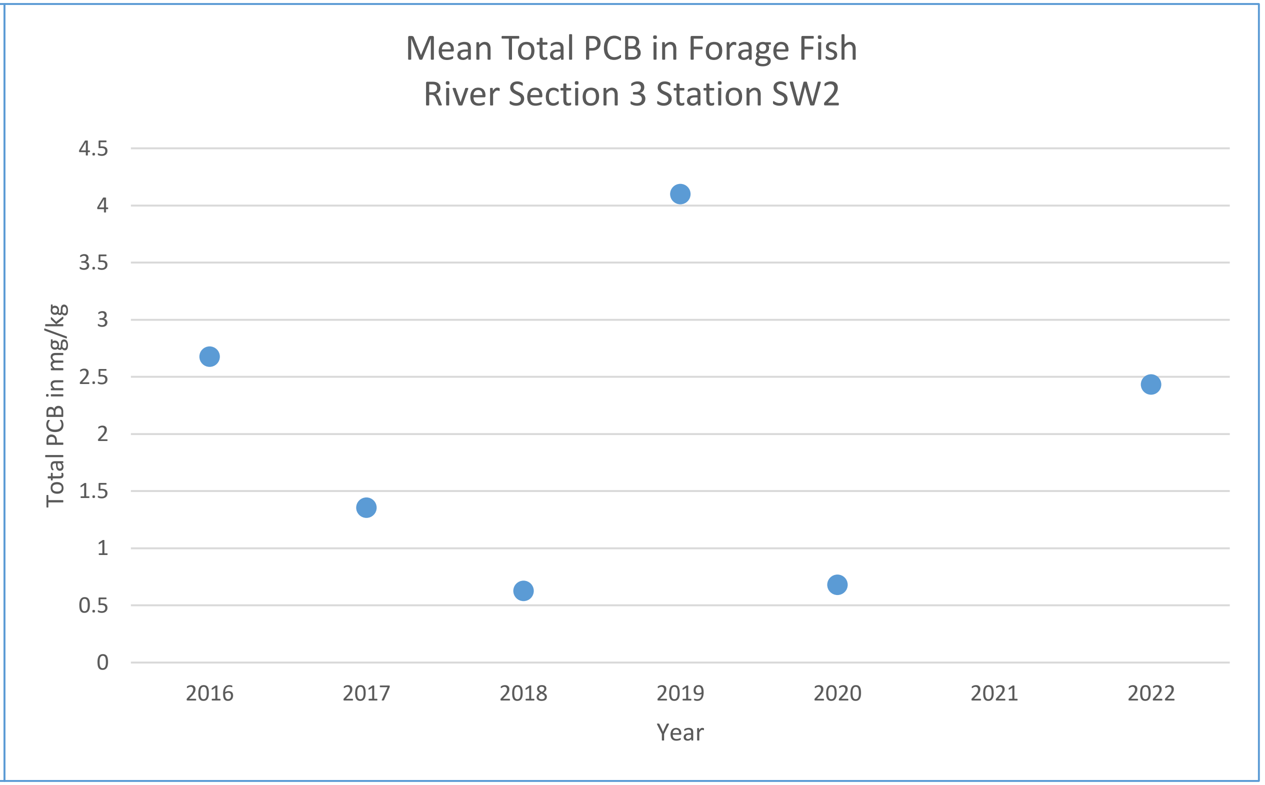




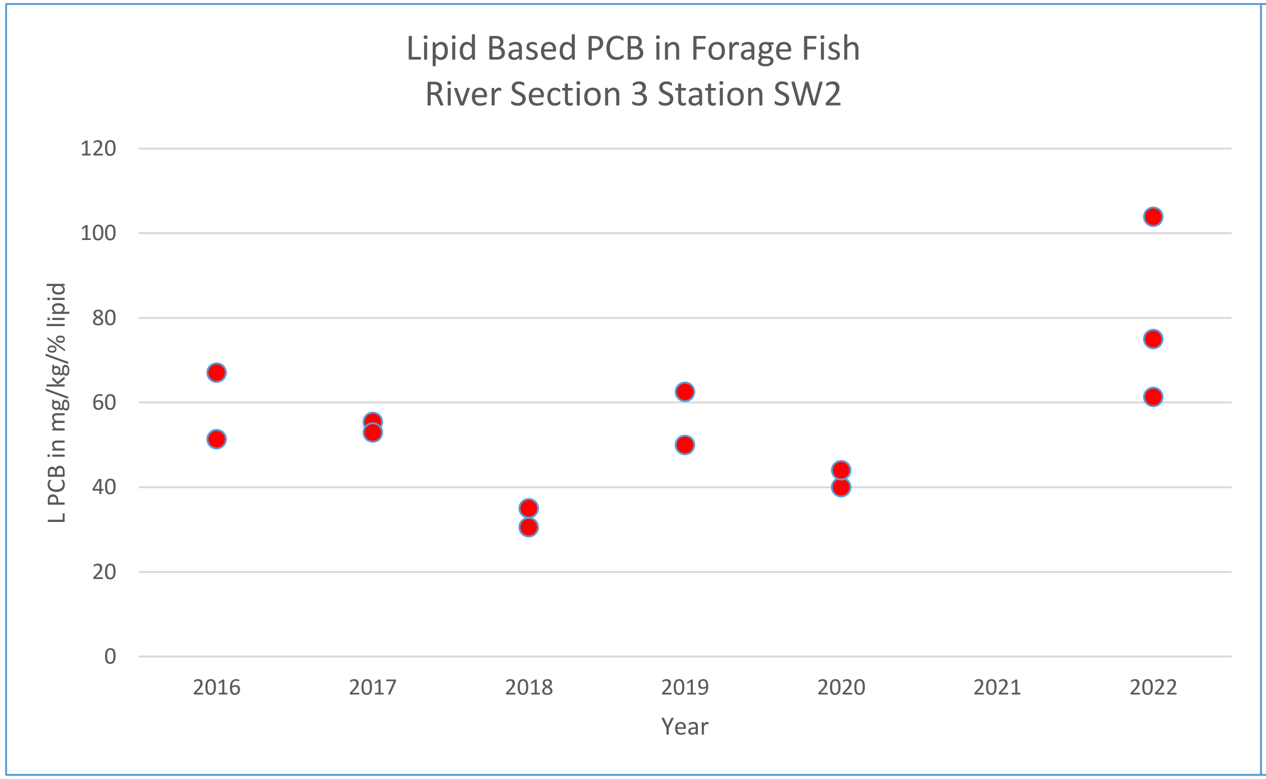
SW2 Forage Fish Data

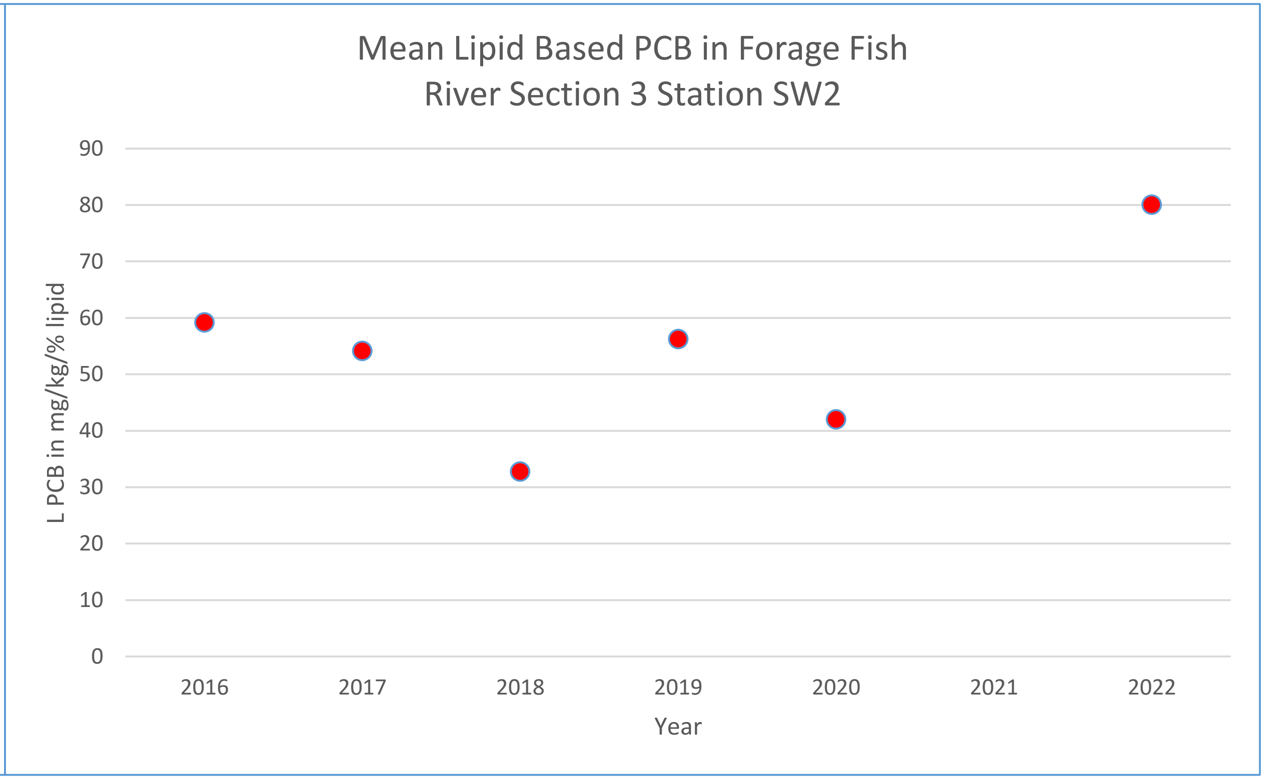
SW2 Forage Fish Total PCB



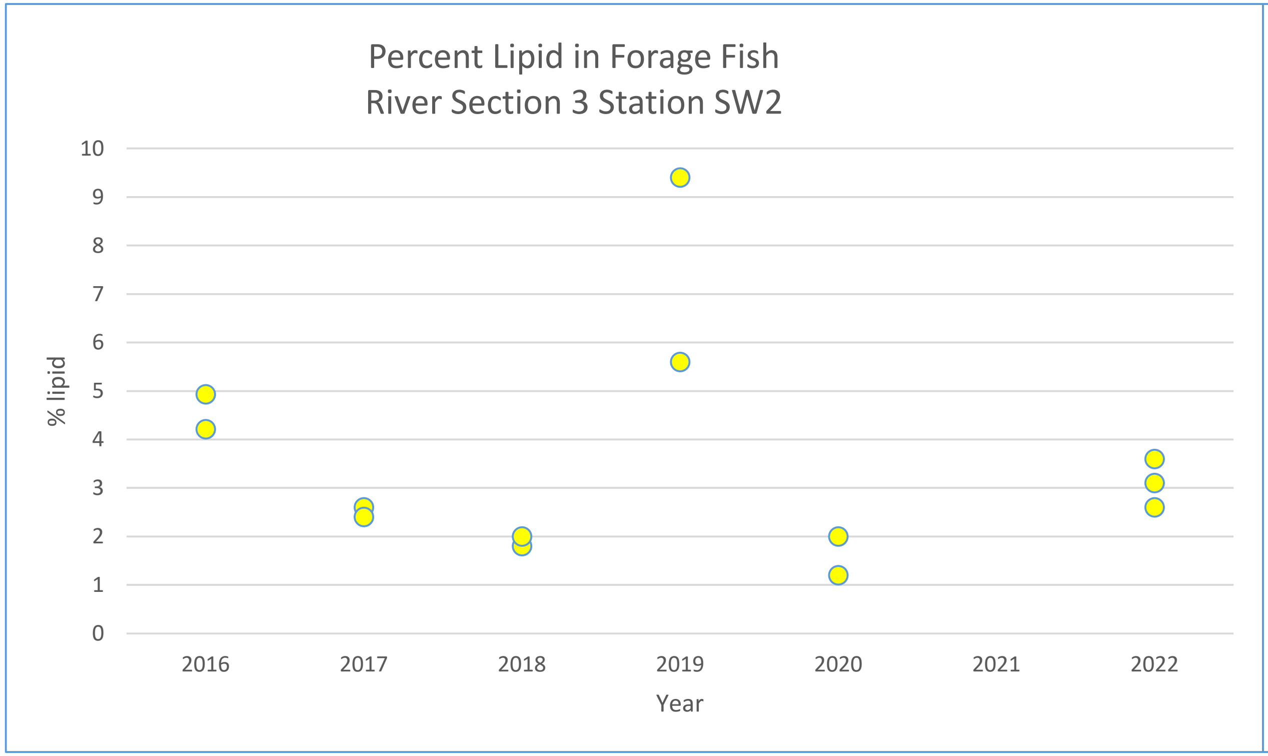


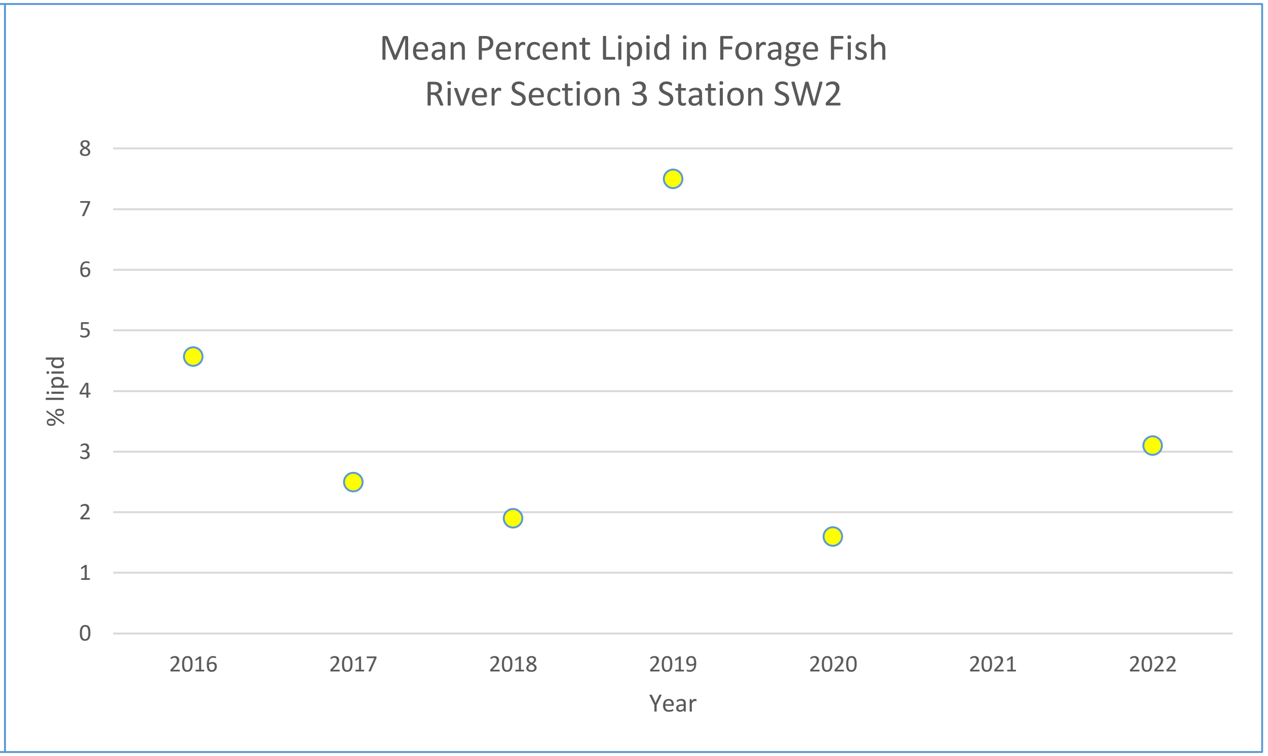
SW2 Forage Fish Lipid Based PCB



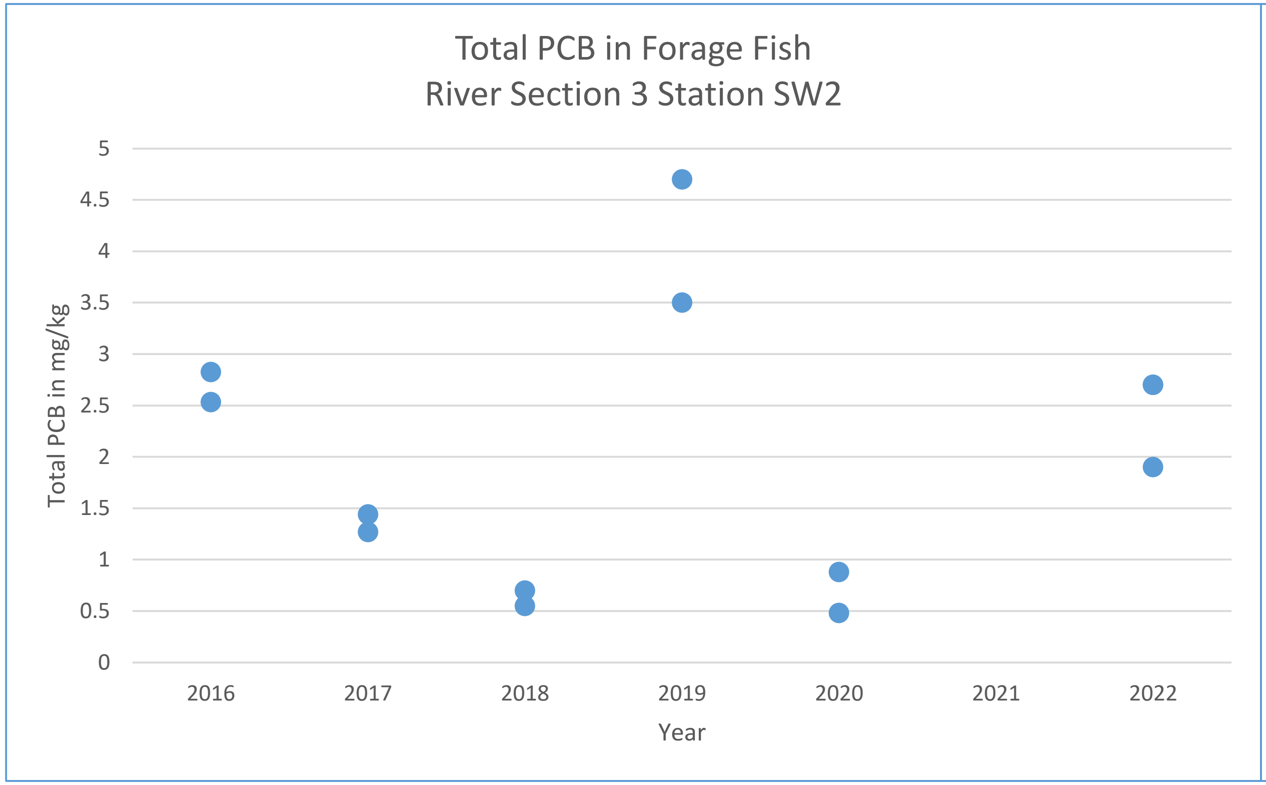


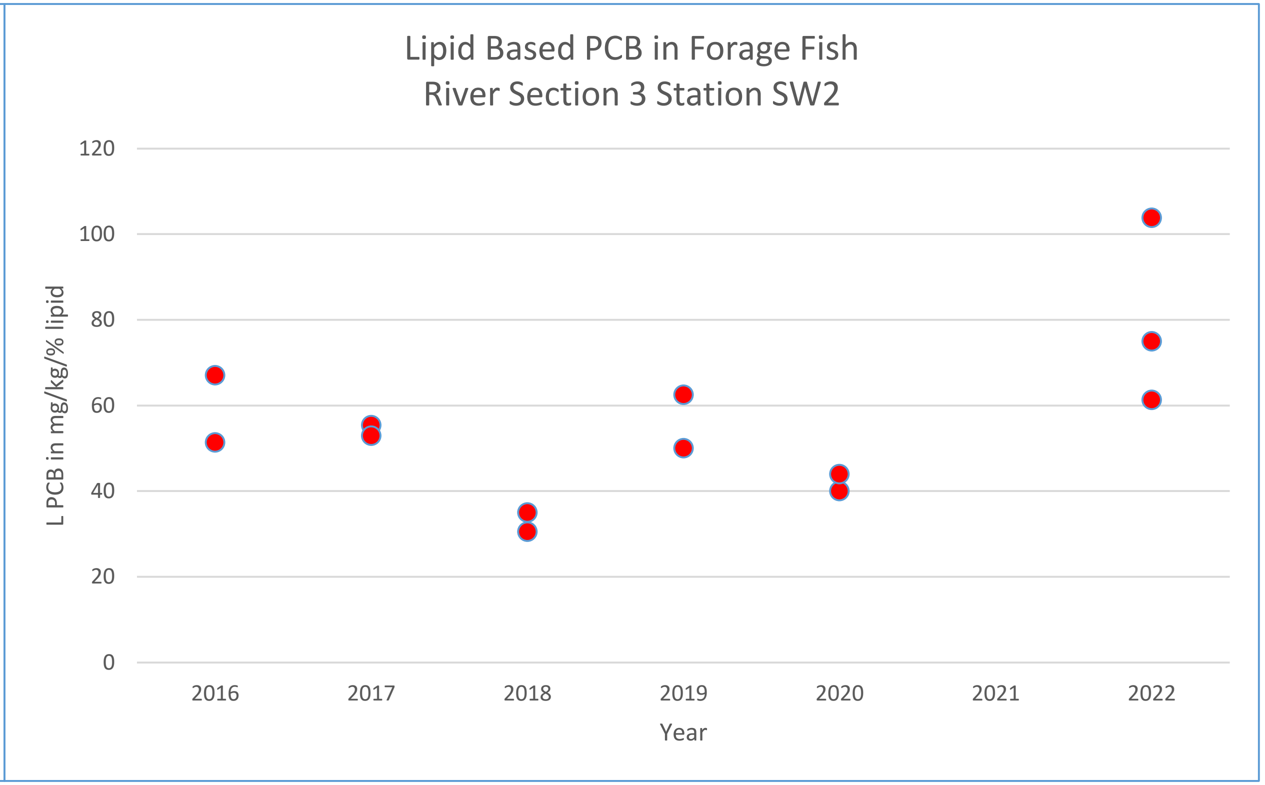
SW2 Forage Fish Percent Lipid



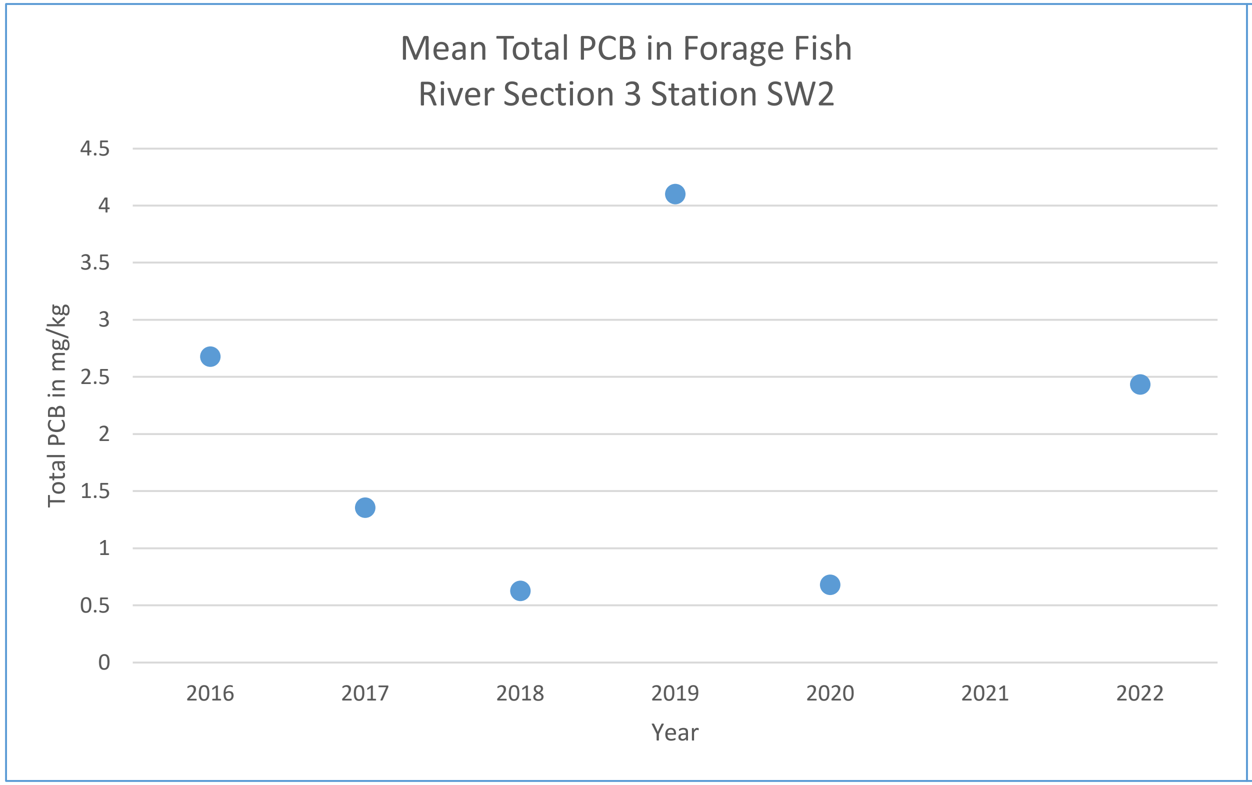


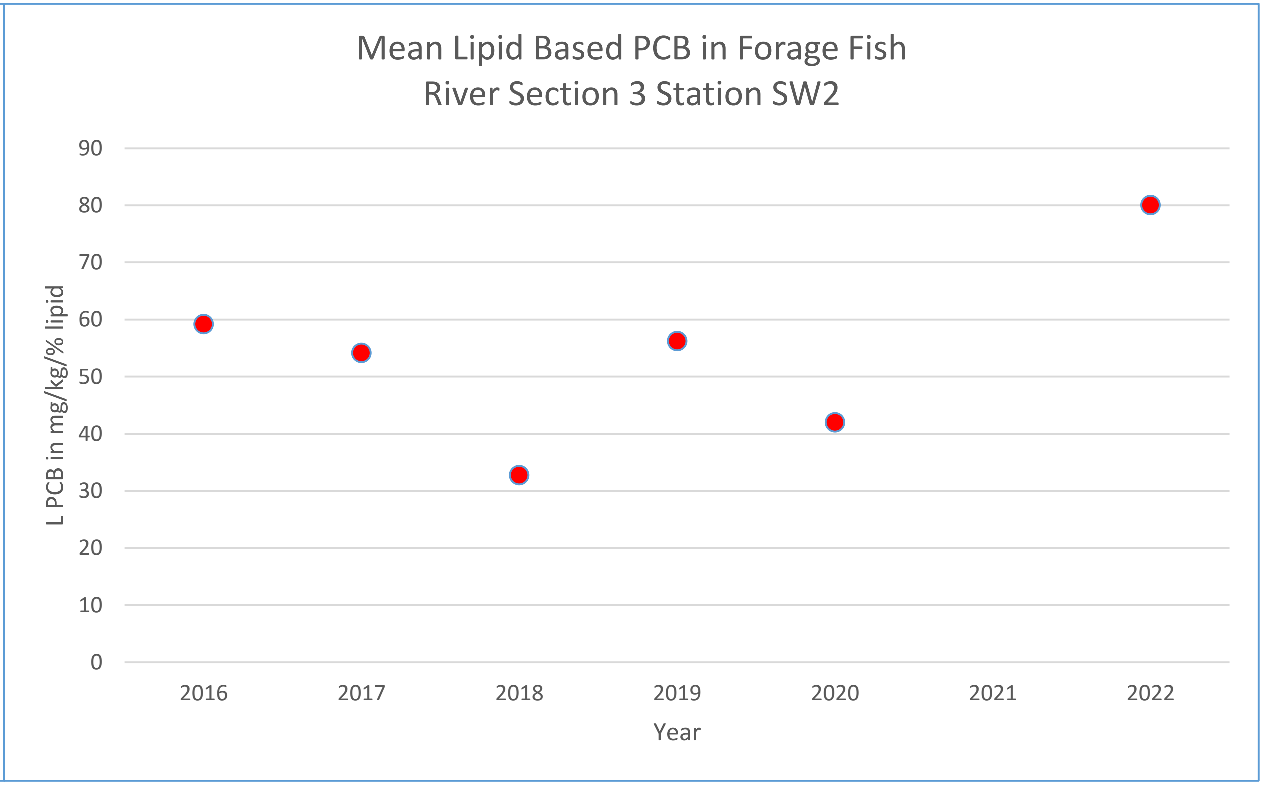
SW2 Forage Fish Total PCB and Lipid Based PCB





SW2 Forage Fish Mean Total PCB and Mean Lipid Based PCB



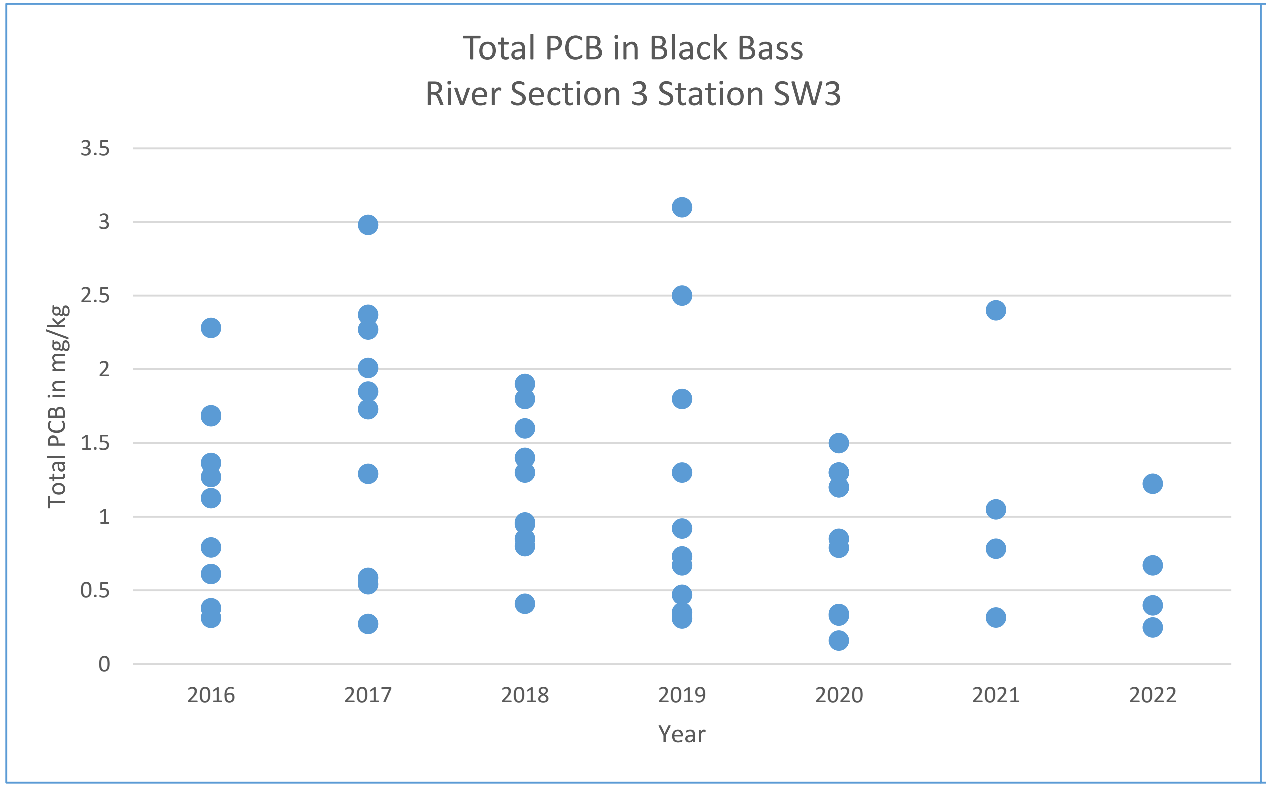


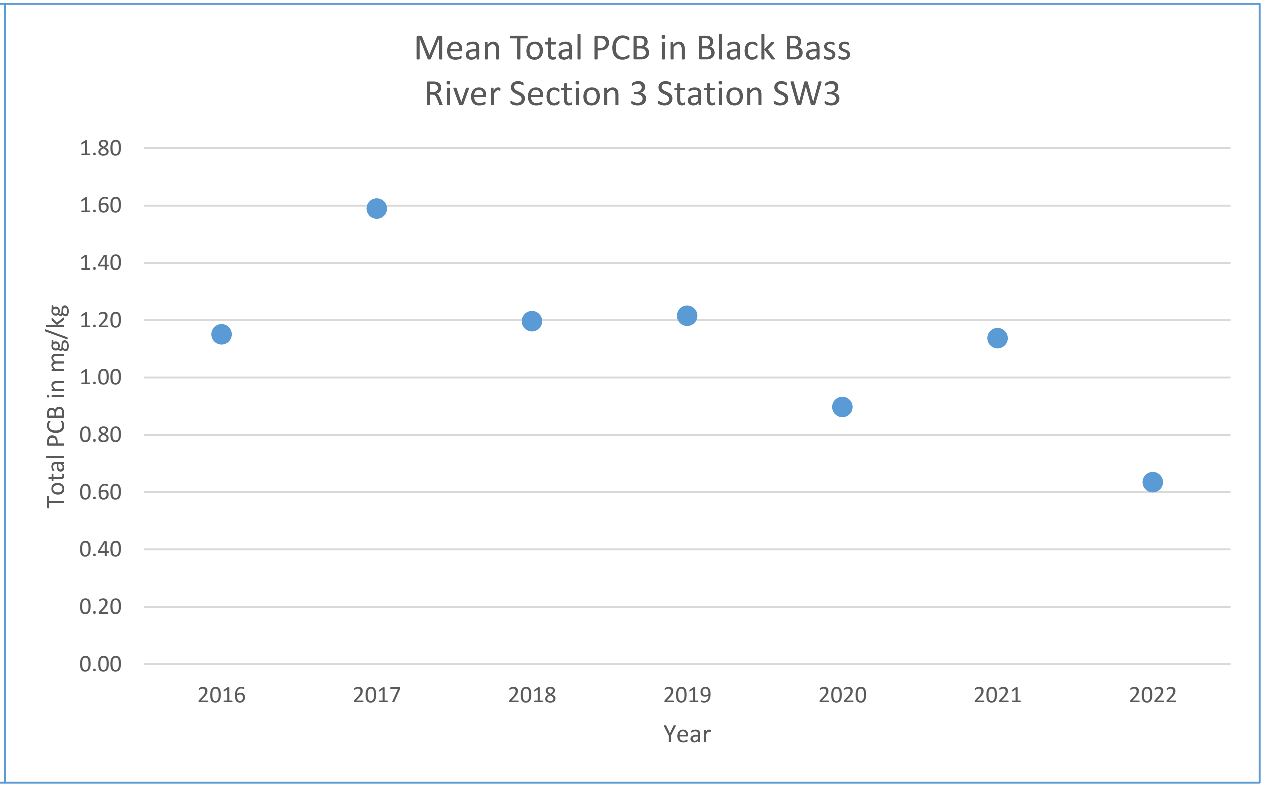
Station SW3

Stations SW2 and SW3

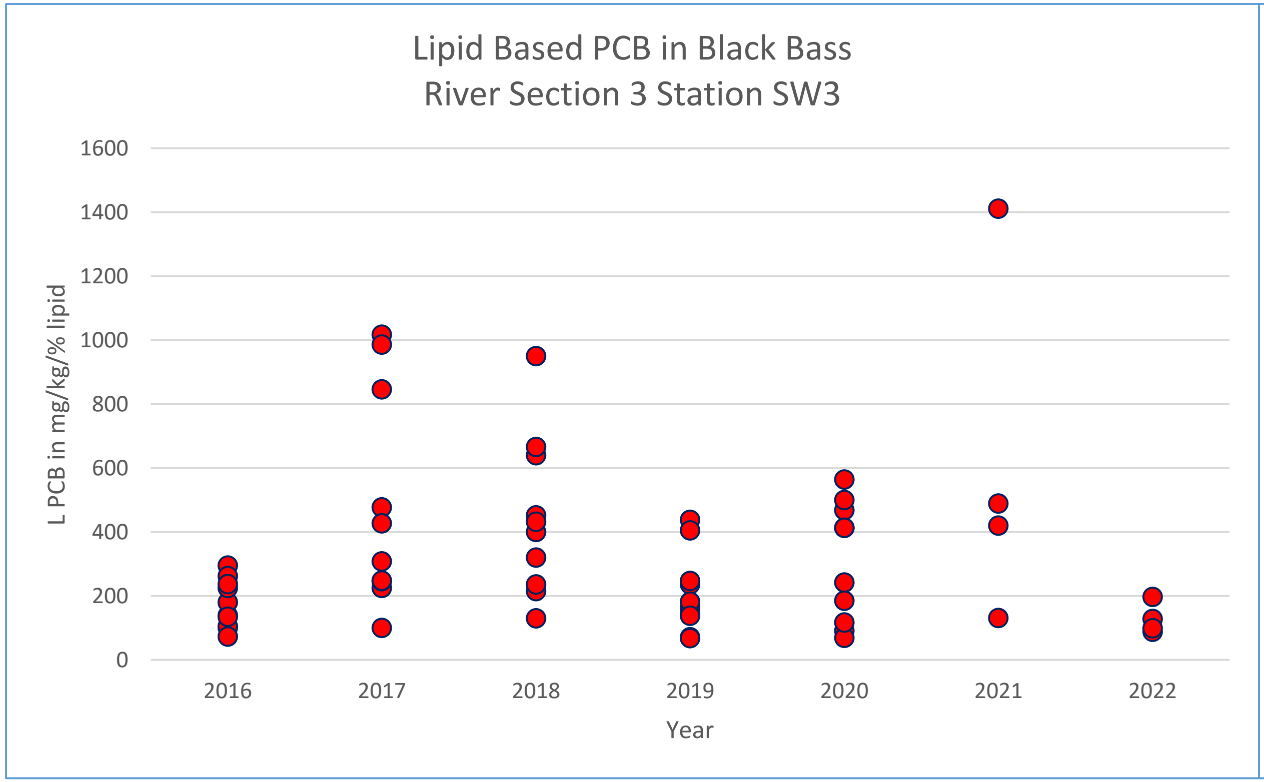
SW3 Black Bass Data

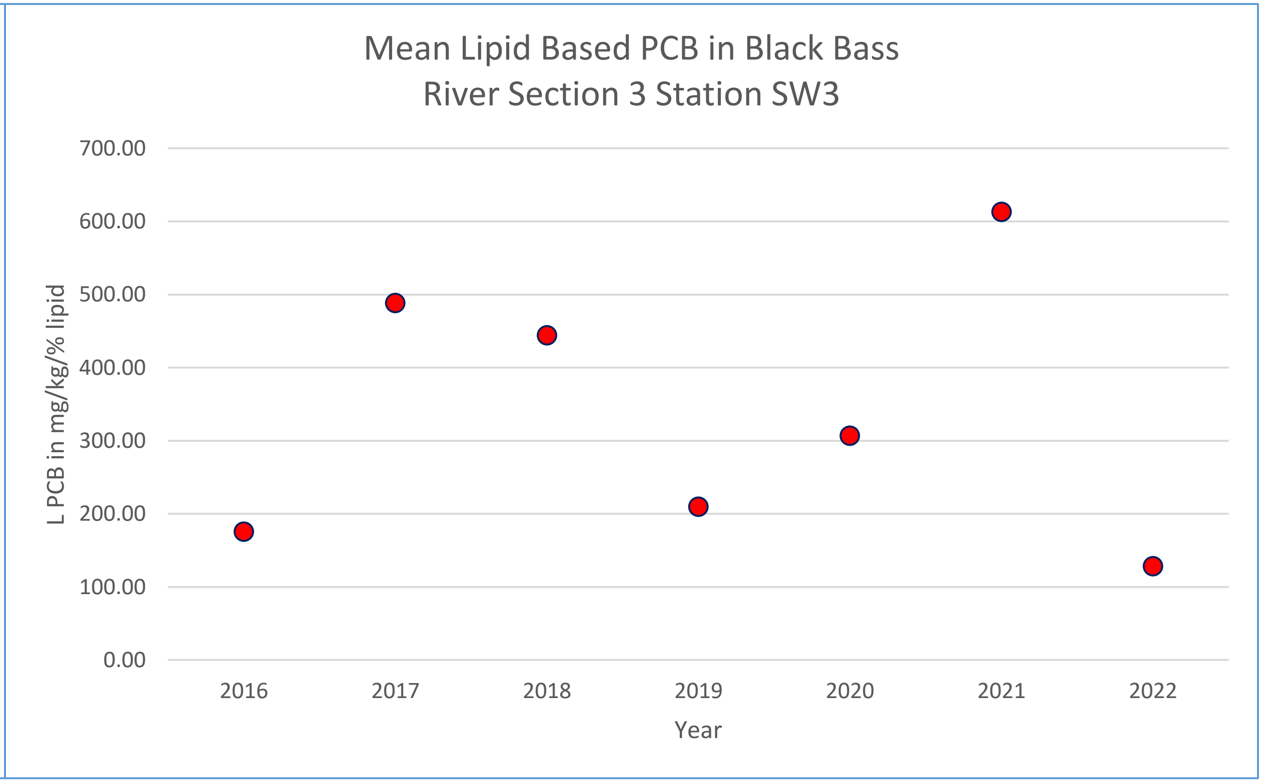
SW3 Black Bass Total PCB



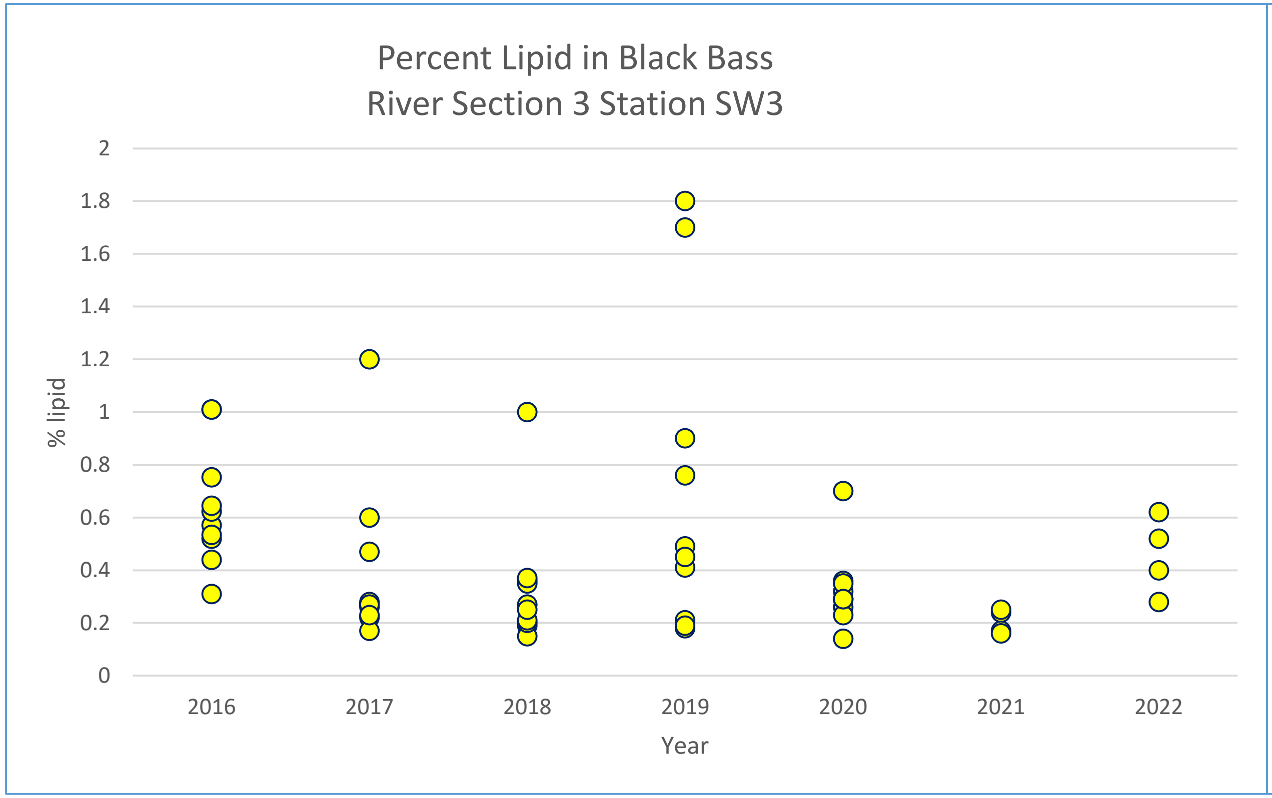


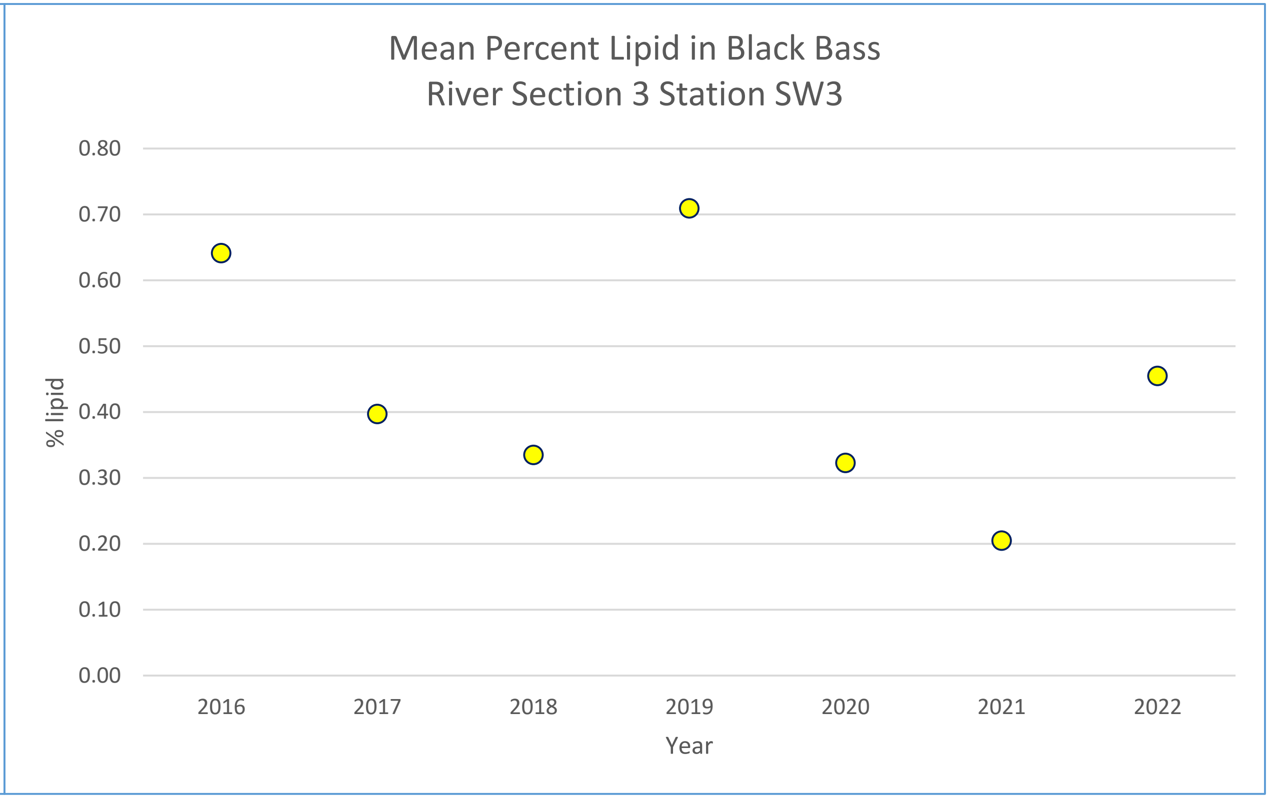
SW3 Black Bass Lipid Based PCB



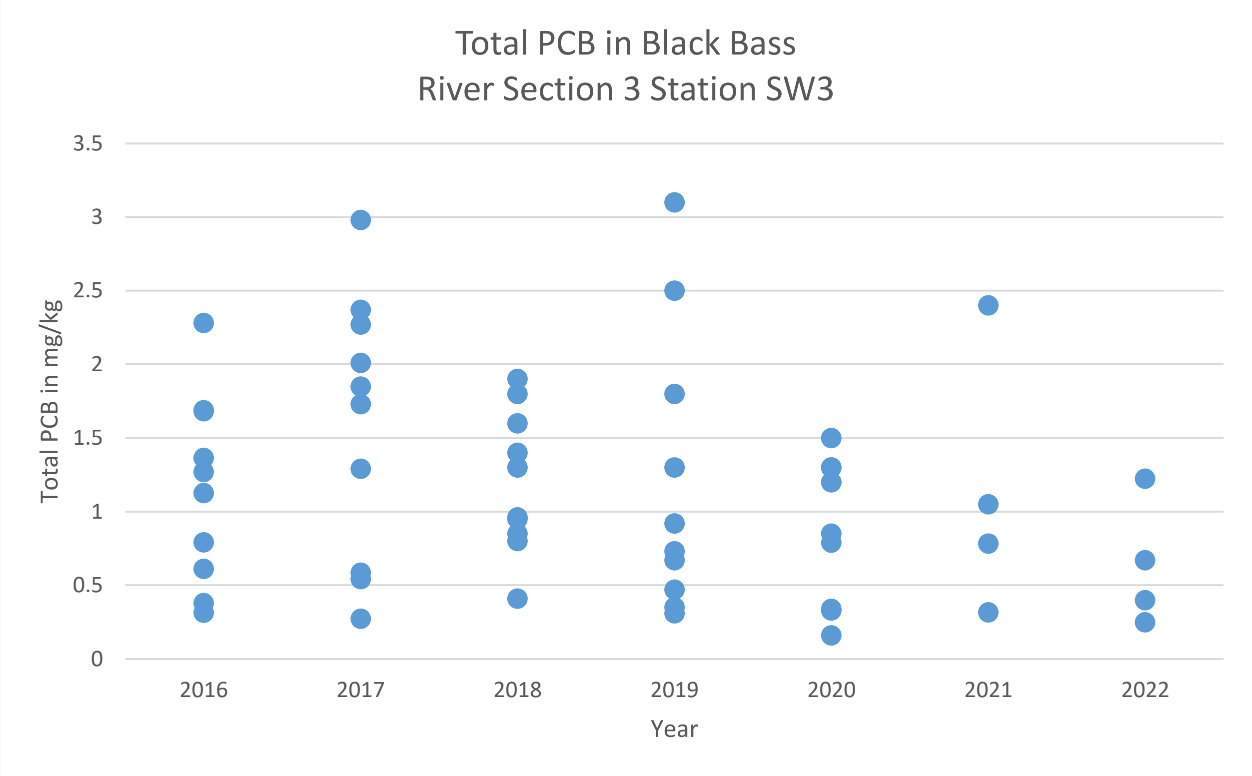


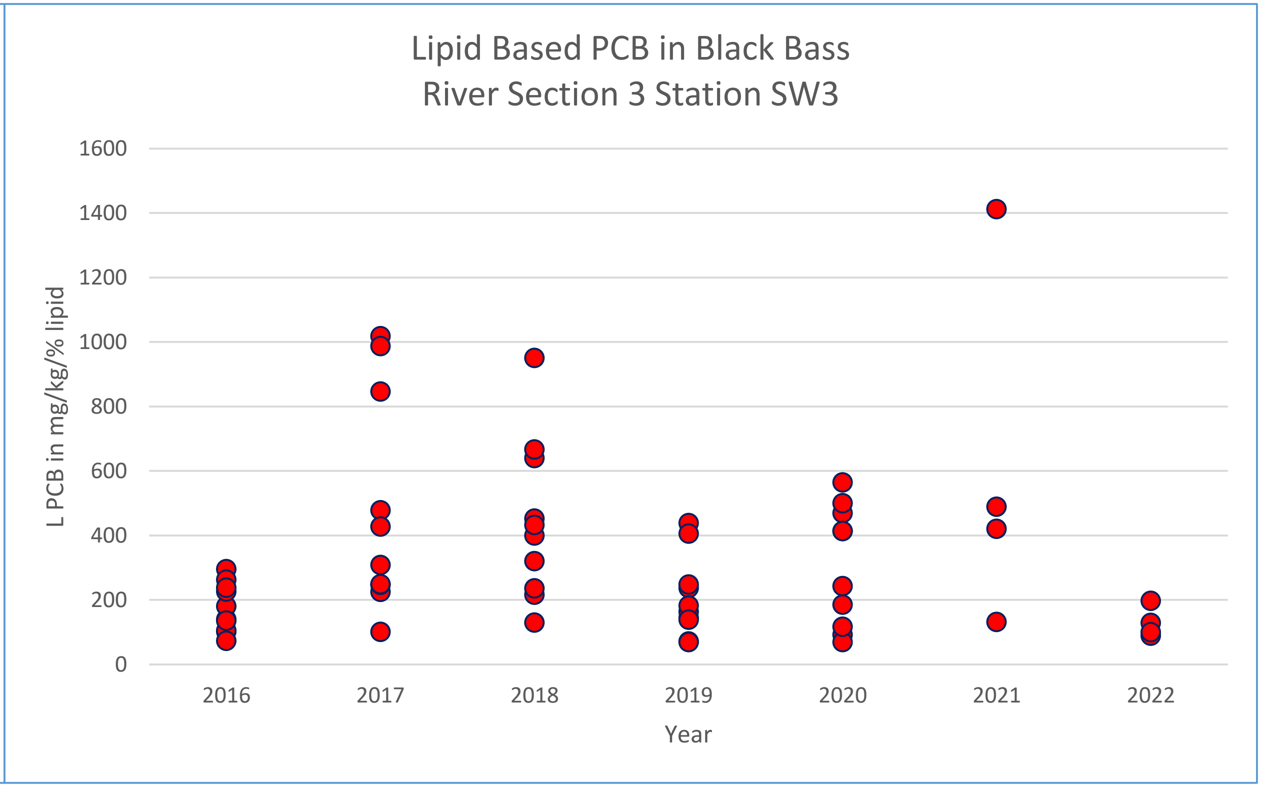
SW3 Black Bass Percent Lipid



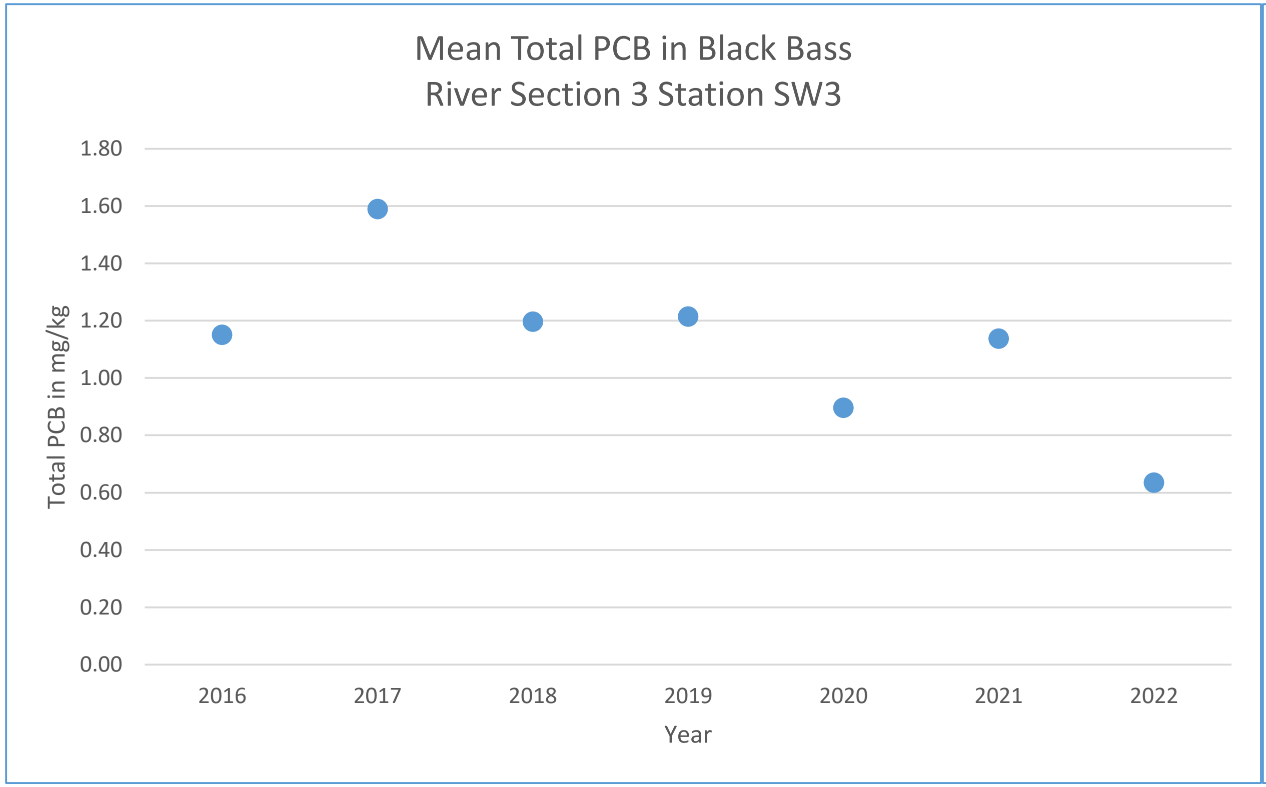


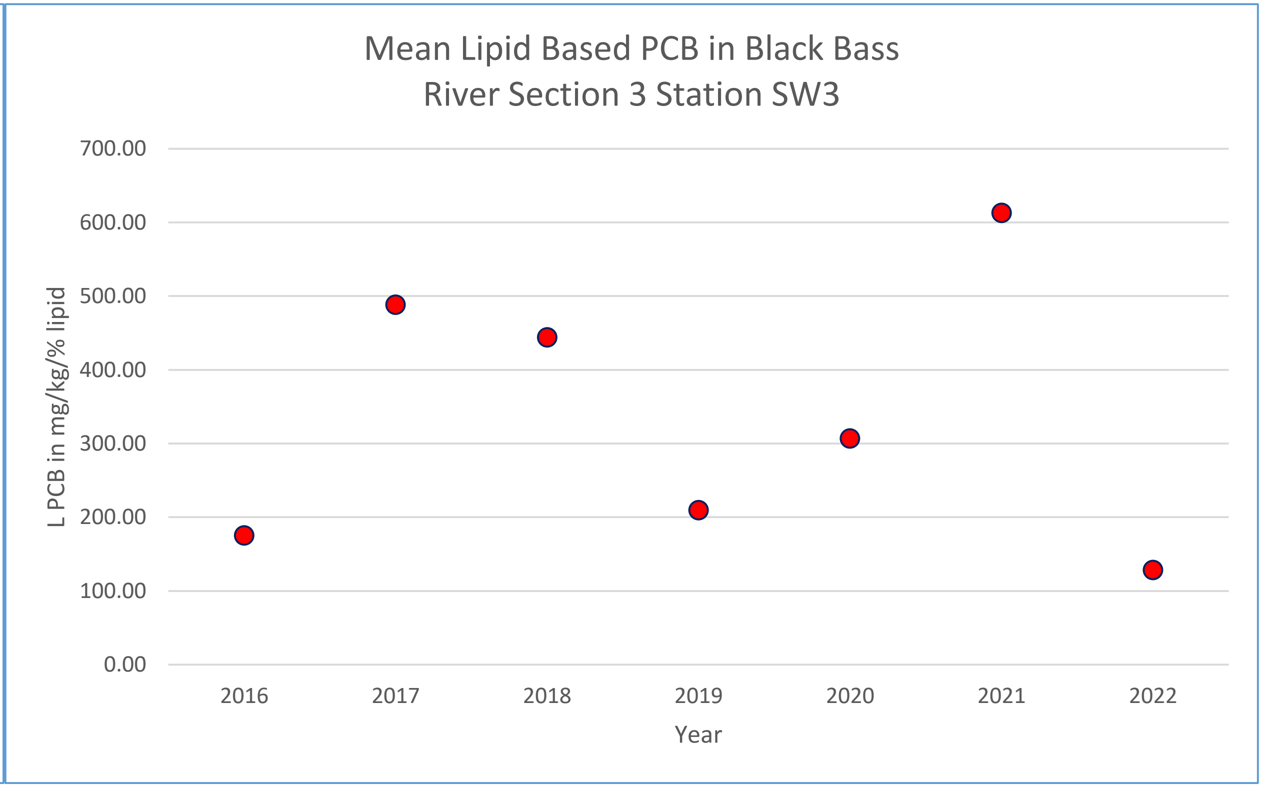
SW3 Black Bass Total PCB and Lipid Based PCB





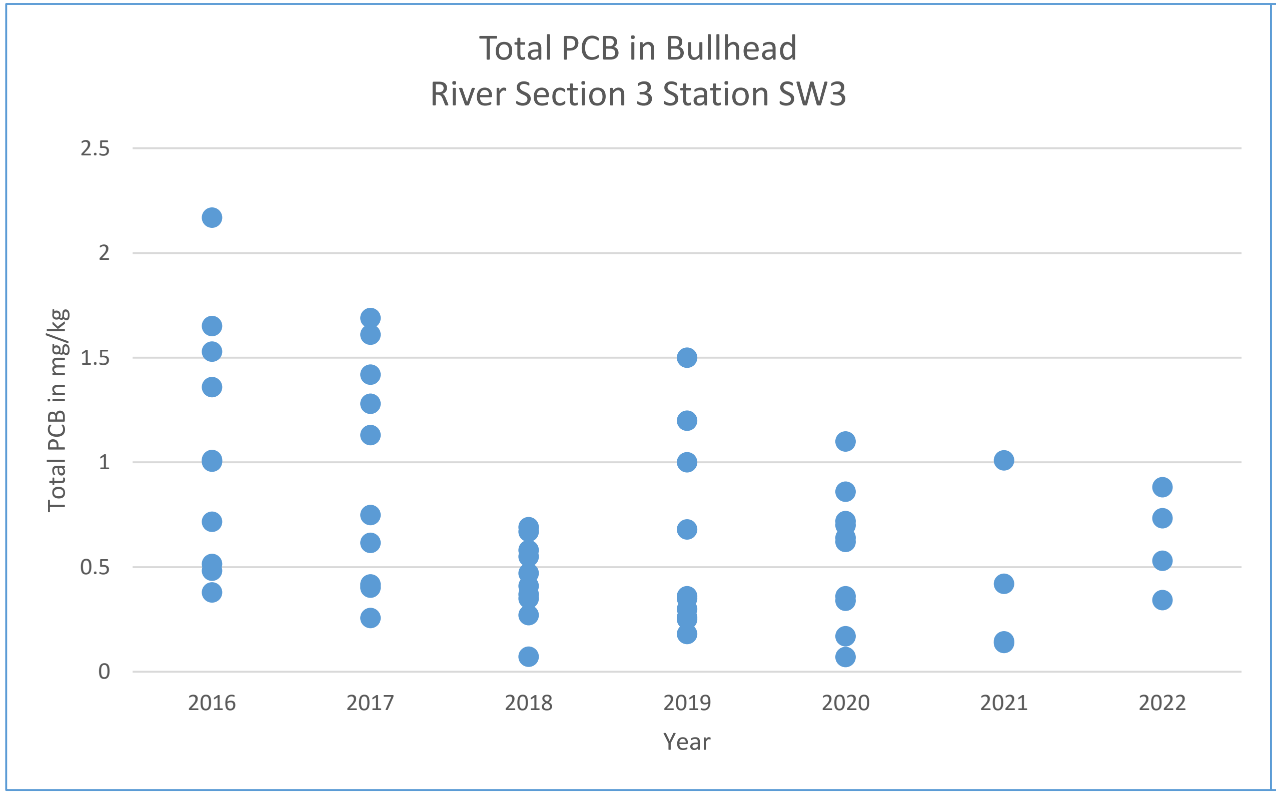
SW3 Black Bass Mean Total PCB and Mean Lipid Based PCB

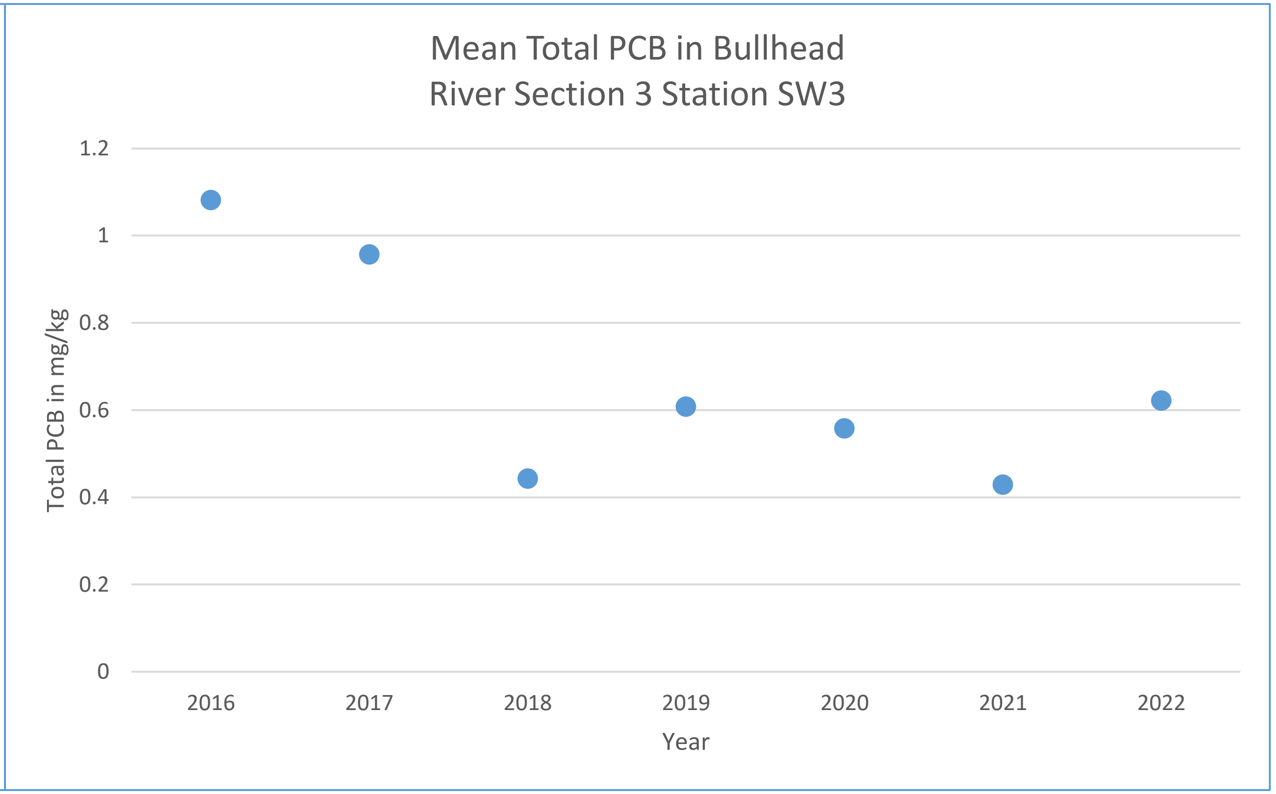




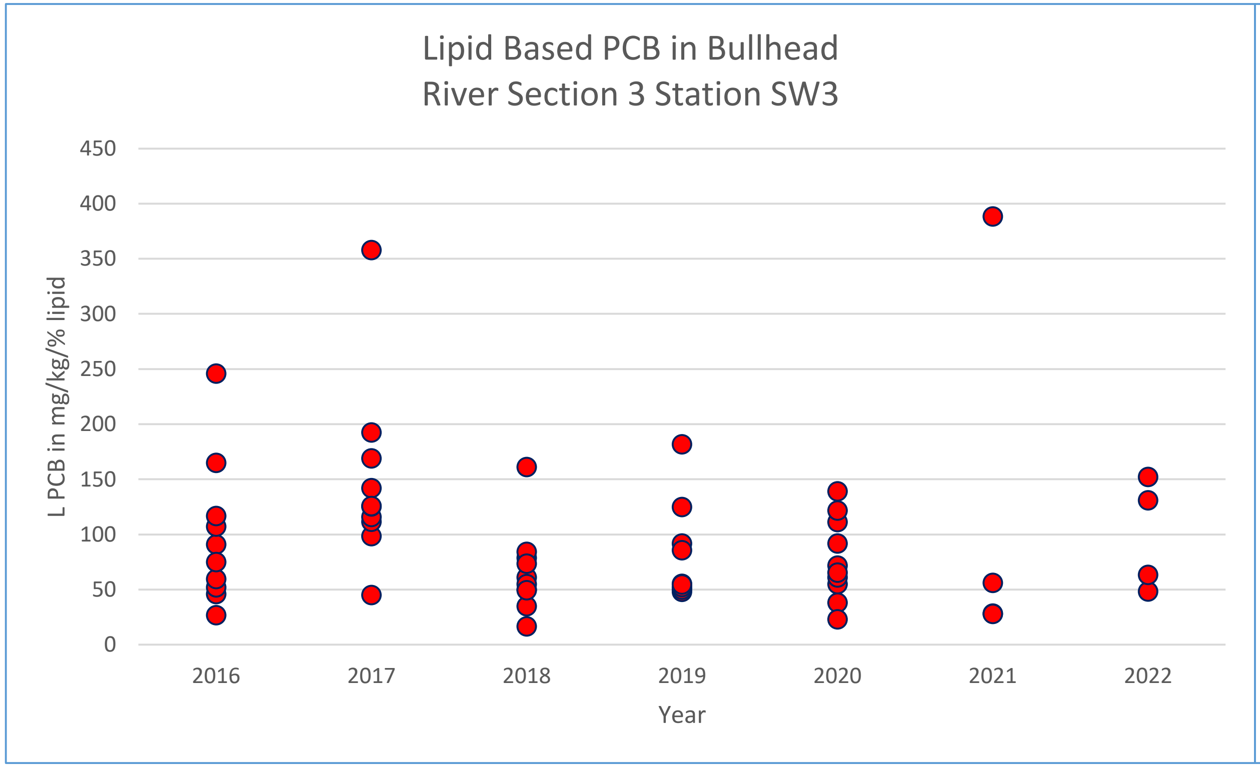
SW3 Bullhead Data

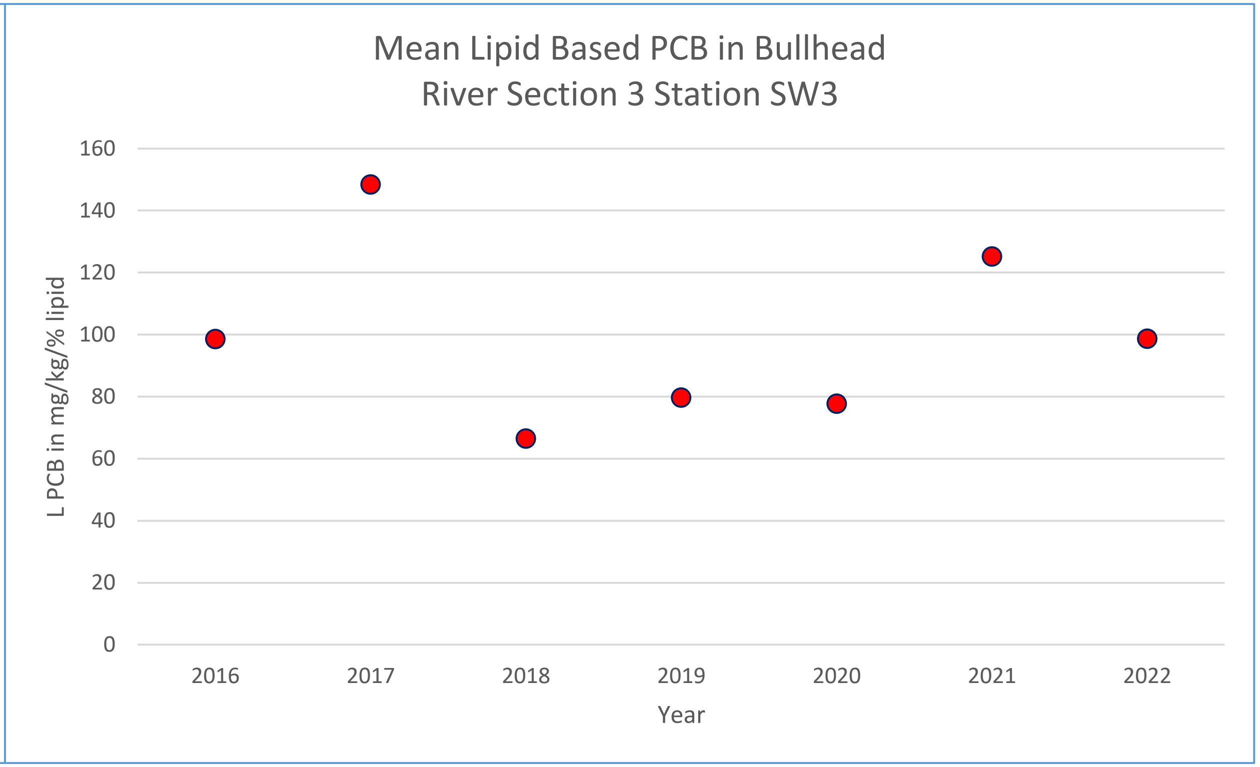
SW3 Bullhead Total PCB



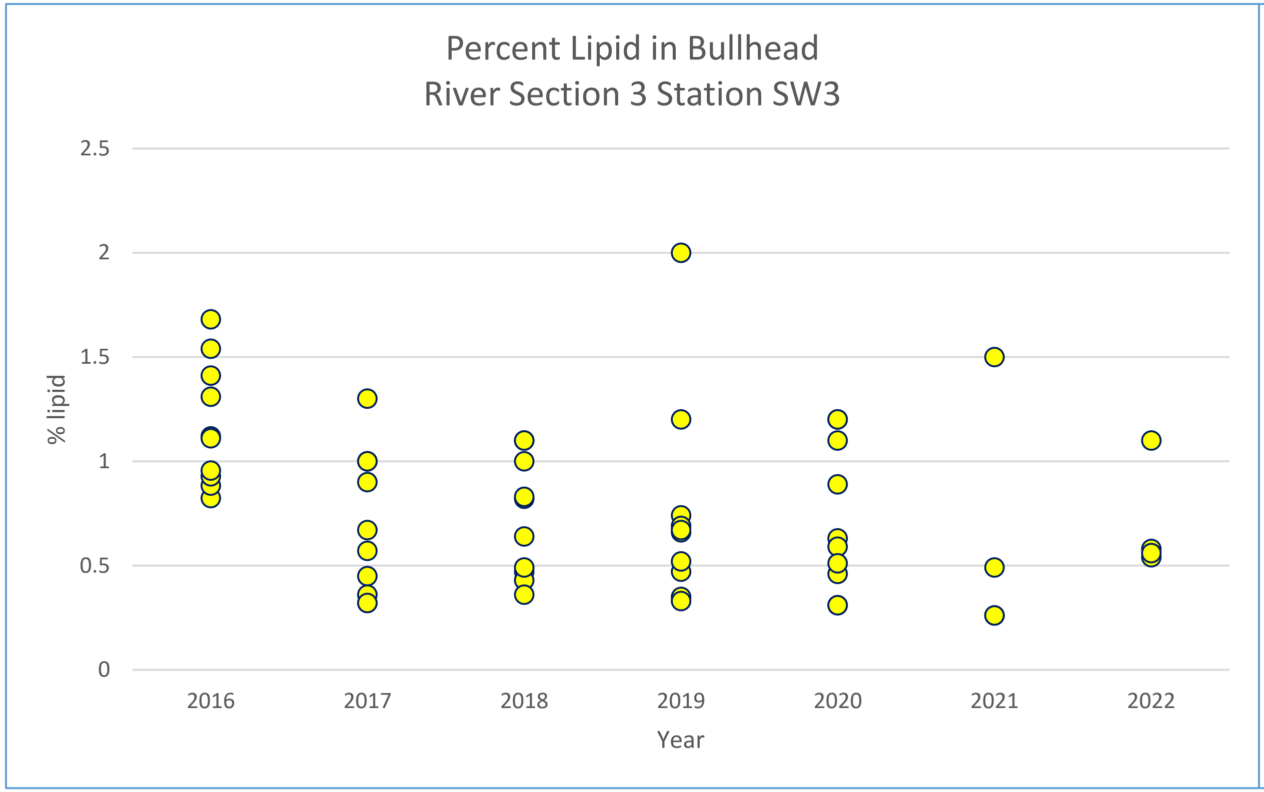


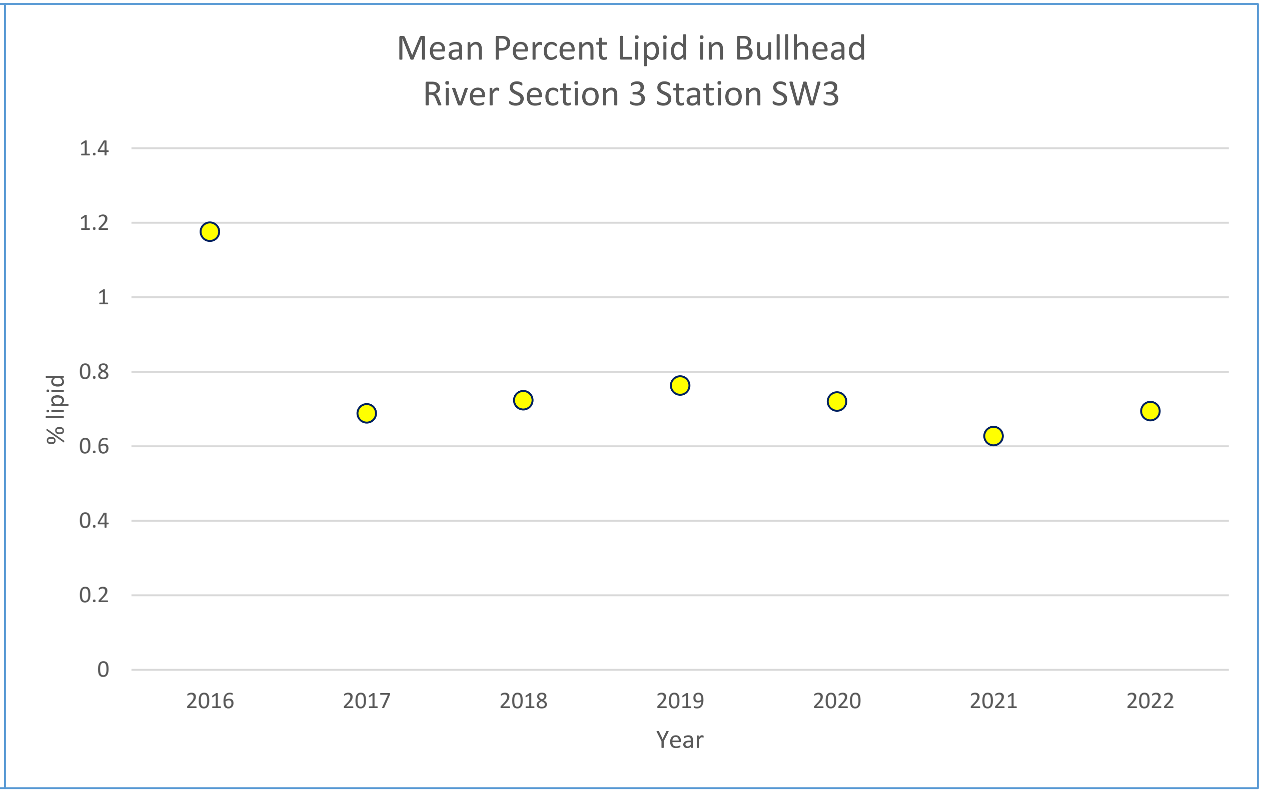
SW3 Bullhead Lipid Based PCB



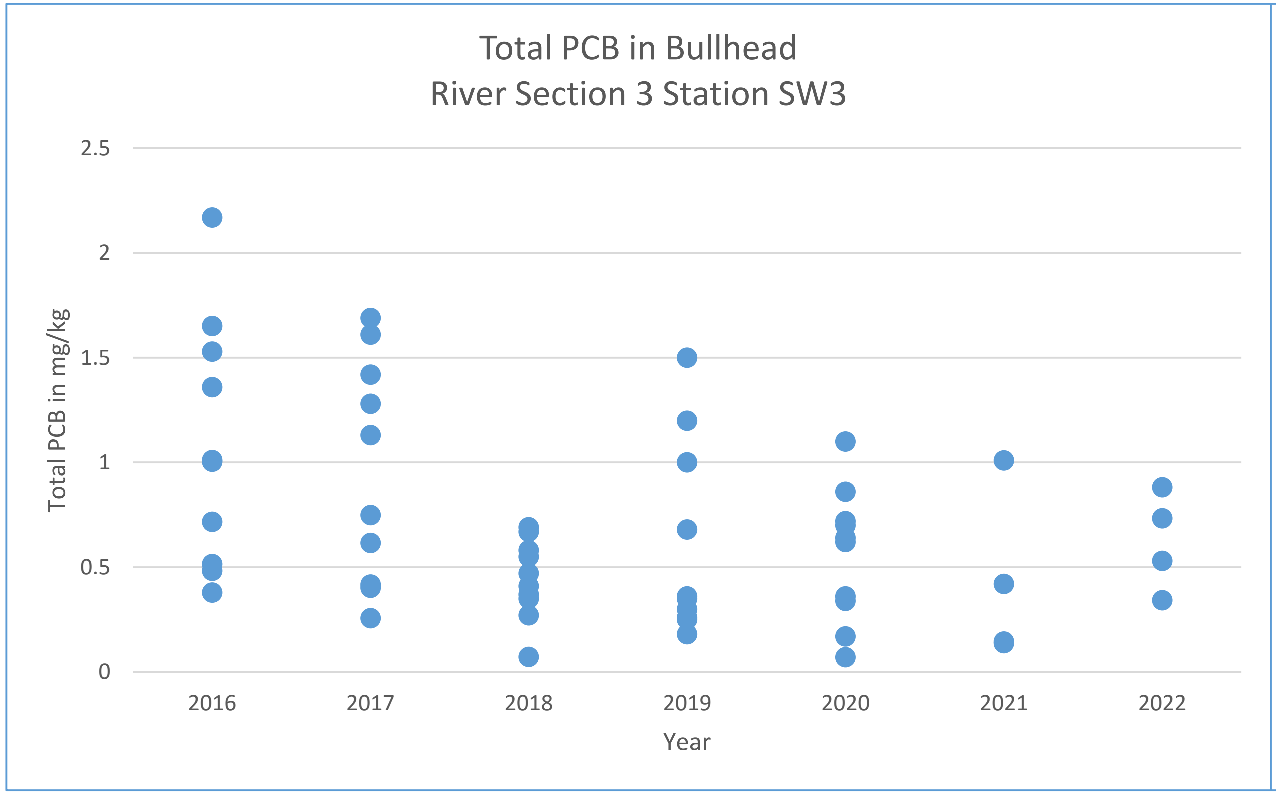


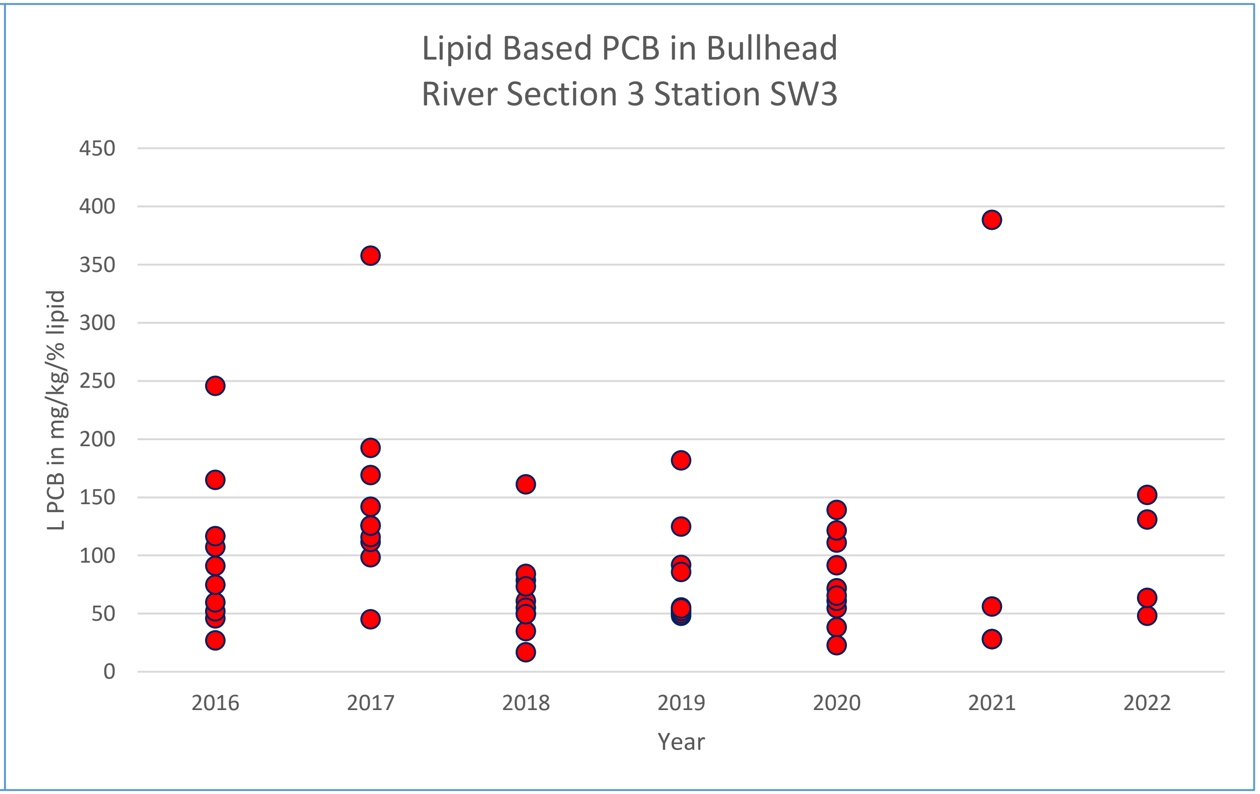
SW3 Bullhead Percent Lipid



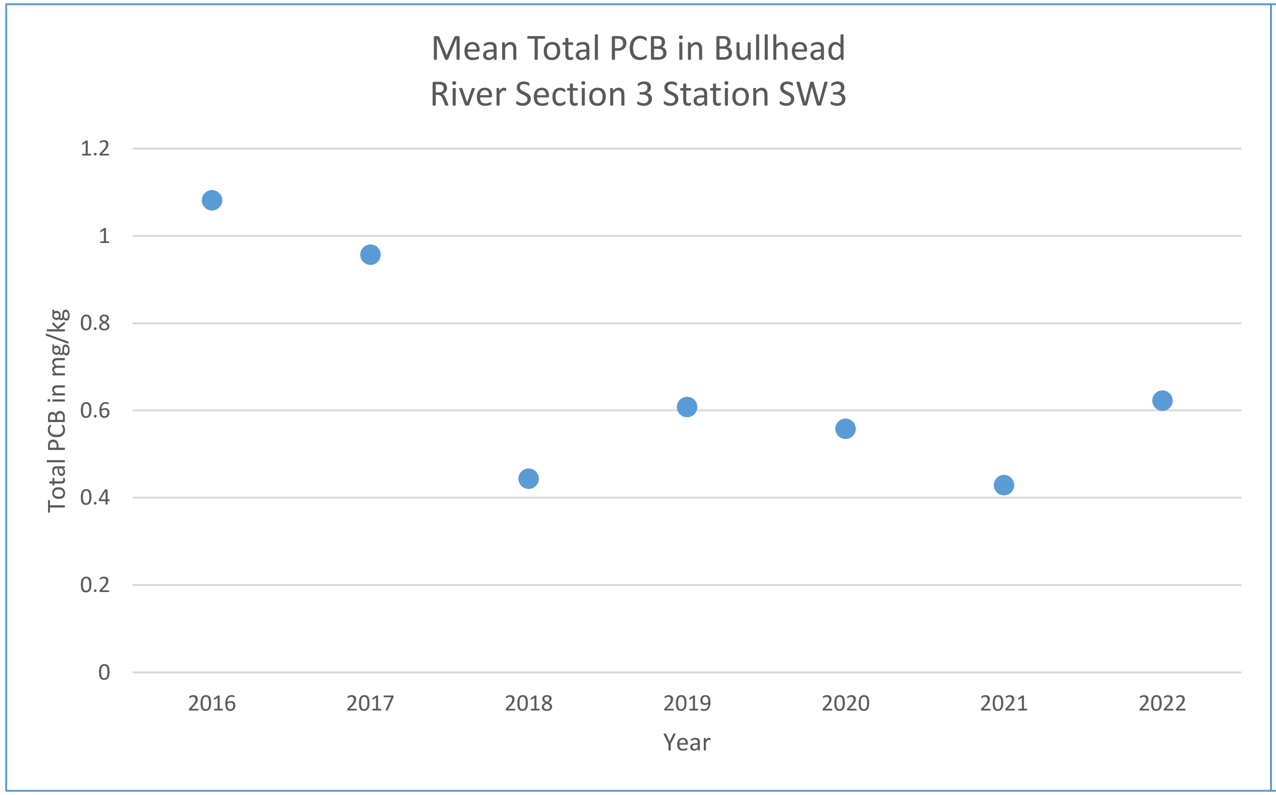


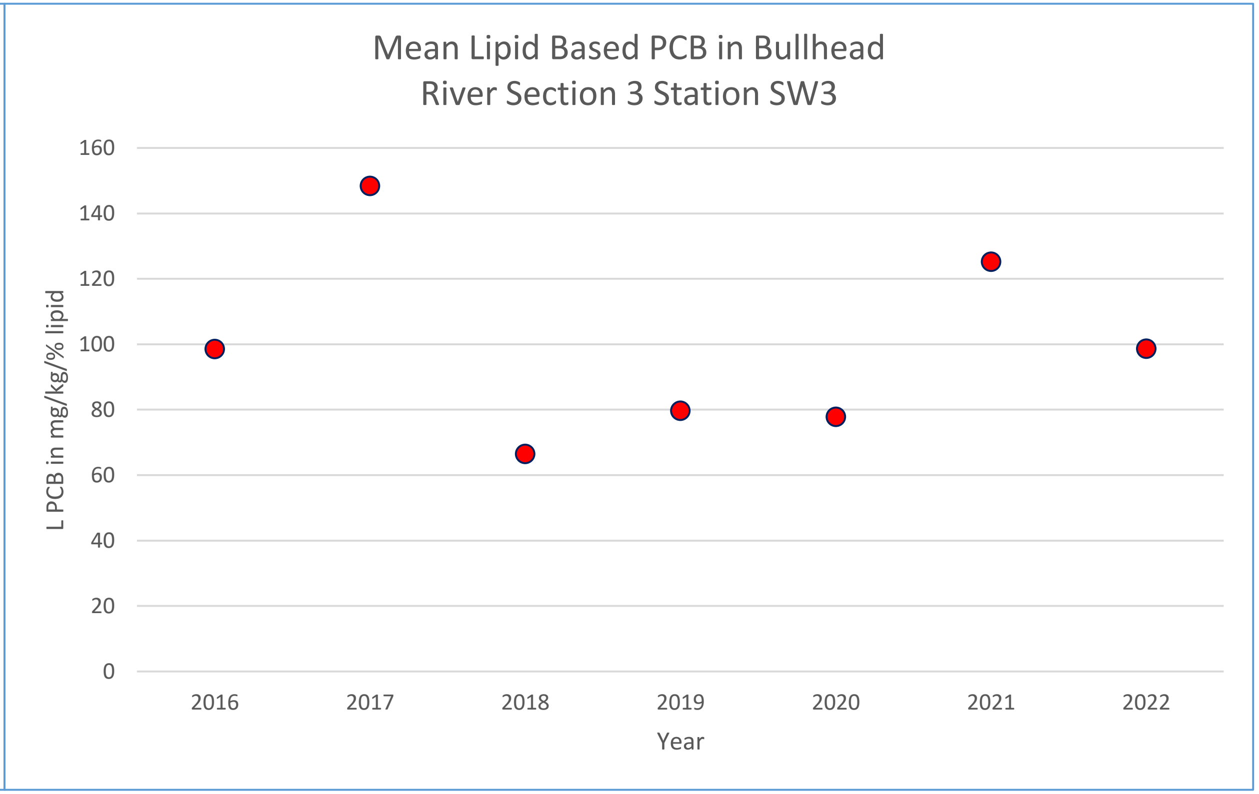
SW3 Bullhead Total PCB and Lipid Based PCB





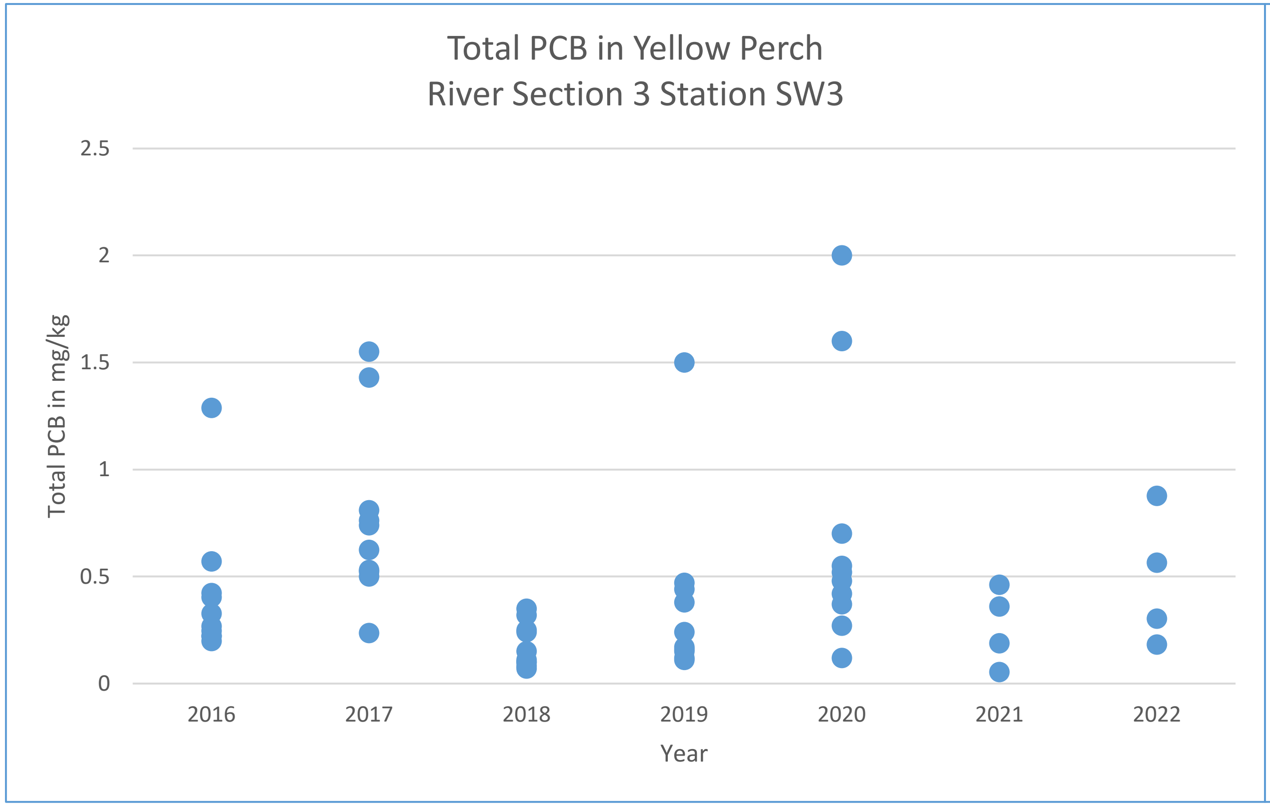
SW3 Bullhead Mean Total PCB and Mean Lipid Based PCB

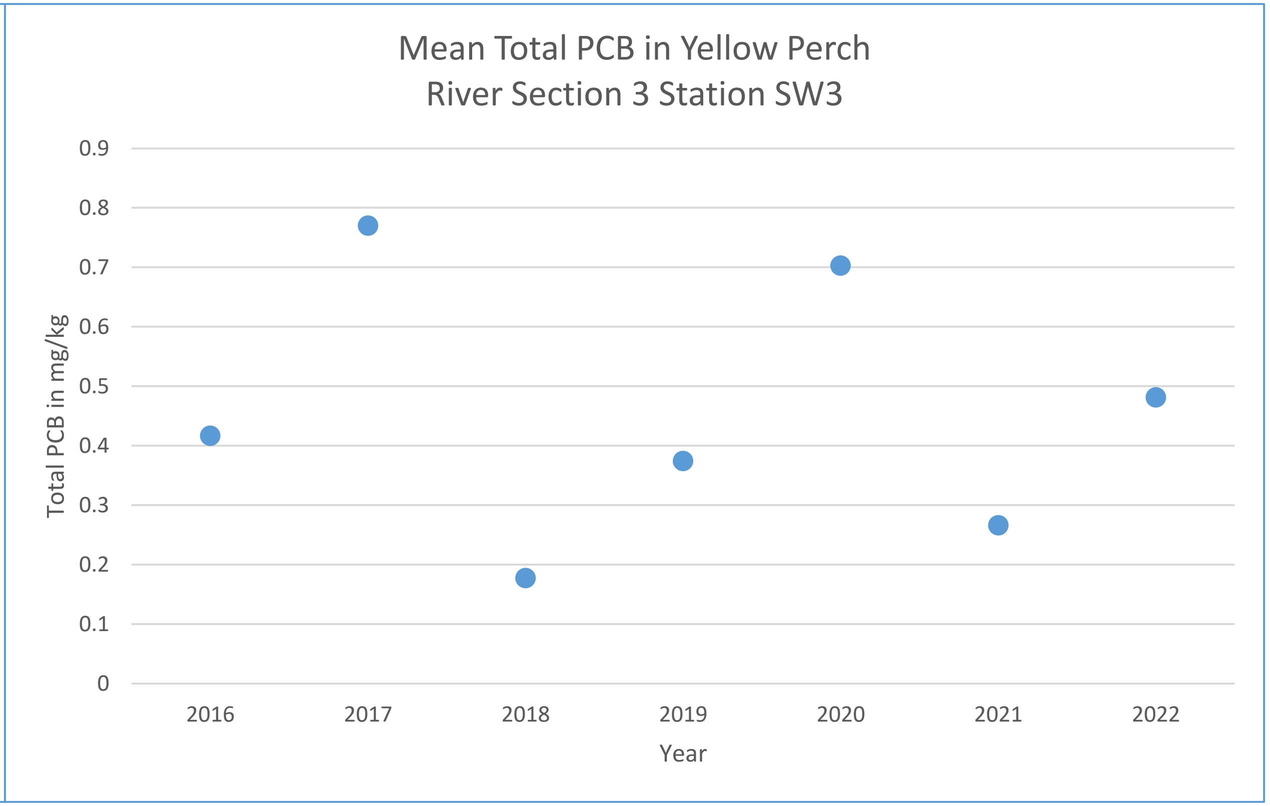




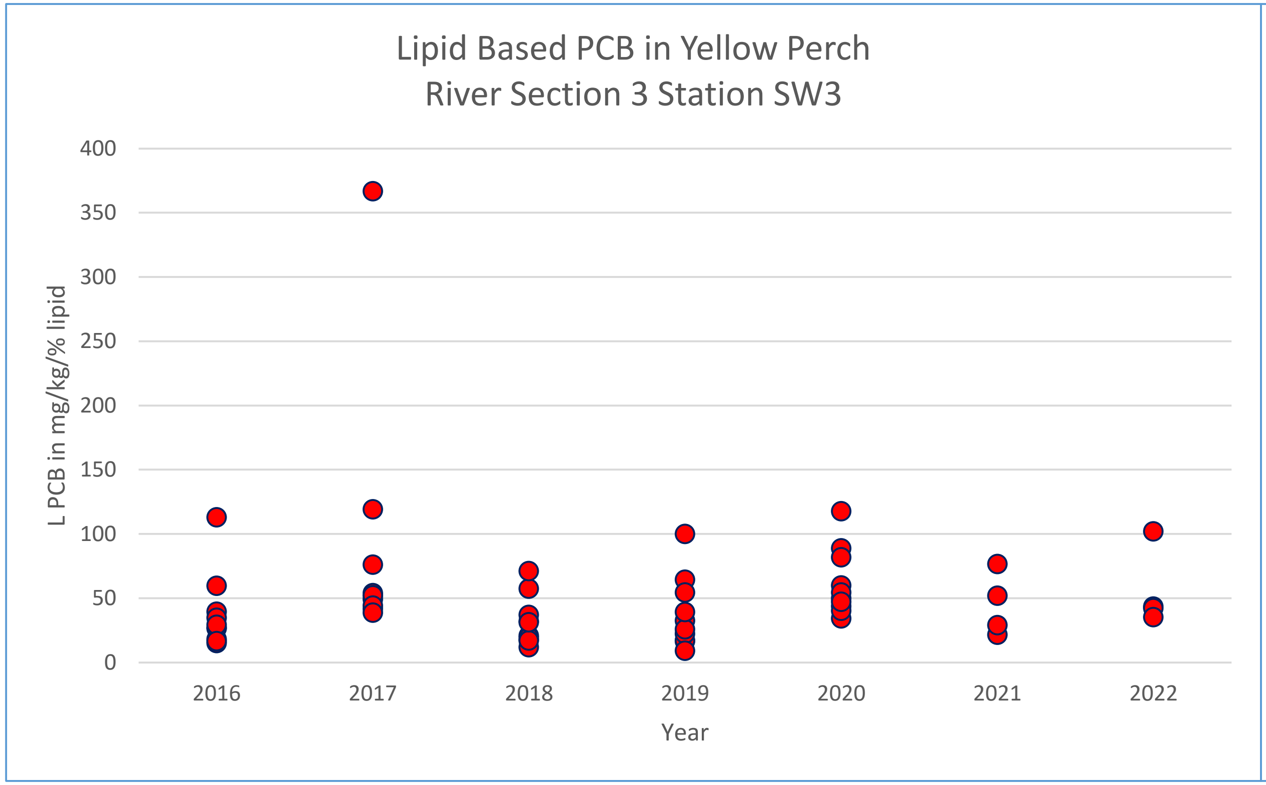
SW3 Yellow Perch Data

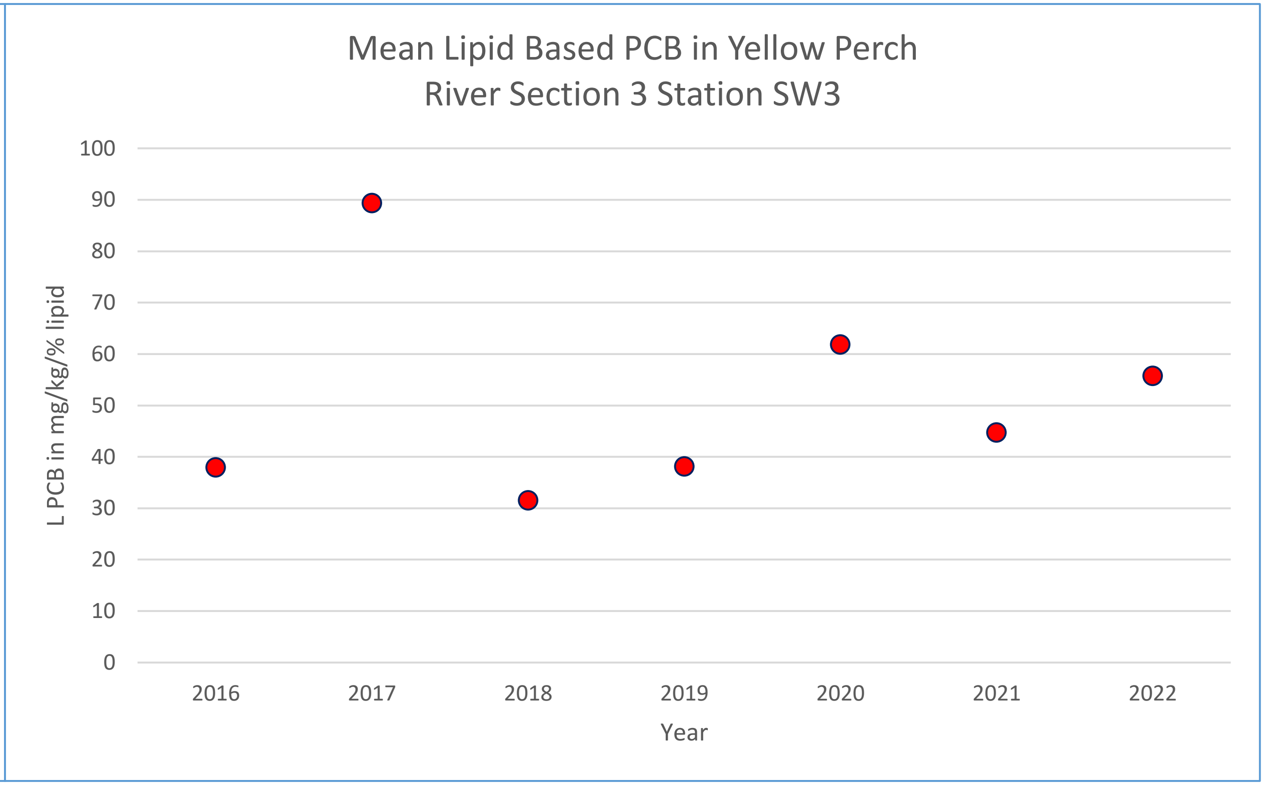
SW3 Yellow Perch Total PCB



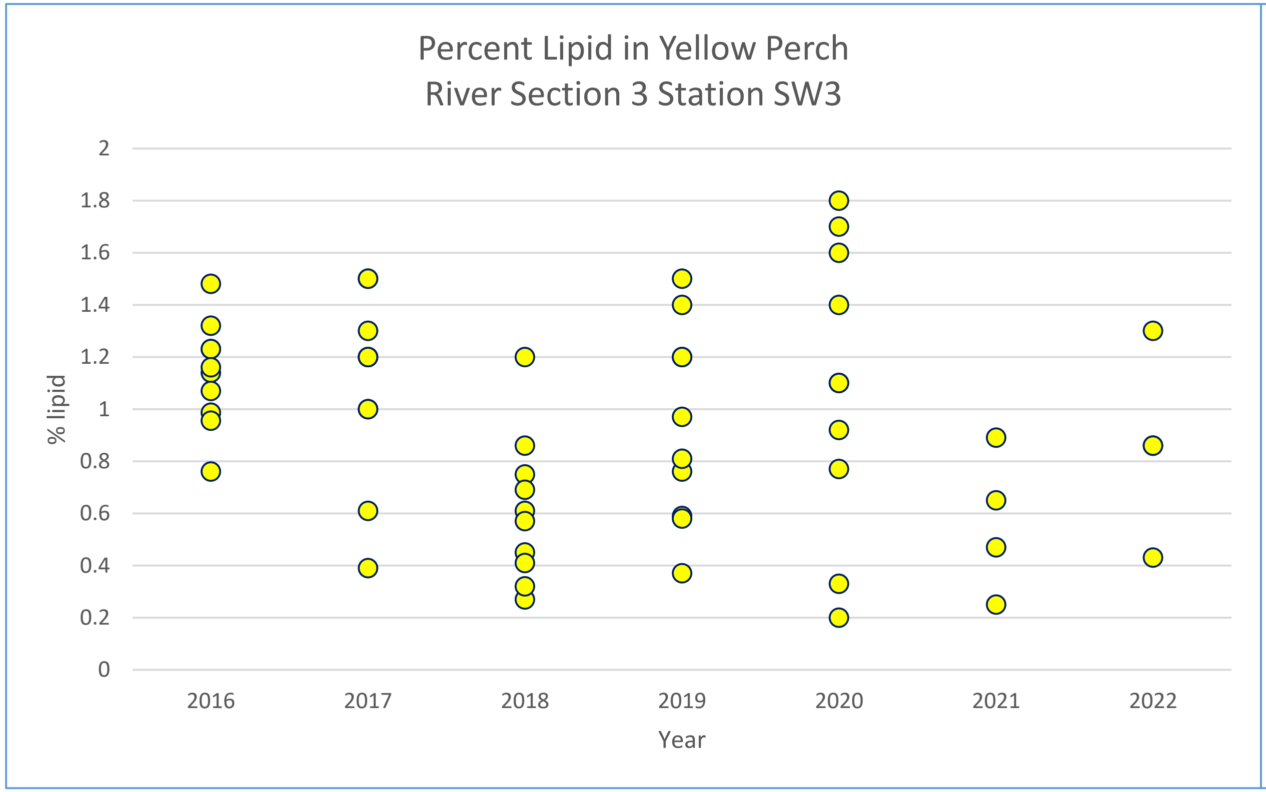


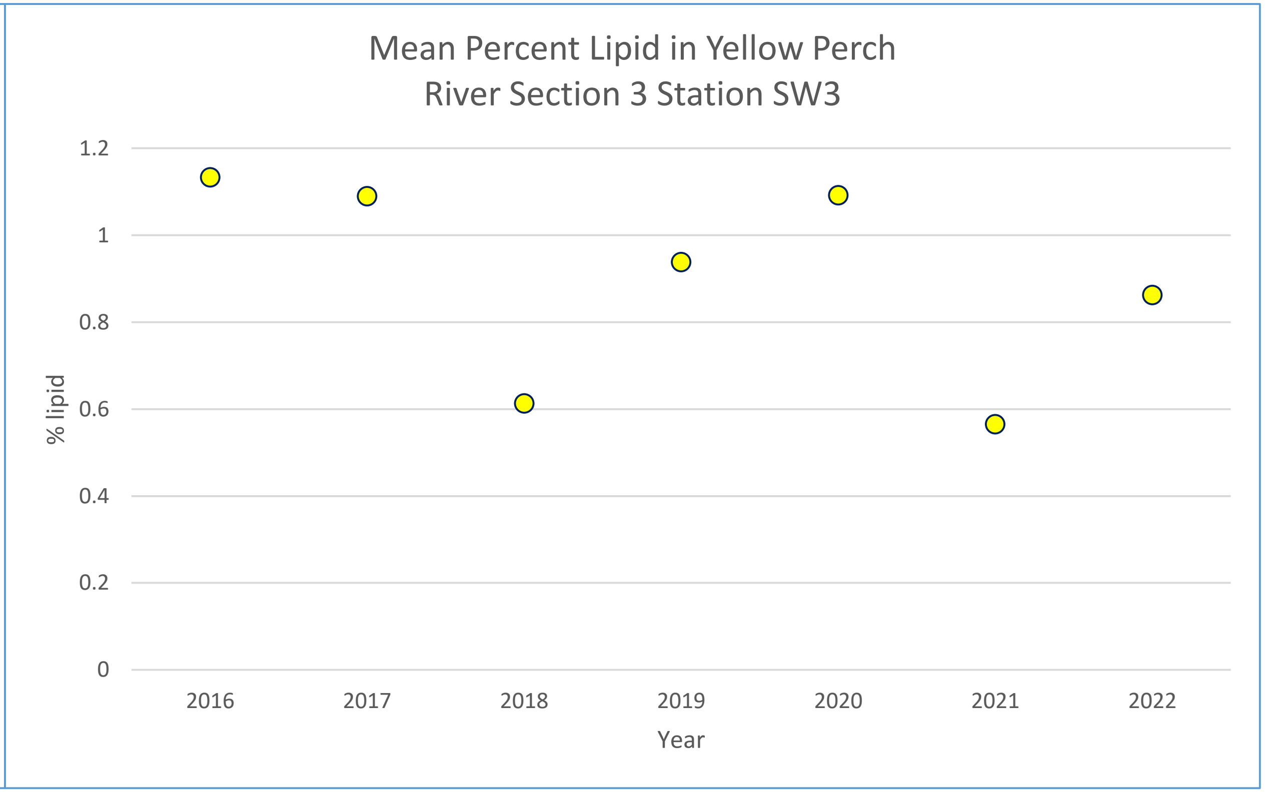
SW3 Yellow Perch Lipid Based PCB



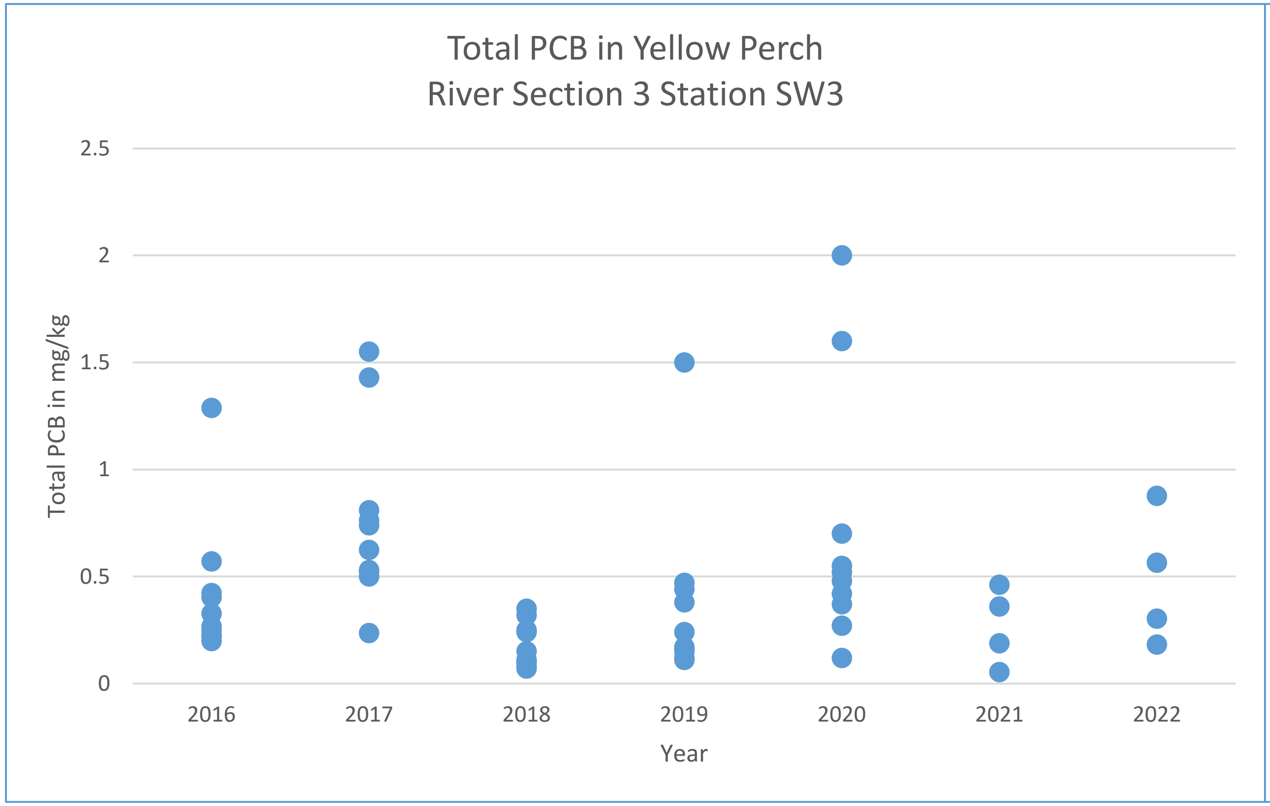


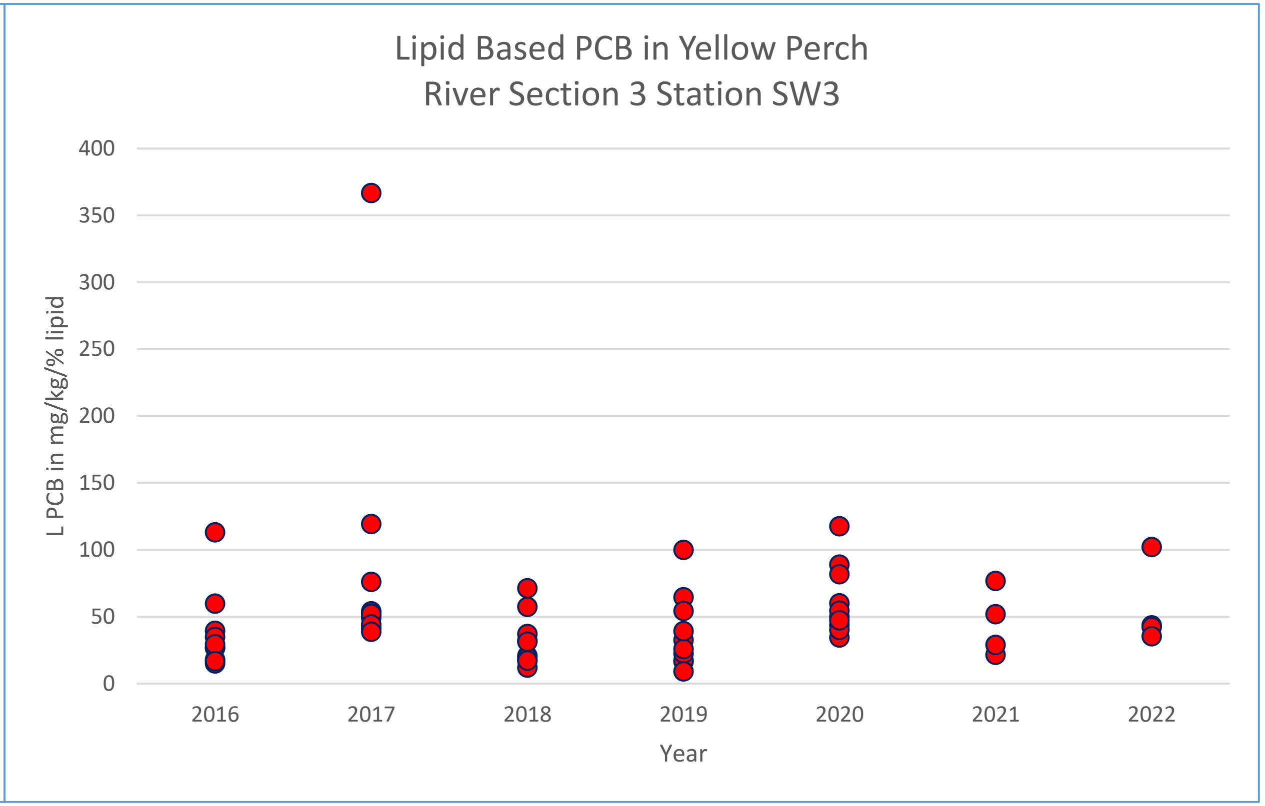
SW3 Yellow Perch Percent Lipid



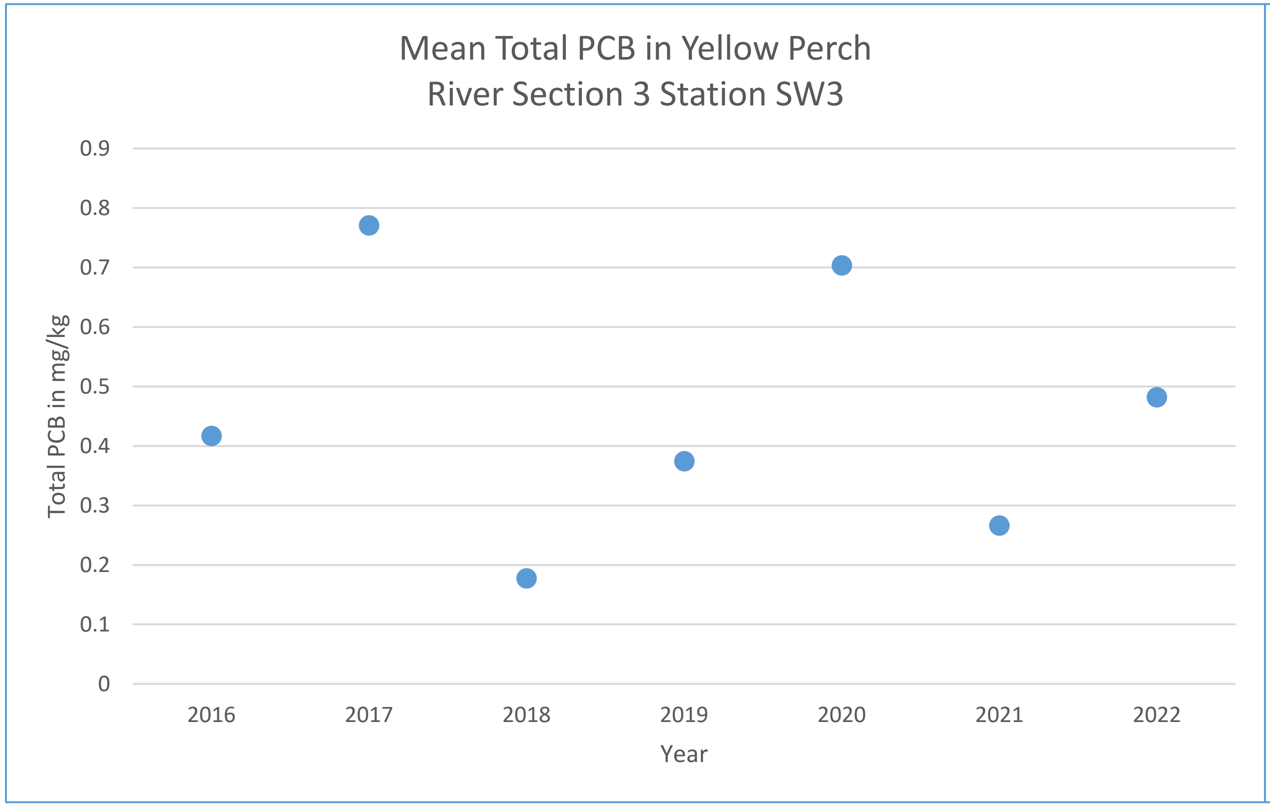


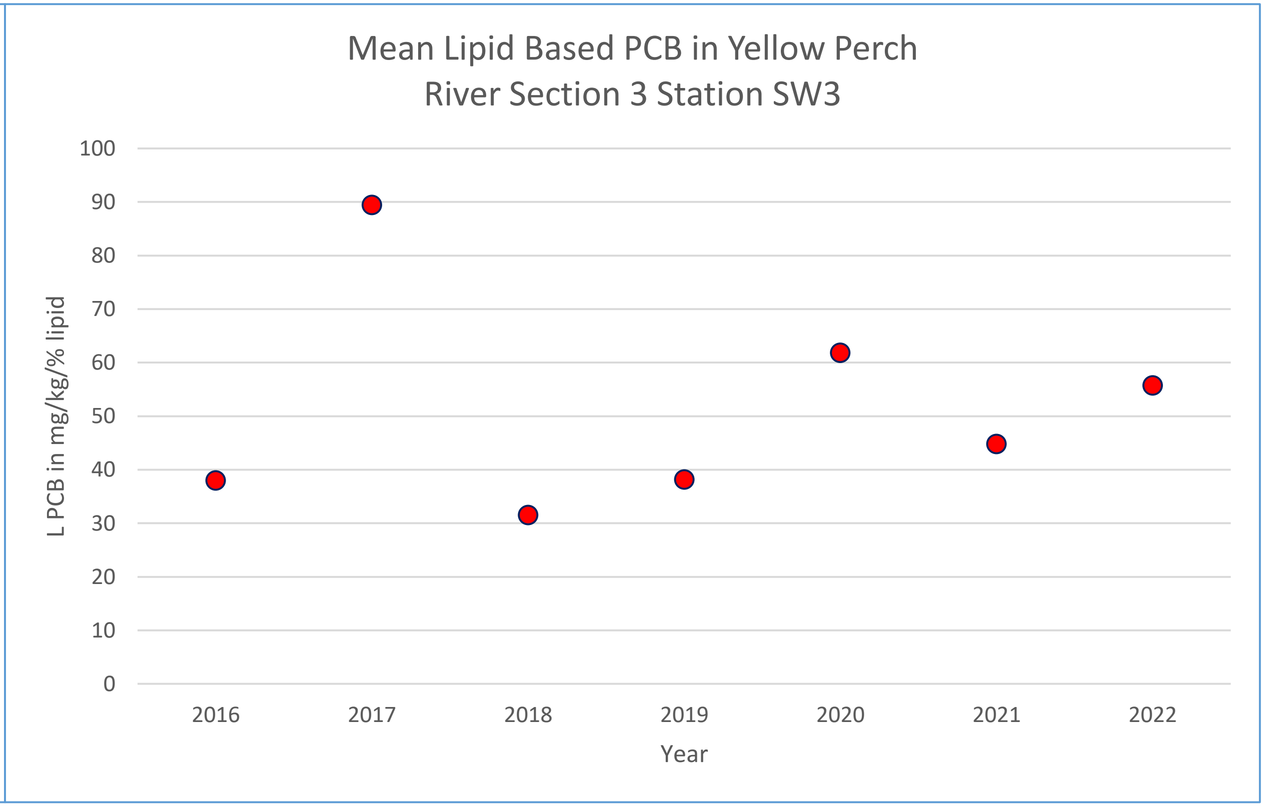
SW3 Yellow Perch Total PCB and Lipid Based PCB





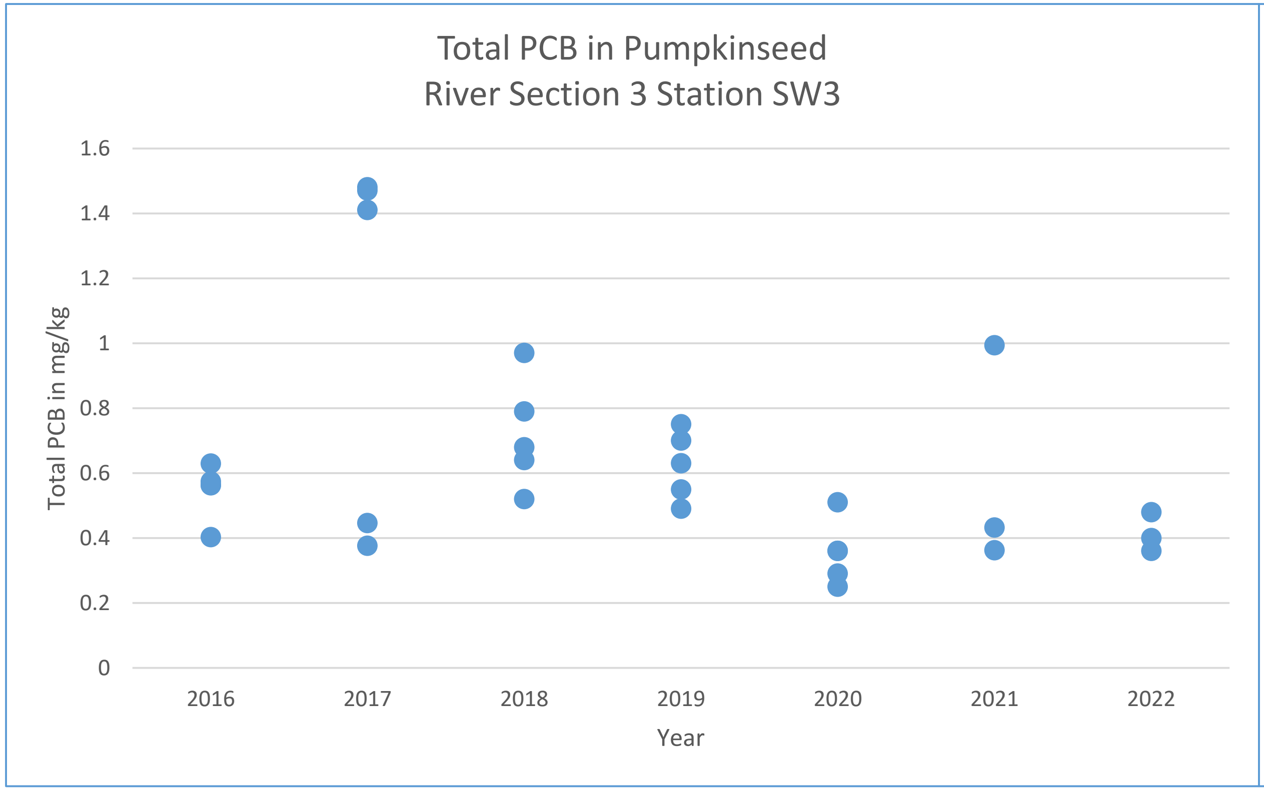
SW3 Yellow Perch Mean Total PCB and Mean Lipid Based PCB

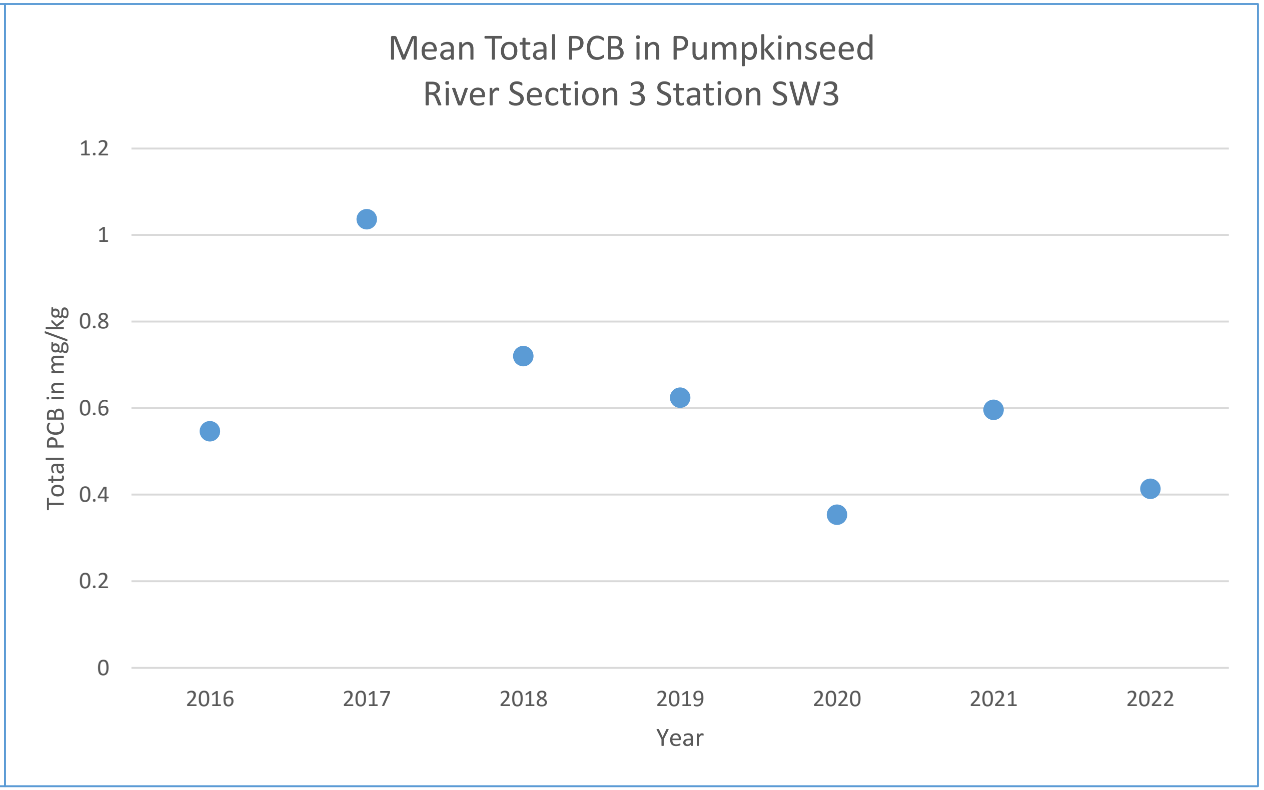




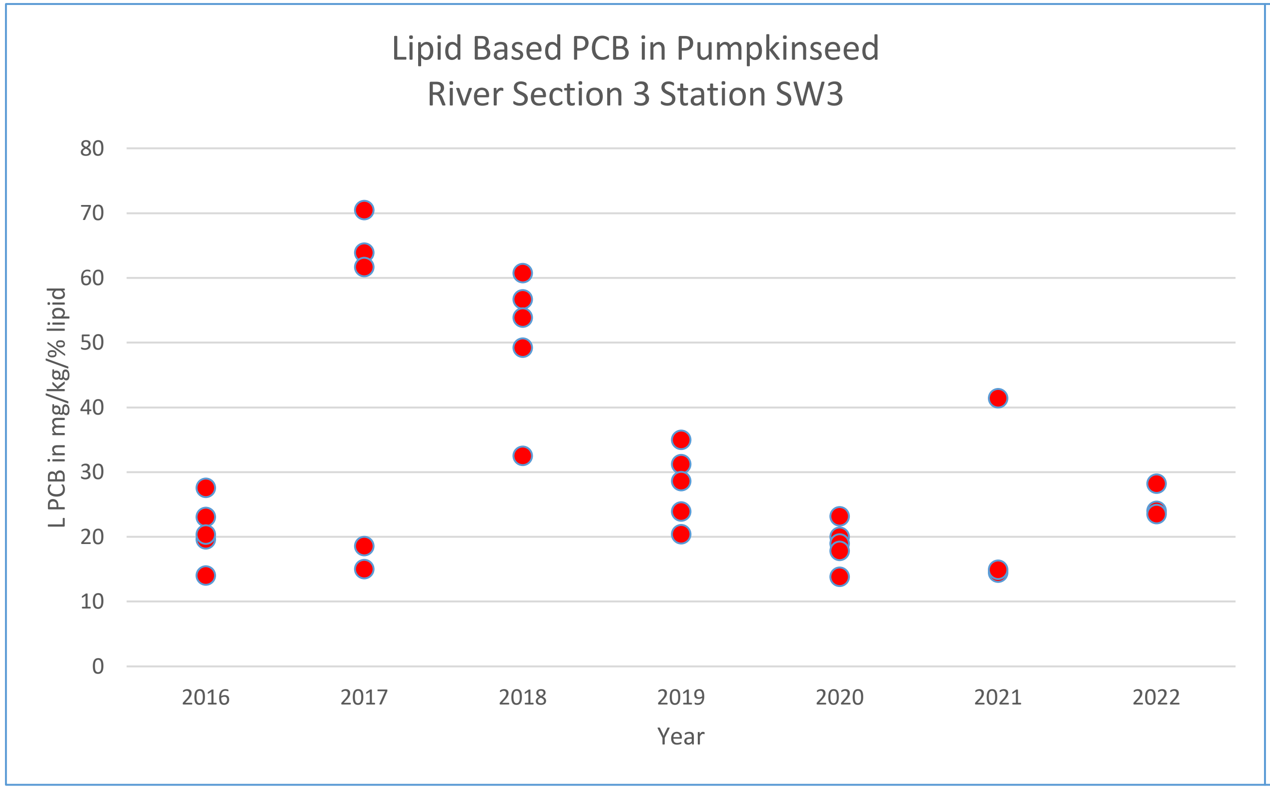
SW3 Pumpkinseed Data

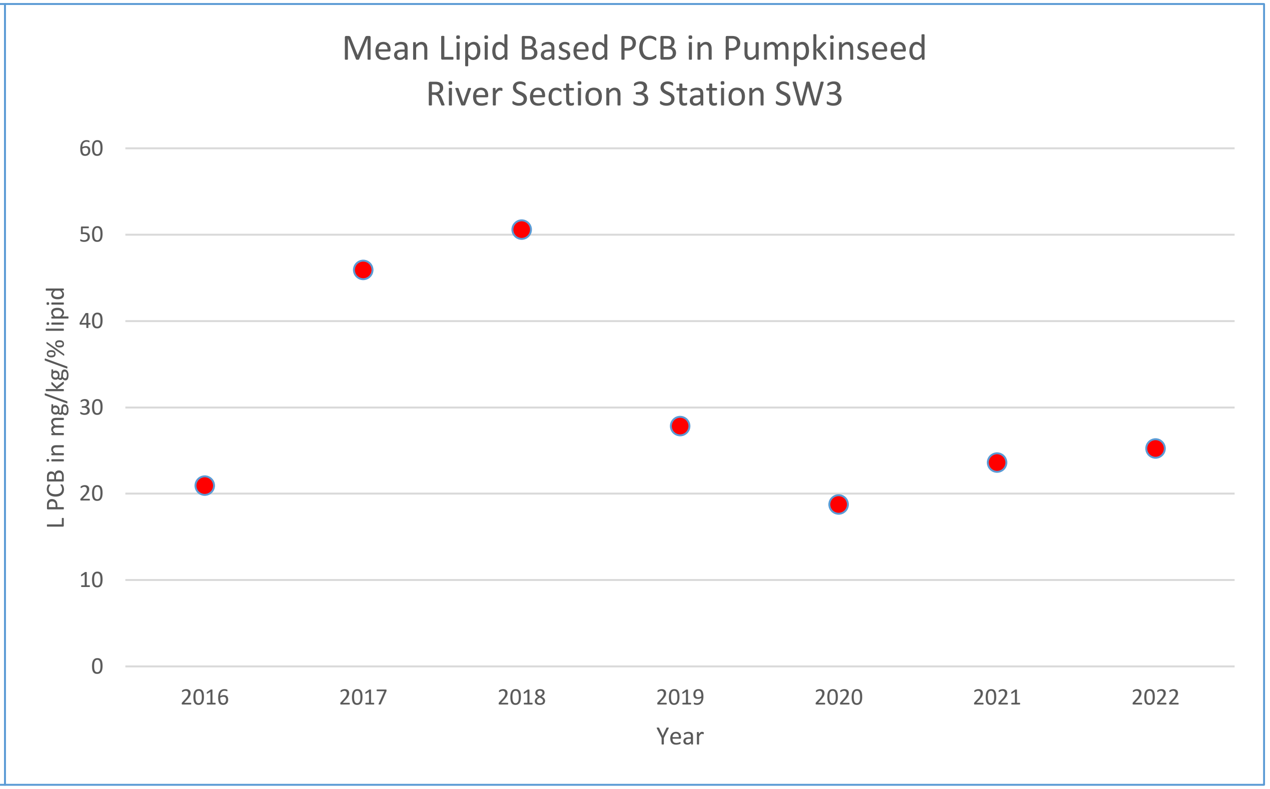
SW3 Pumpkinseed Total PCB



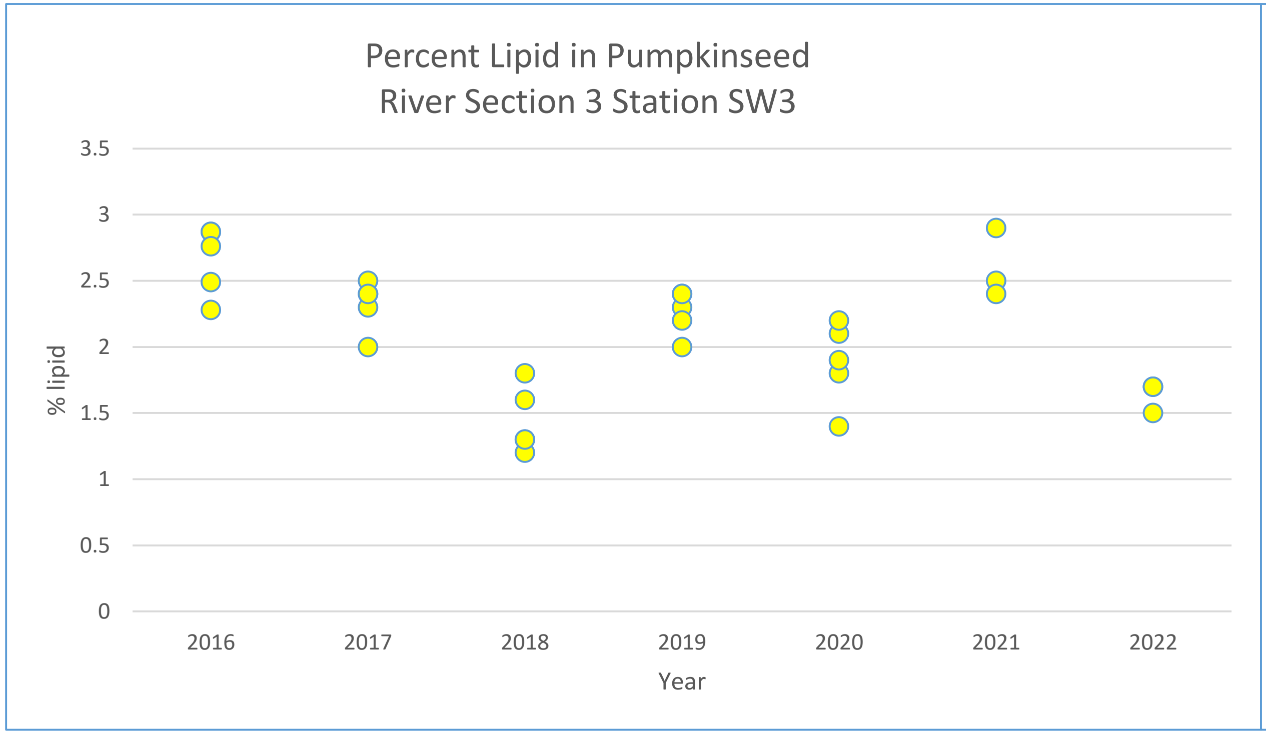


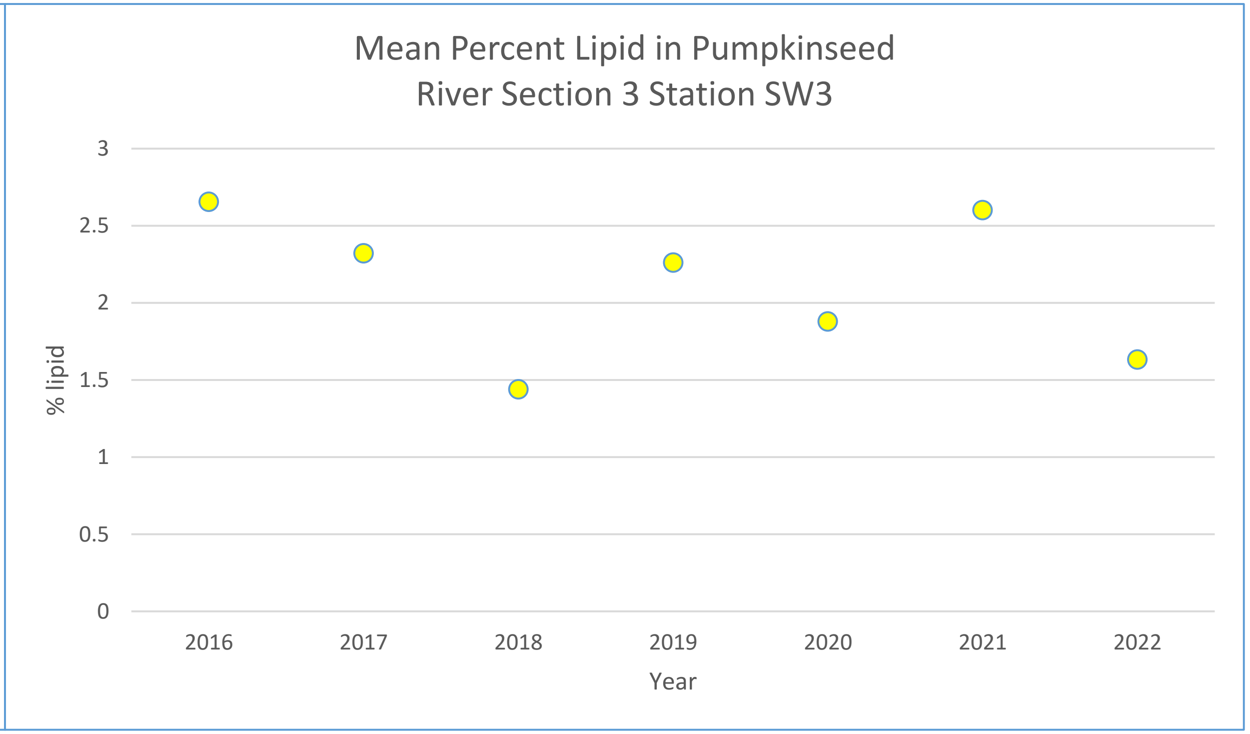
SW3 Pumpkinseed Lipid Based PCB



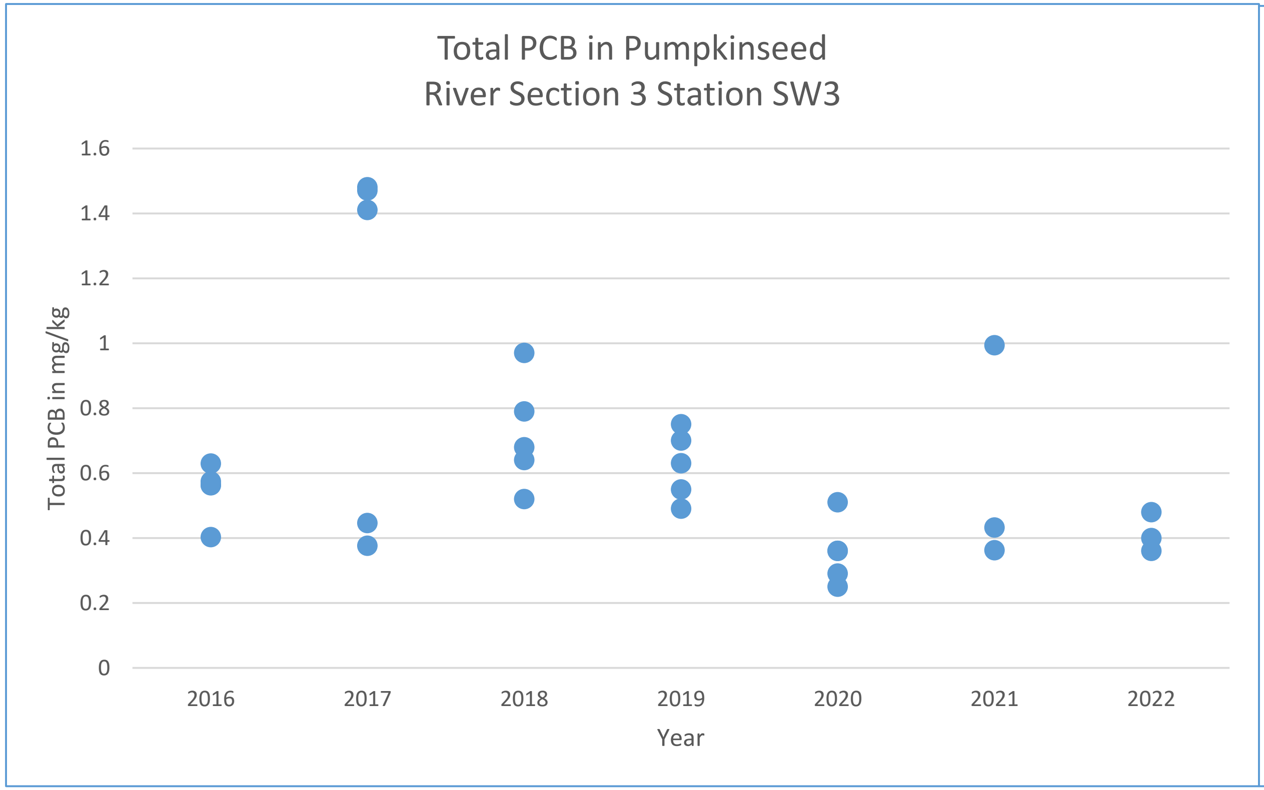


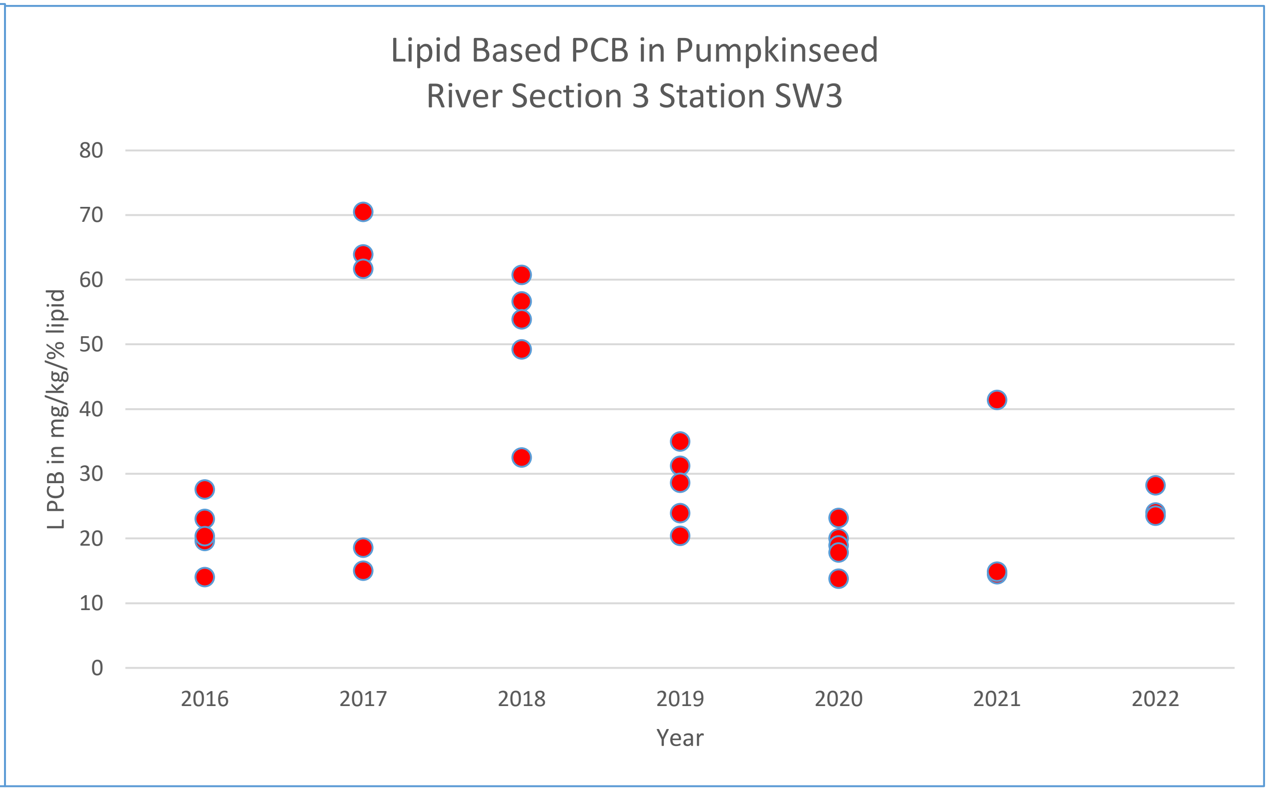
SW3 Pumpkinseed Percent Lipid



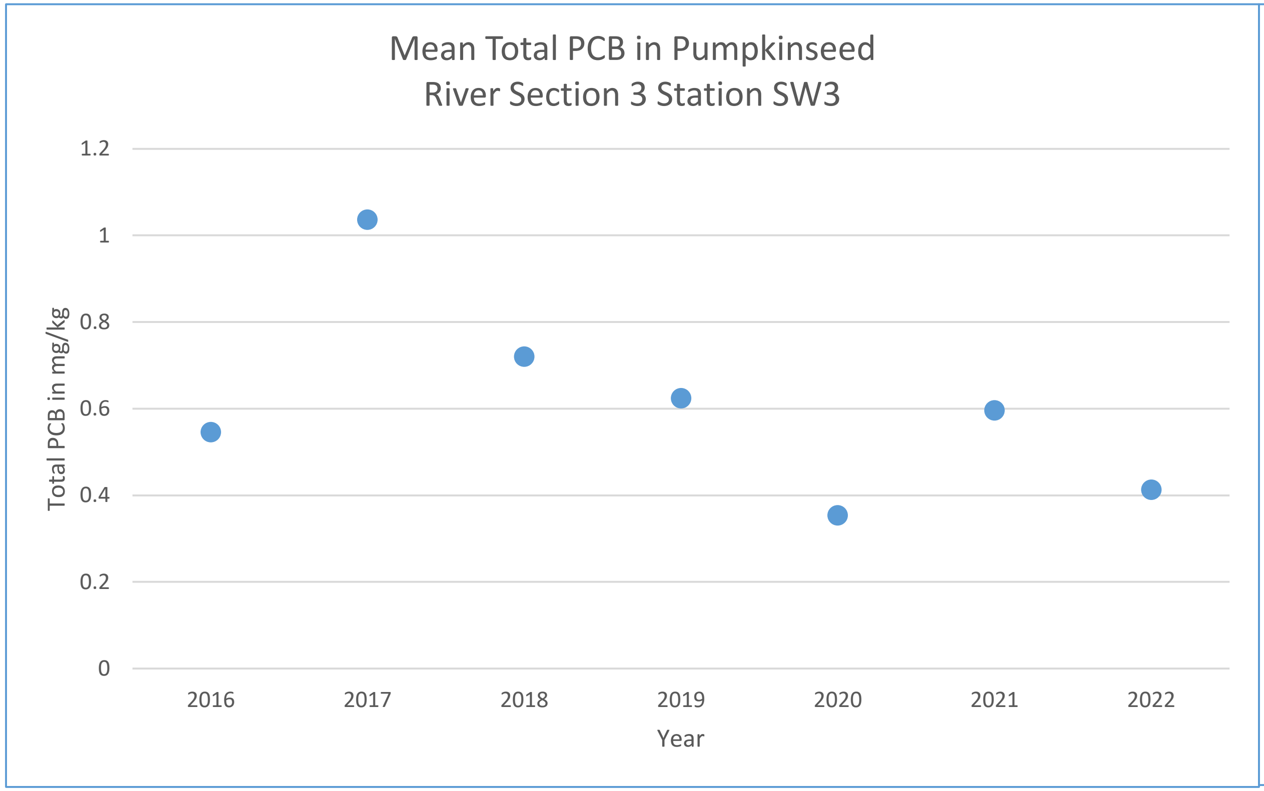


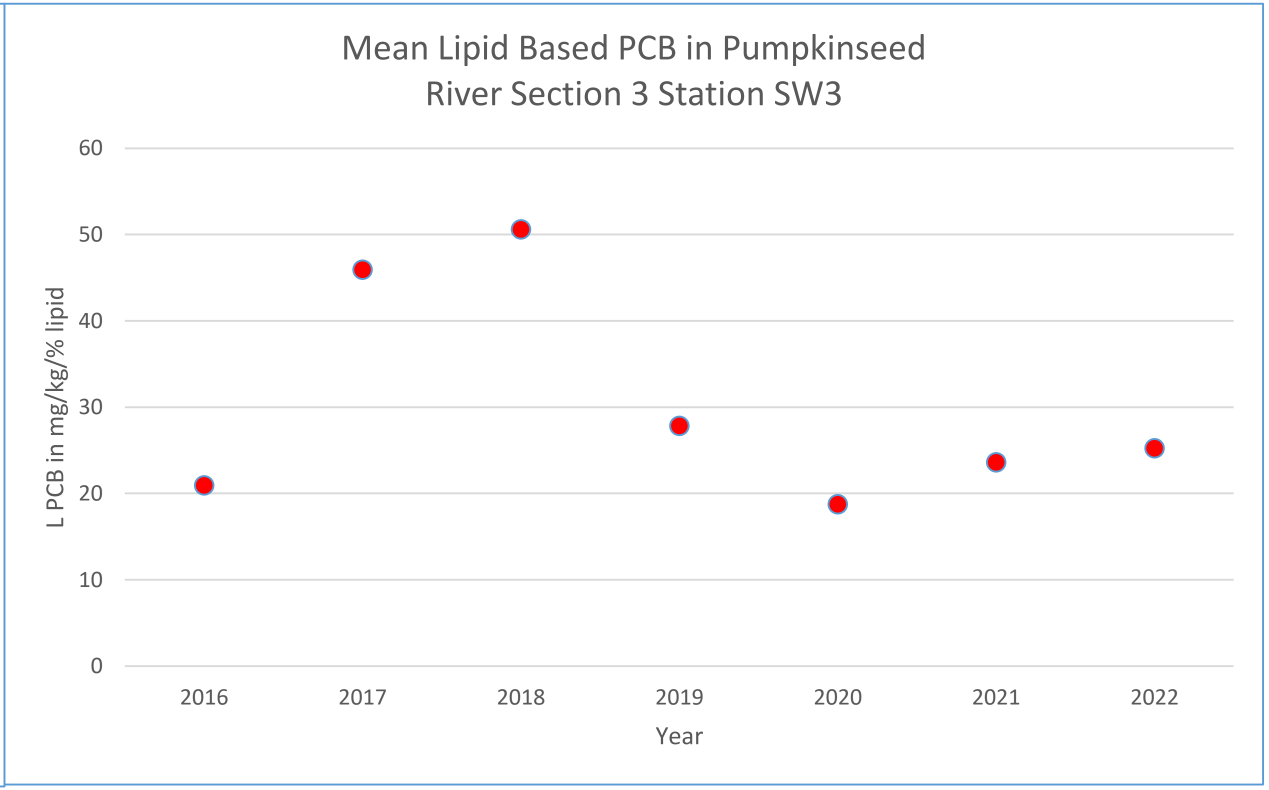
SW3 Pumpkinseed Total PCB and Lipid Based PCB





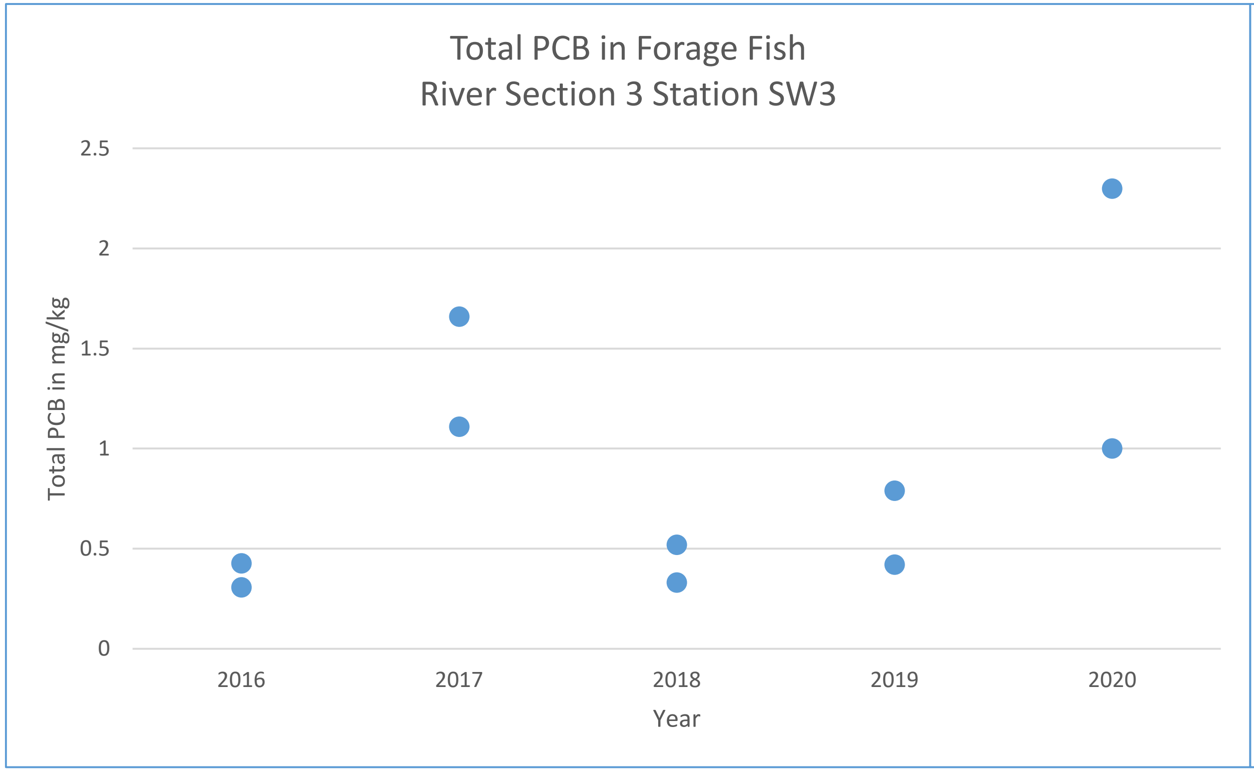
SW3 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

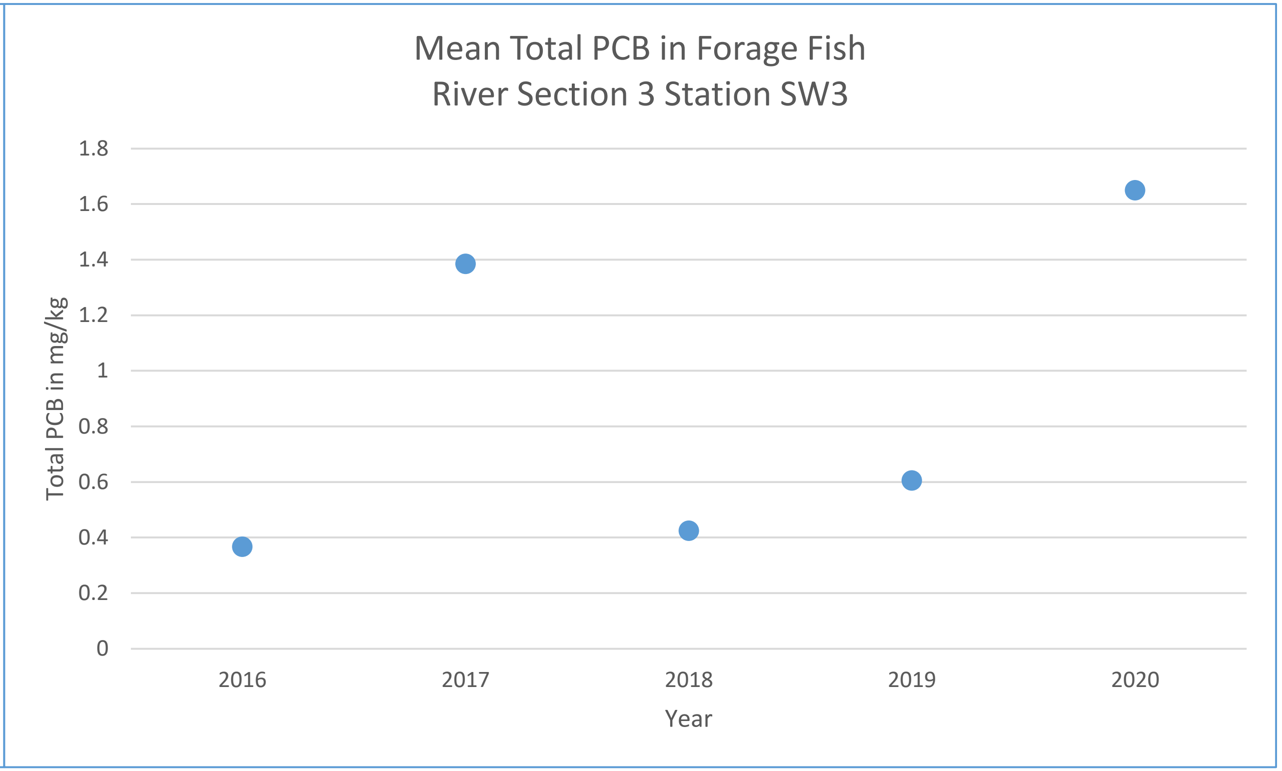




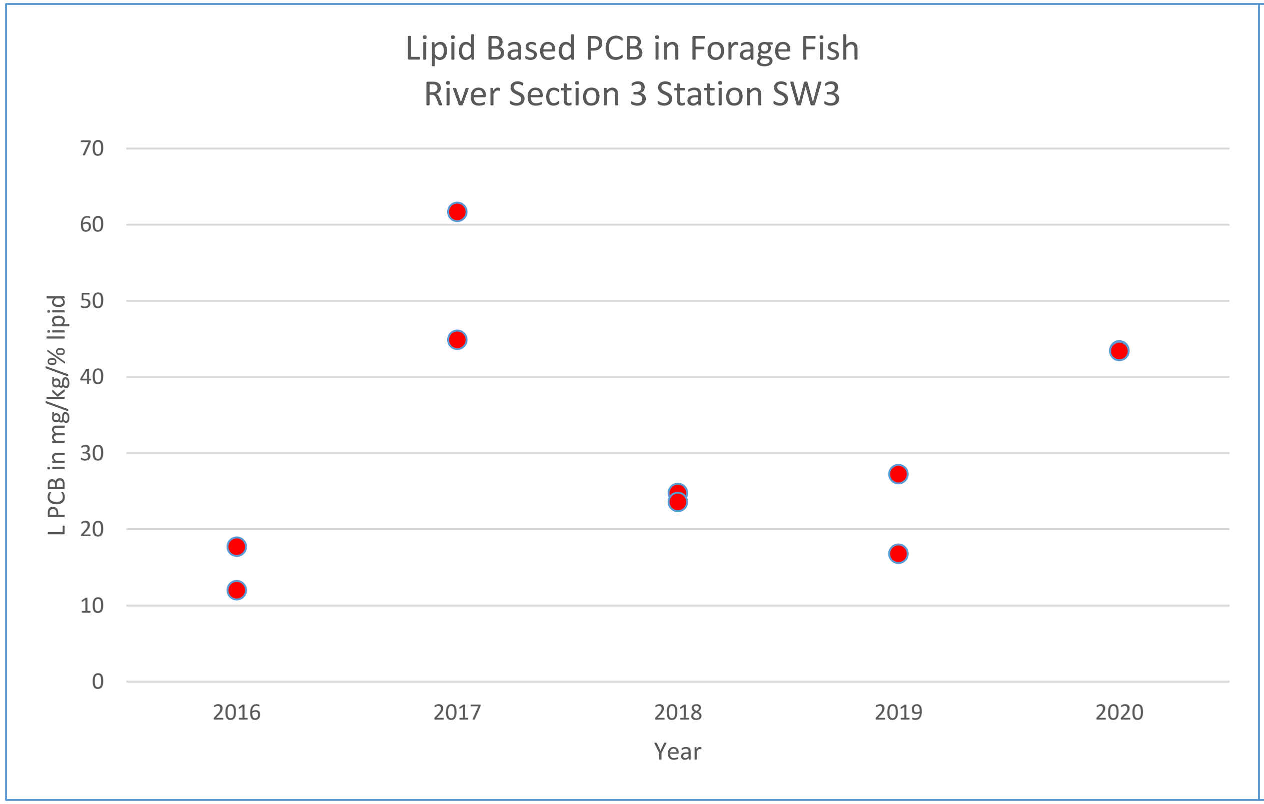
SW3 Forage Fish Data

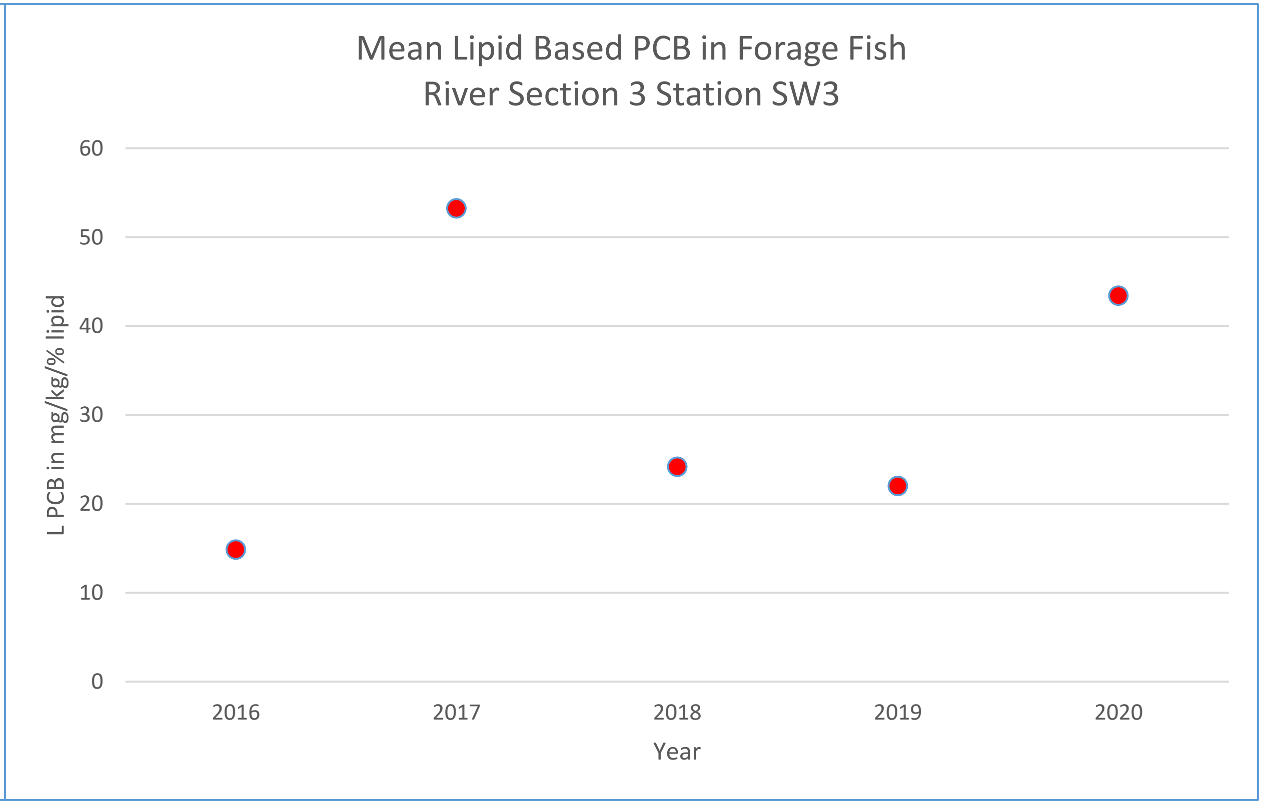
SW3 Forage Fish Total PCB



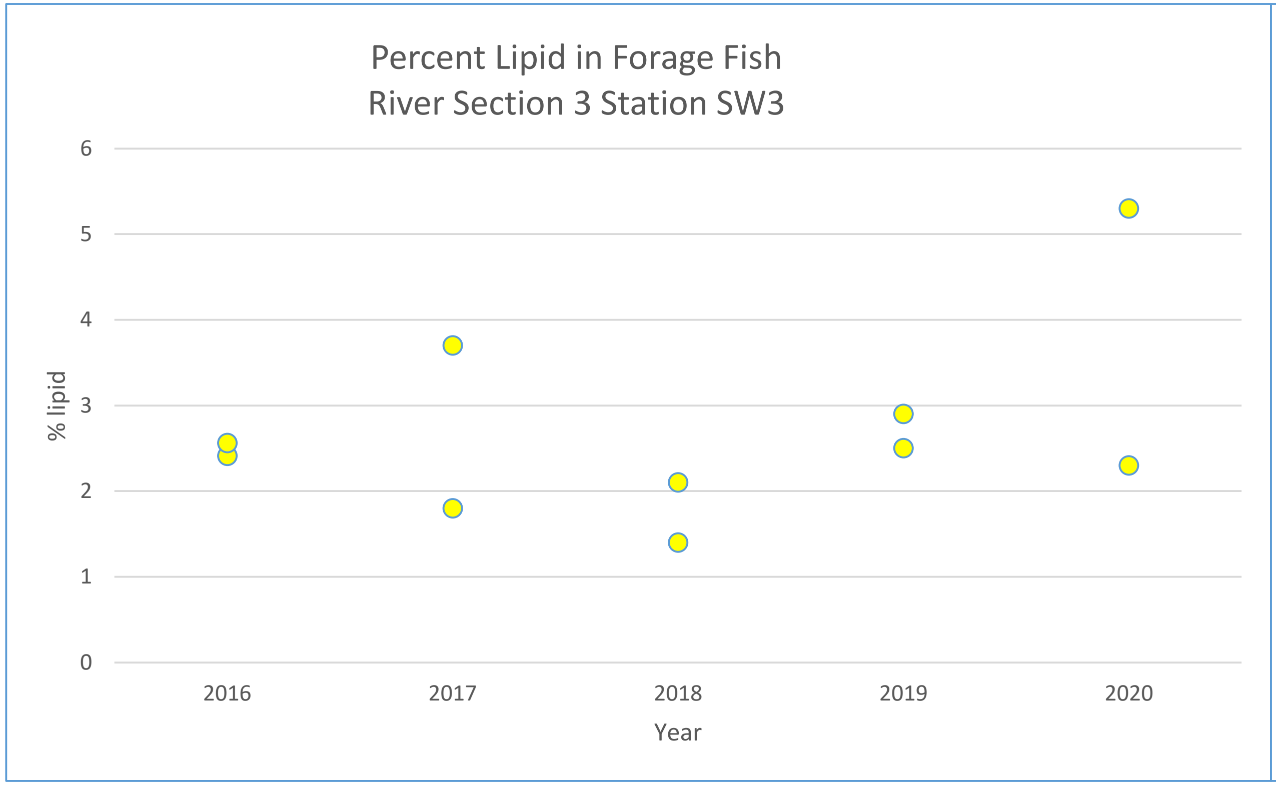


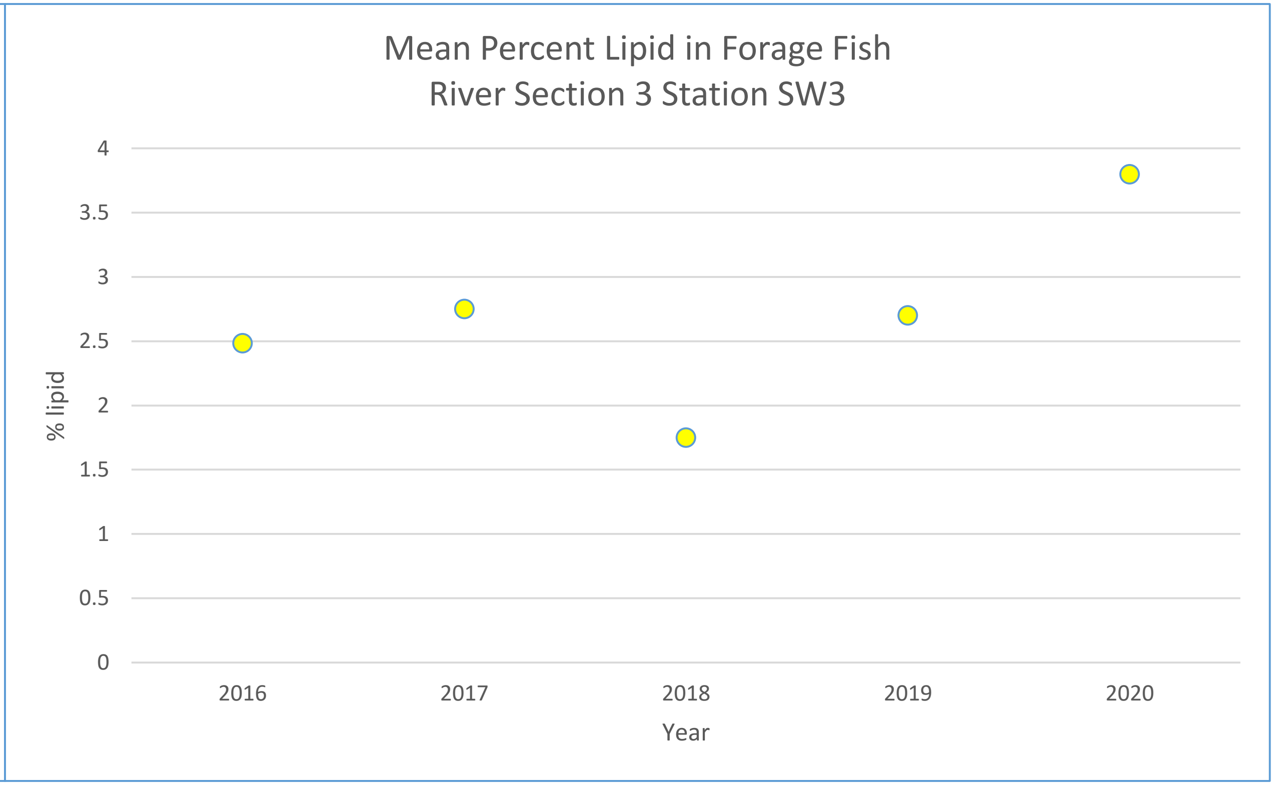
SW3 Forage Fish Lipid Based PCB



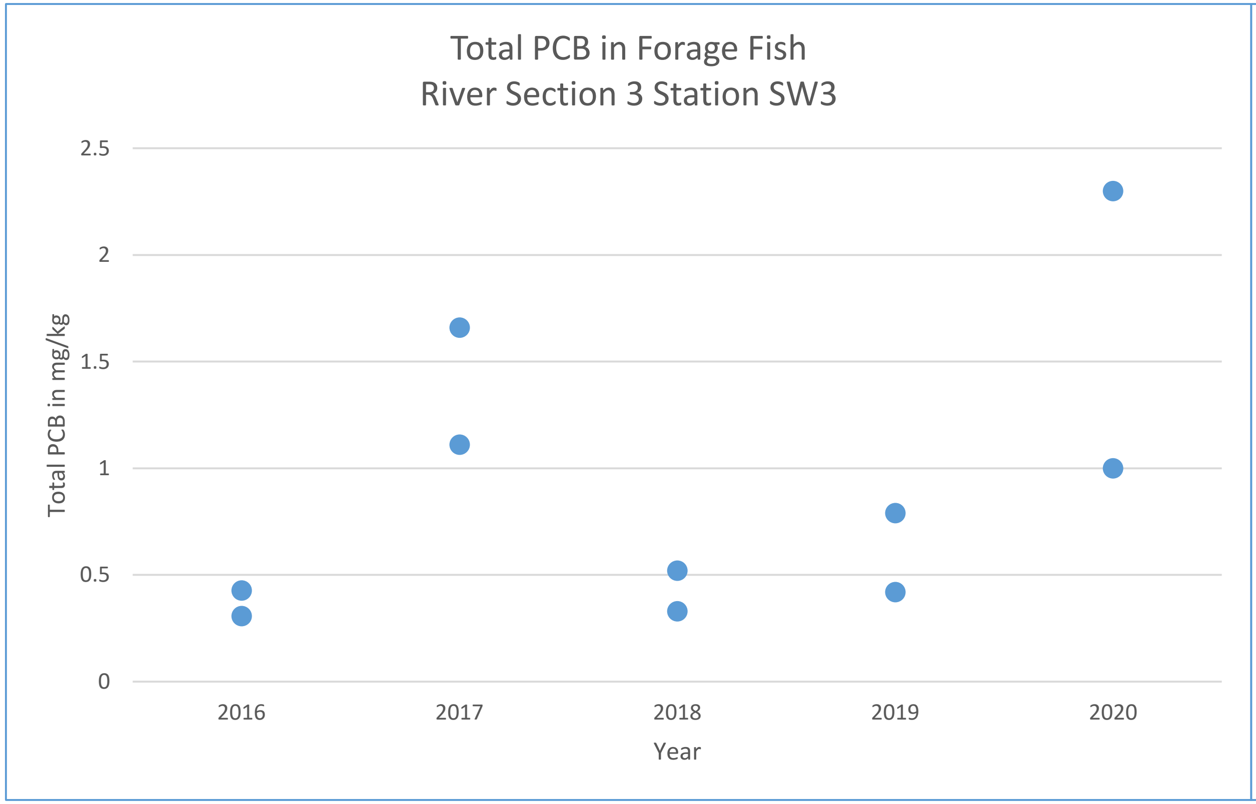


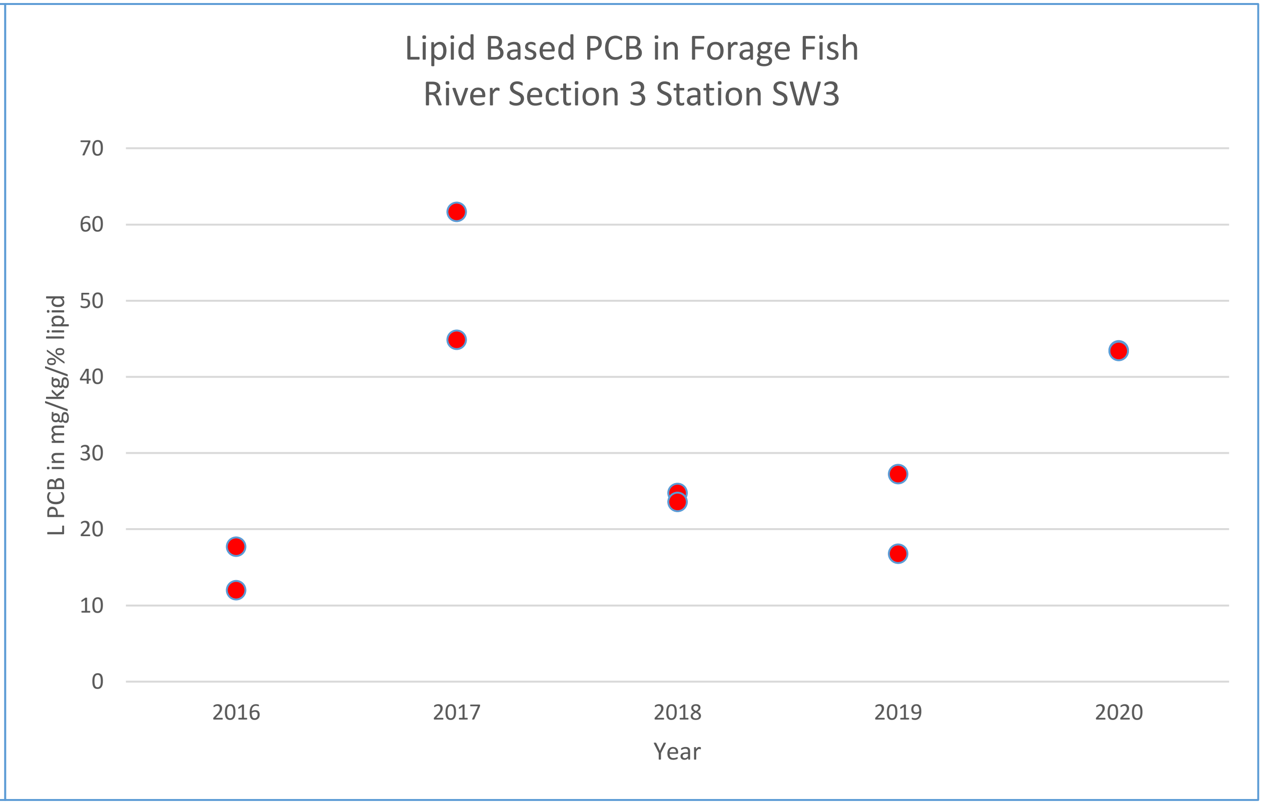
SW3 Forage Fish Percent Lipid



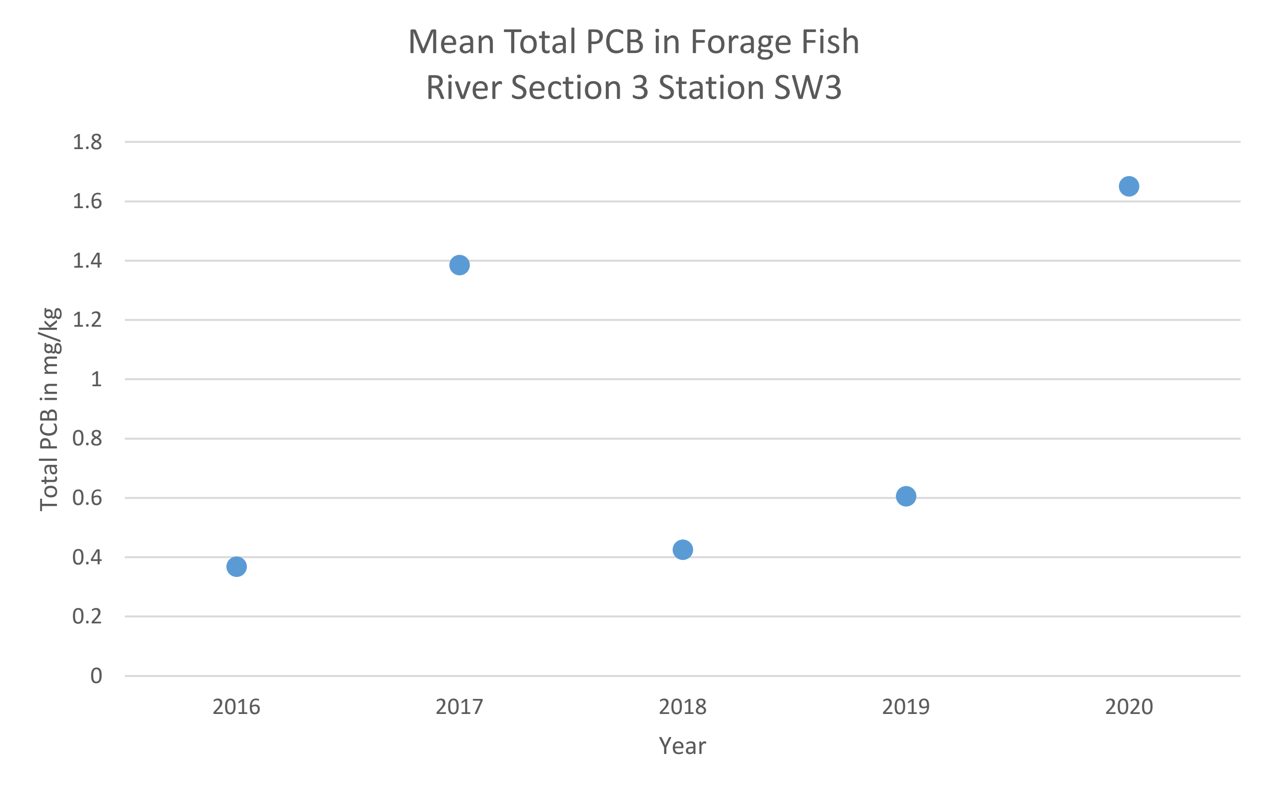


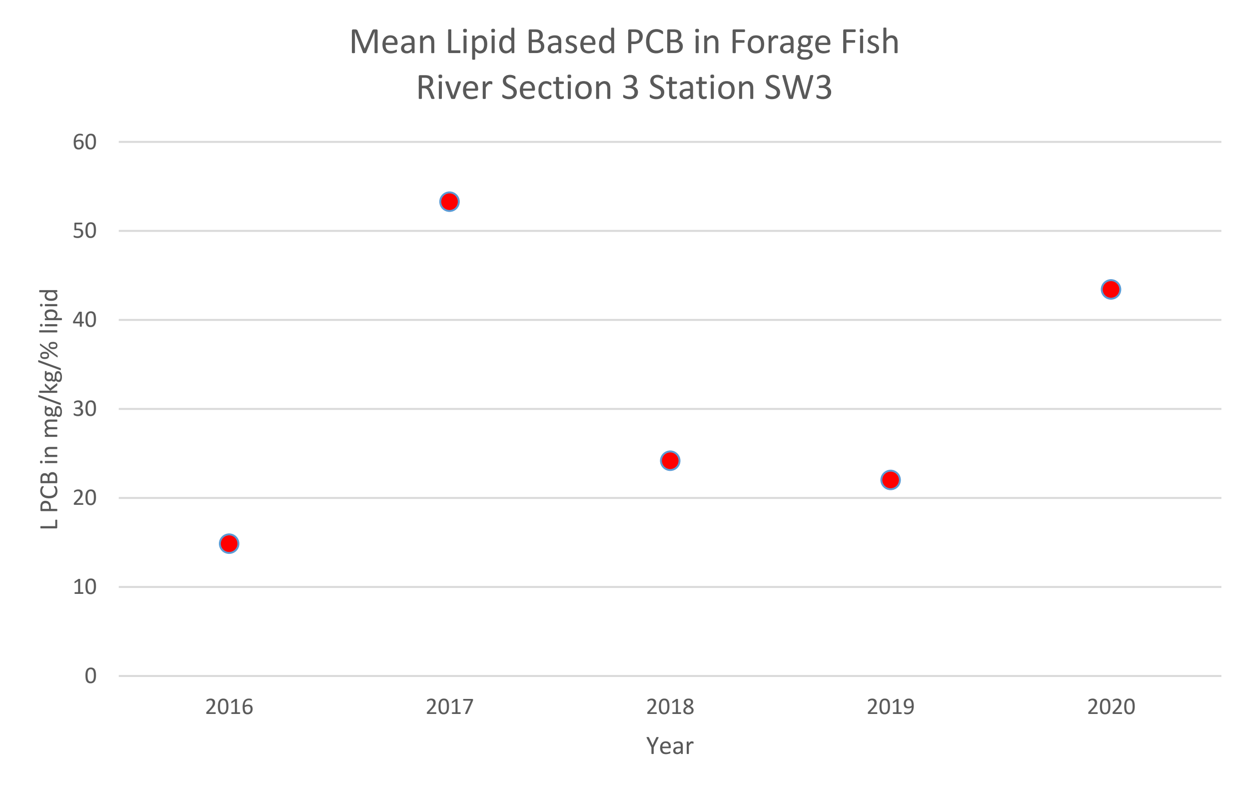
SW3 Forage Fish Total PCB and Lipid Based PCB





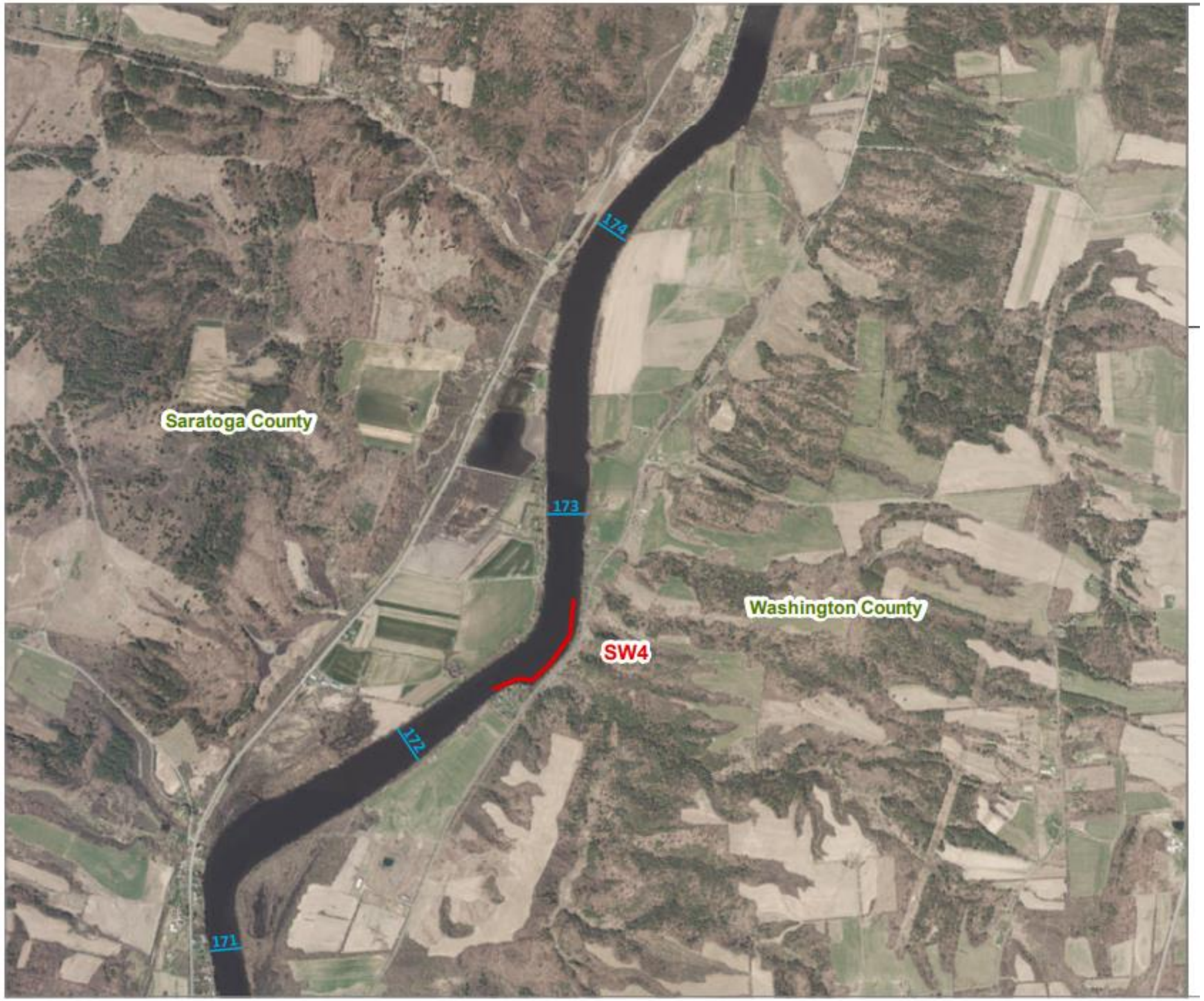
SW3 Forage Fish Mean Total PCB and Mean Lipid Based PCB





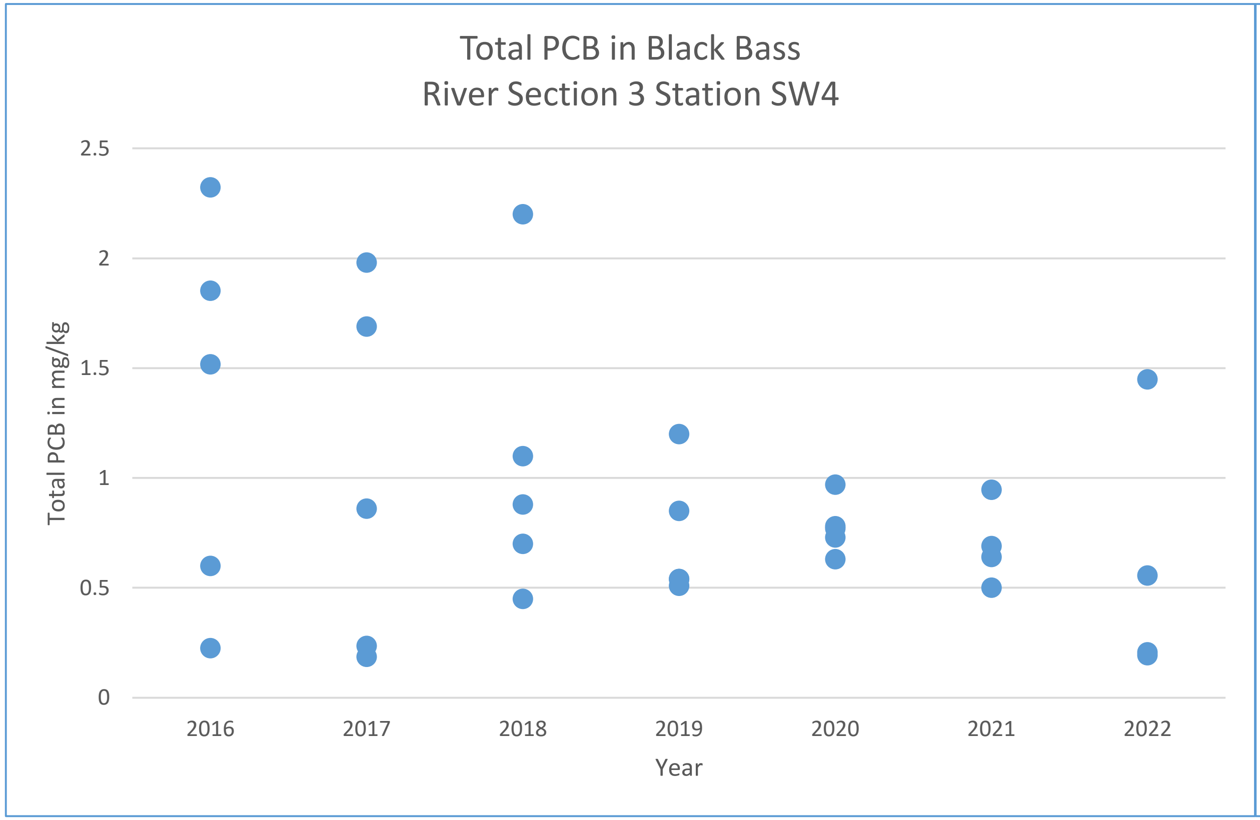
Station SW4

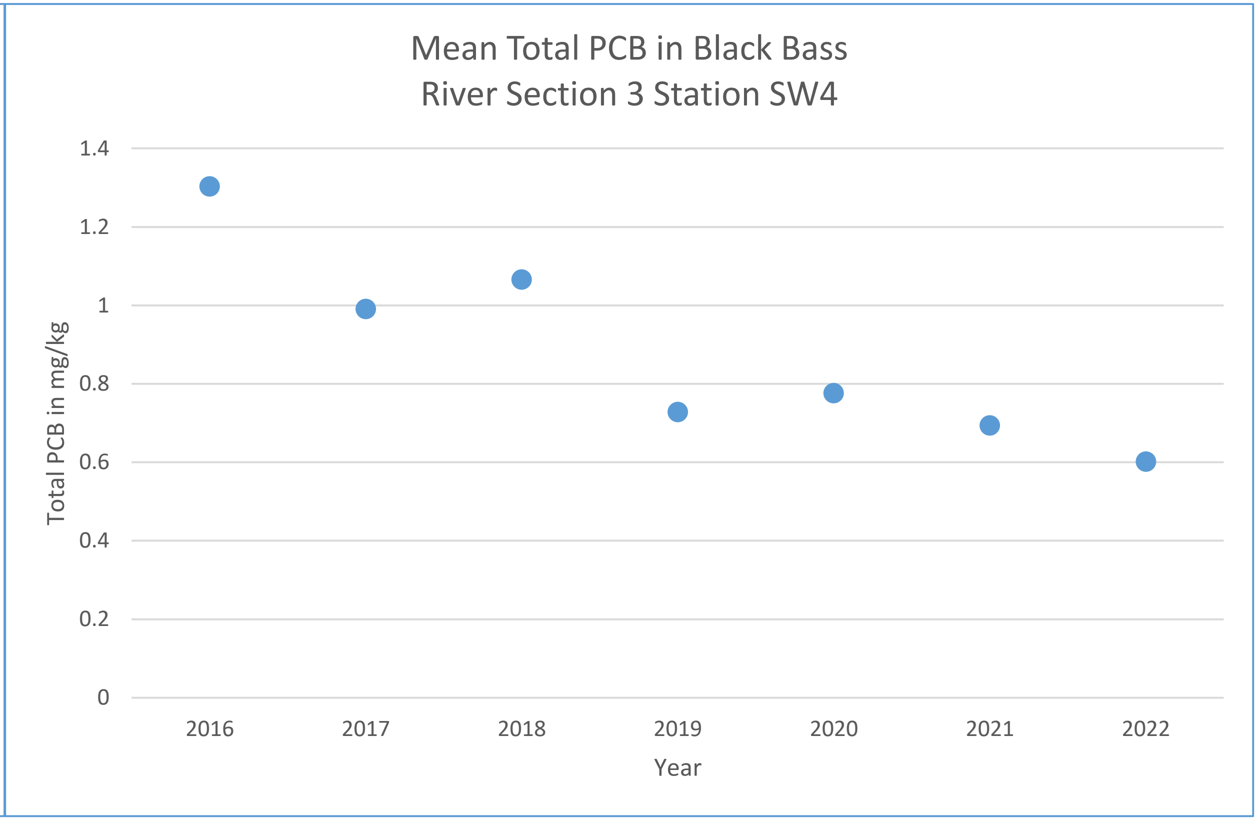
Station SW4



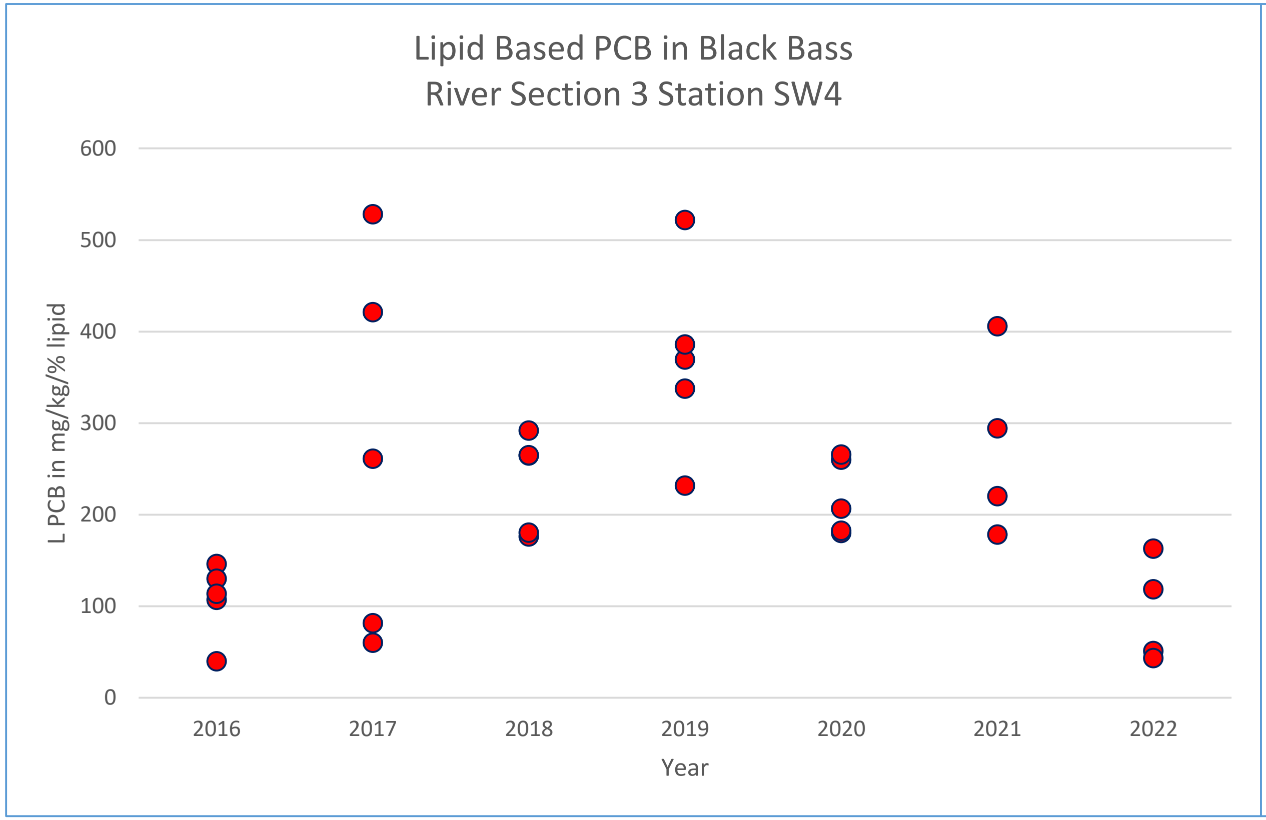
SW4 Black Bass Data

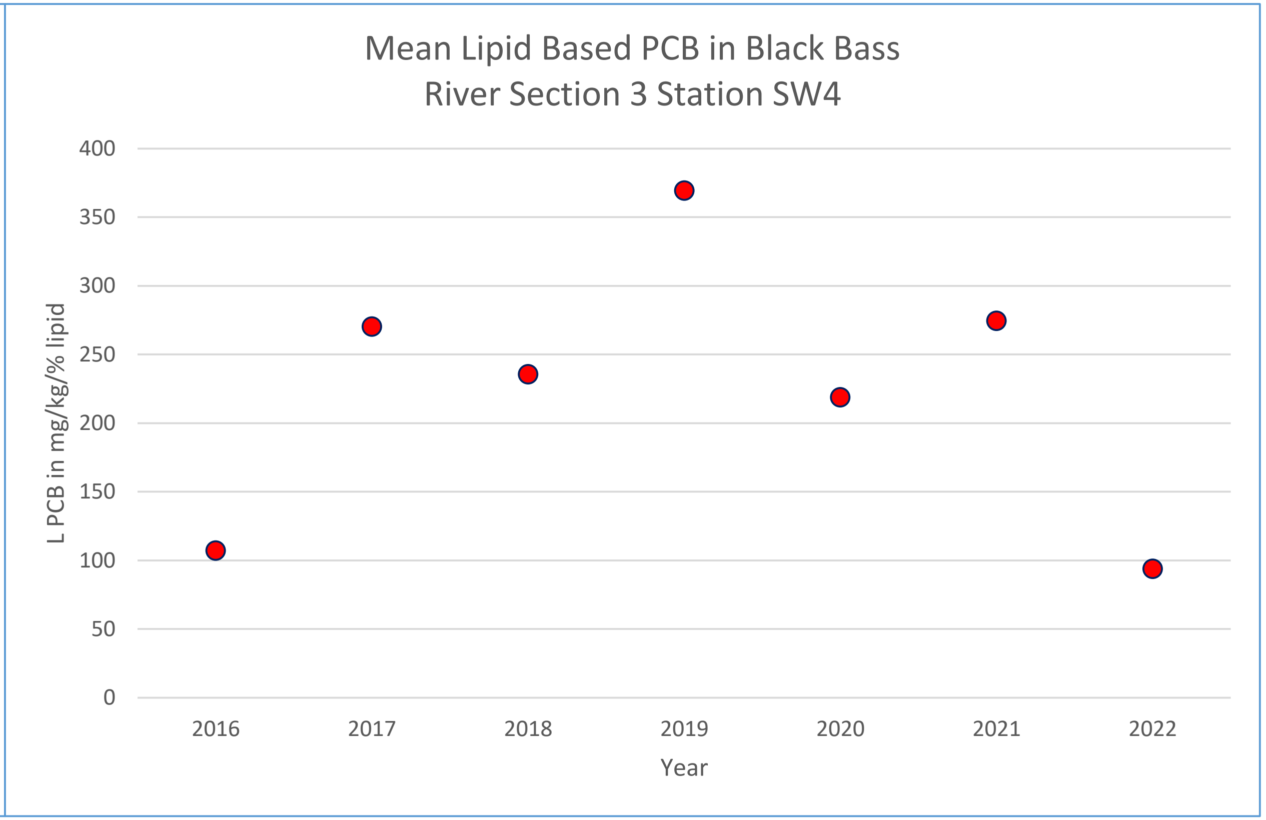
SW4 Black Bass Total PCB



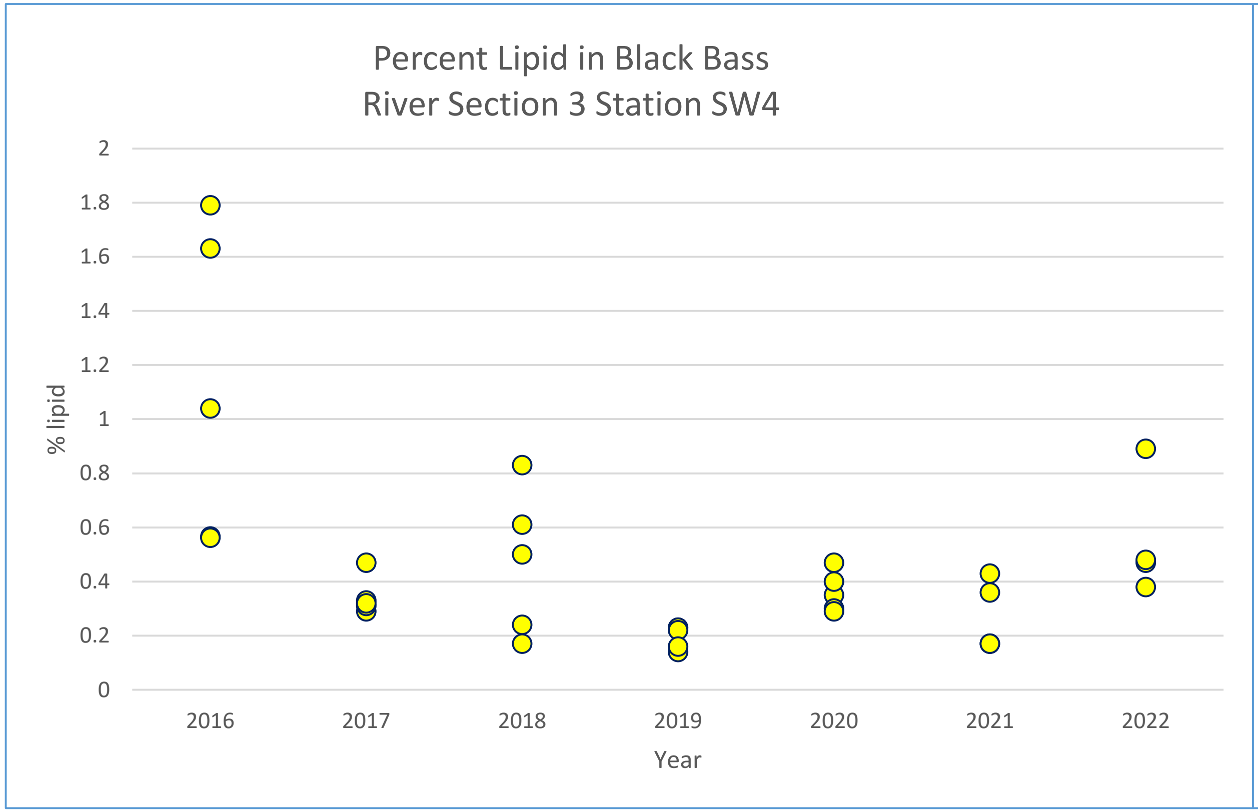


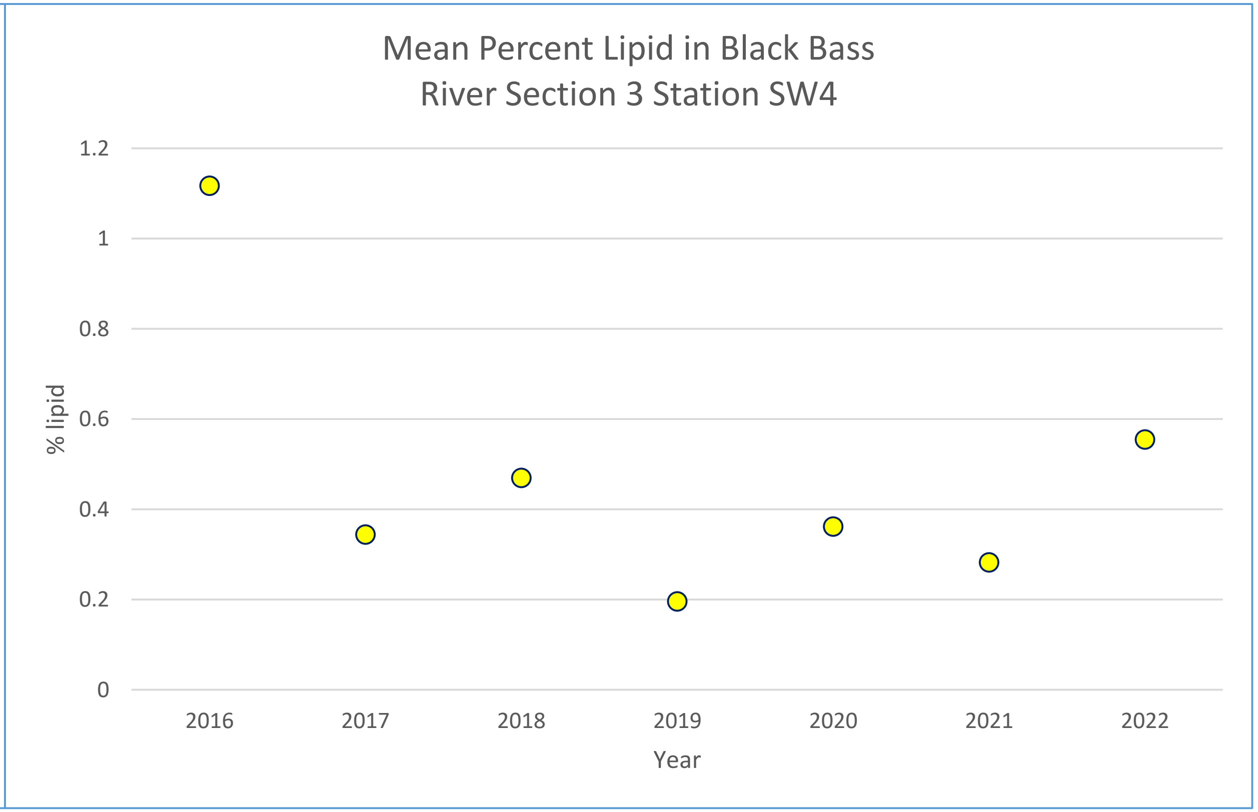
SW4 Black Bass Lipid Based PCB



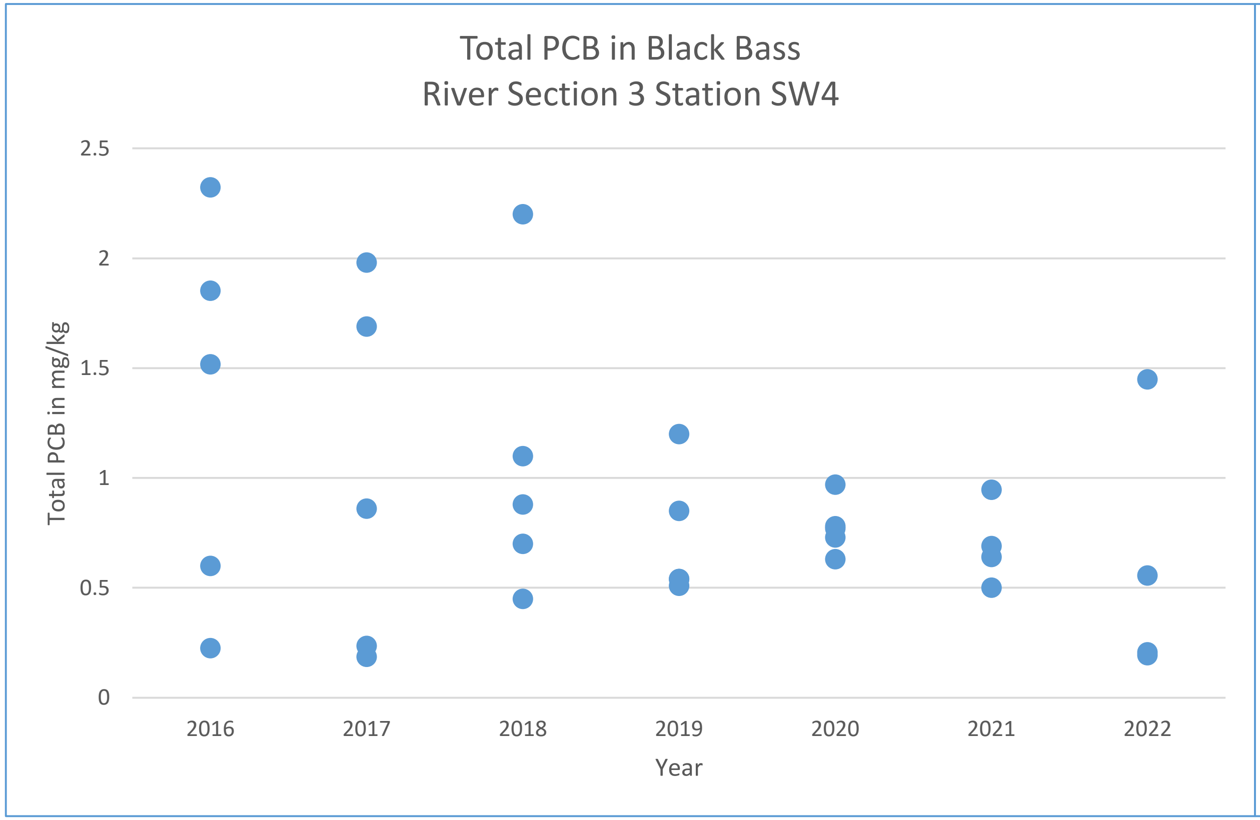


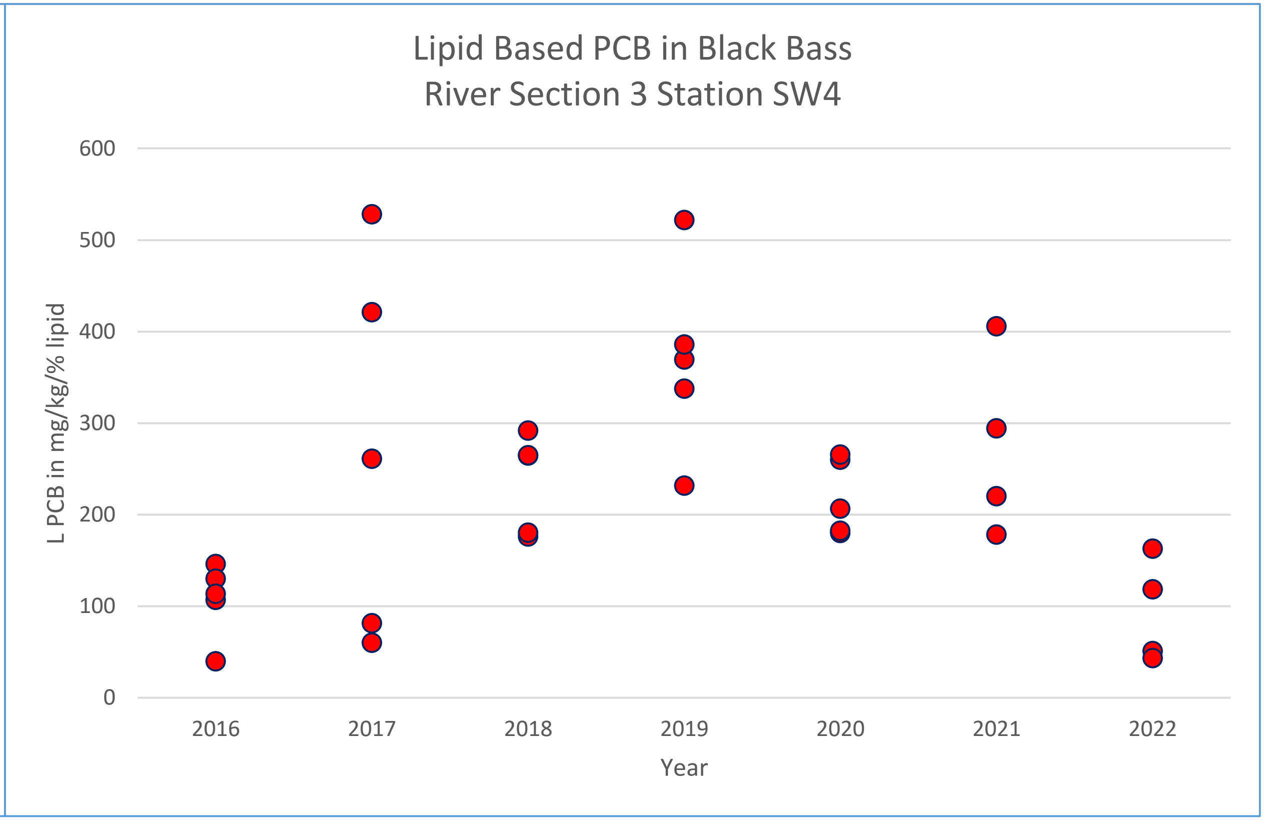
SW4 Black Bass Percent Lipid



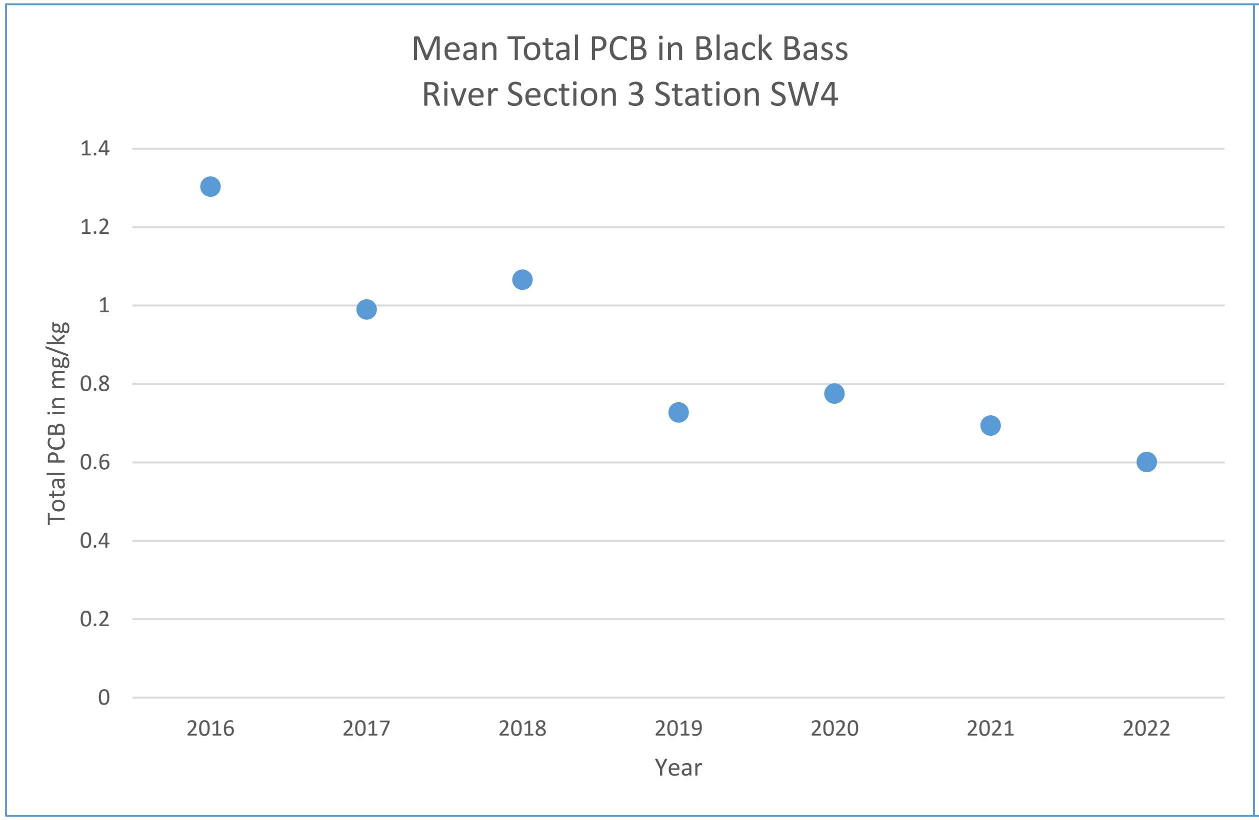


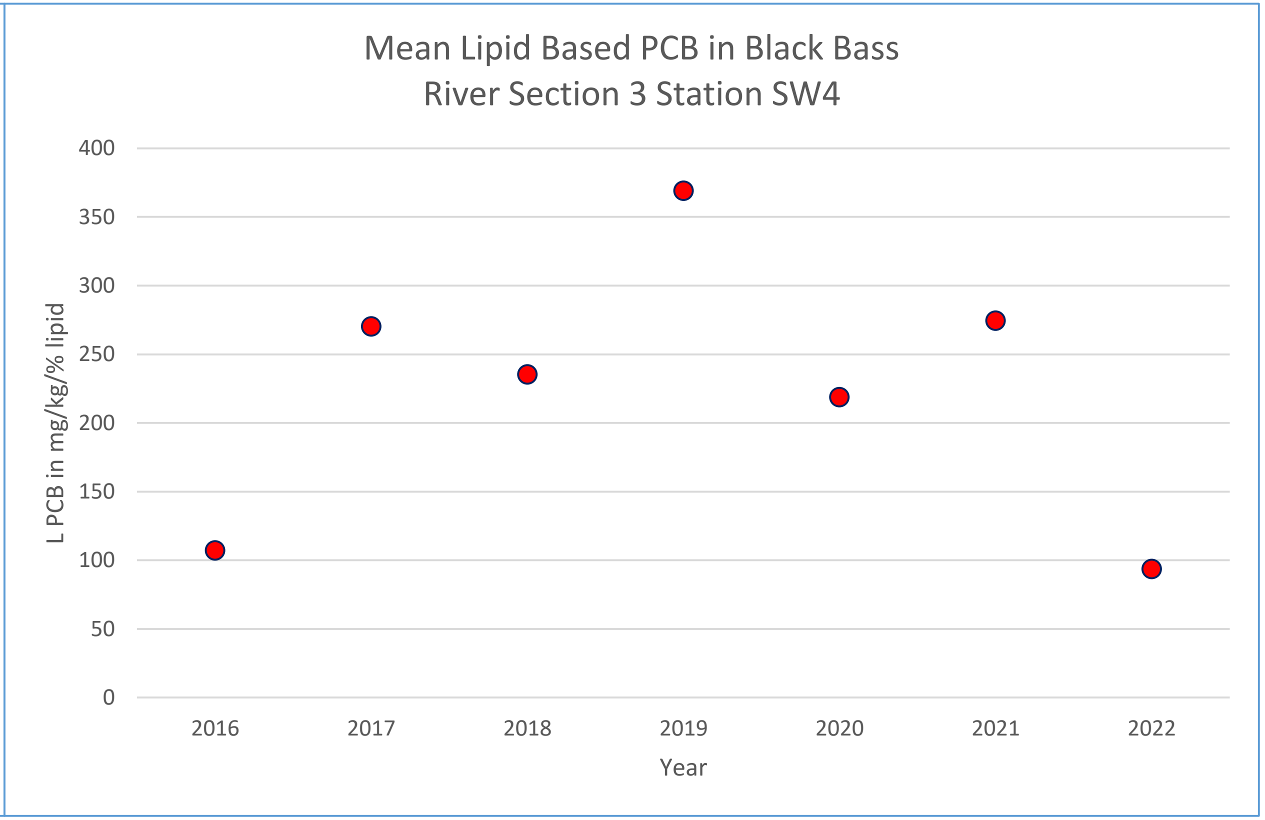
SW4 Black Bass Total PCB and Lipid Based PCB





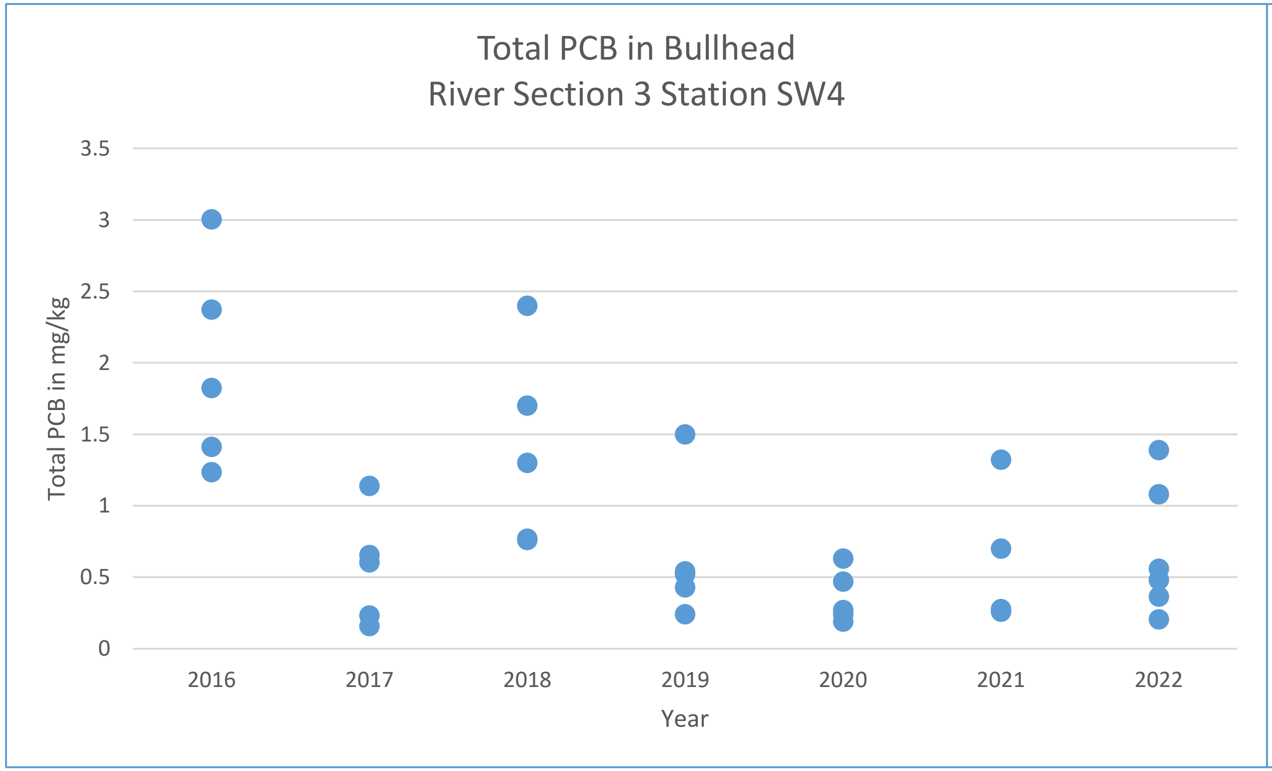
SW4 Black Bass Mean Total PCB and Mean Lipid Based PCB

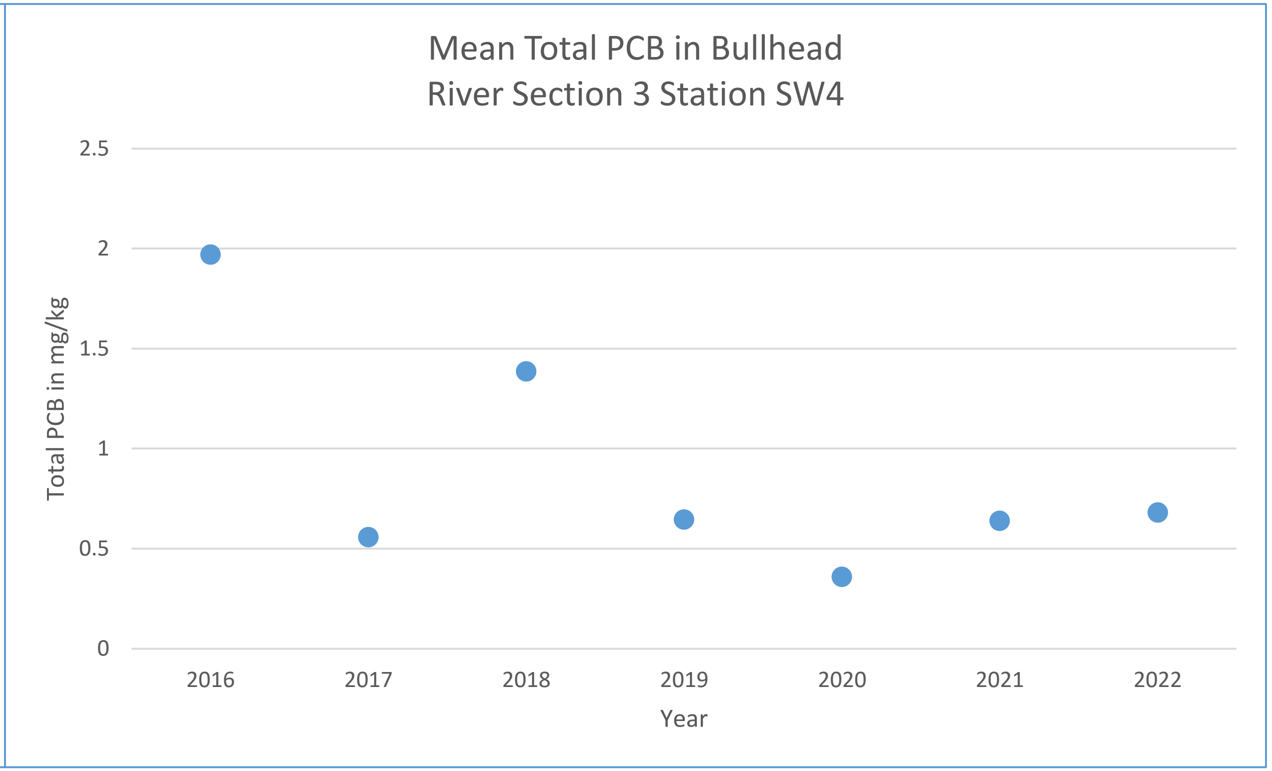




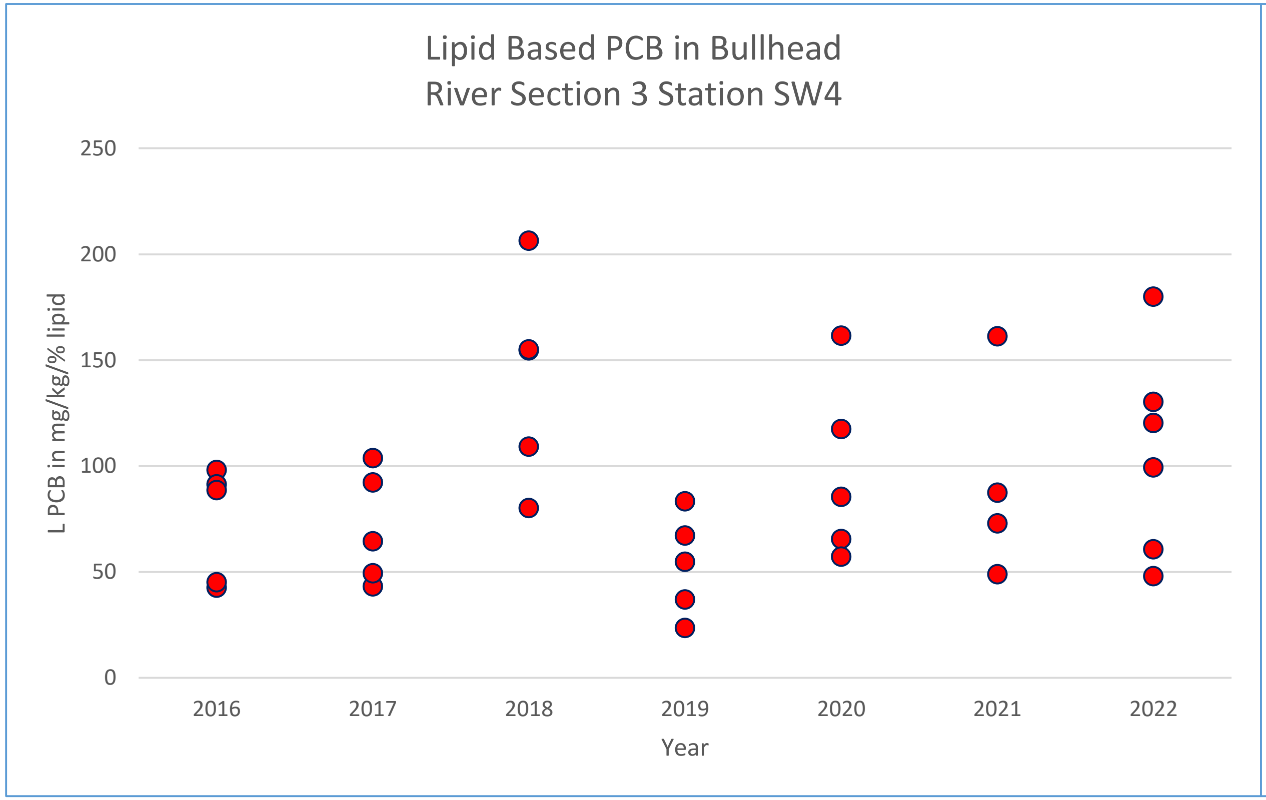
SW4 Bullhead Data

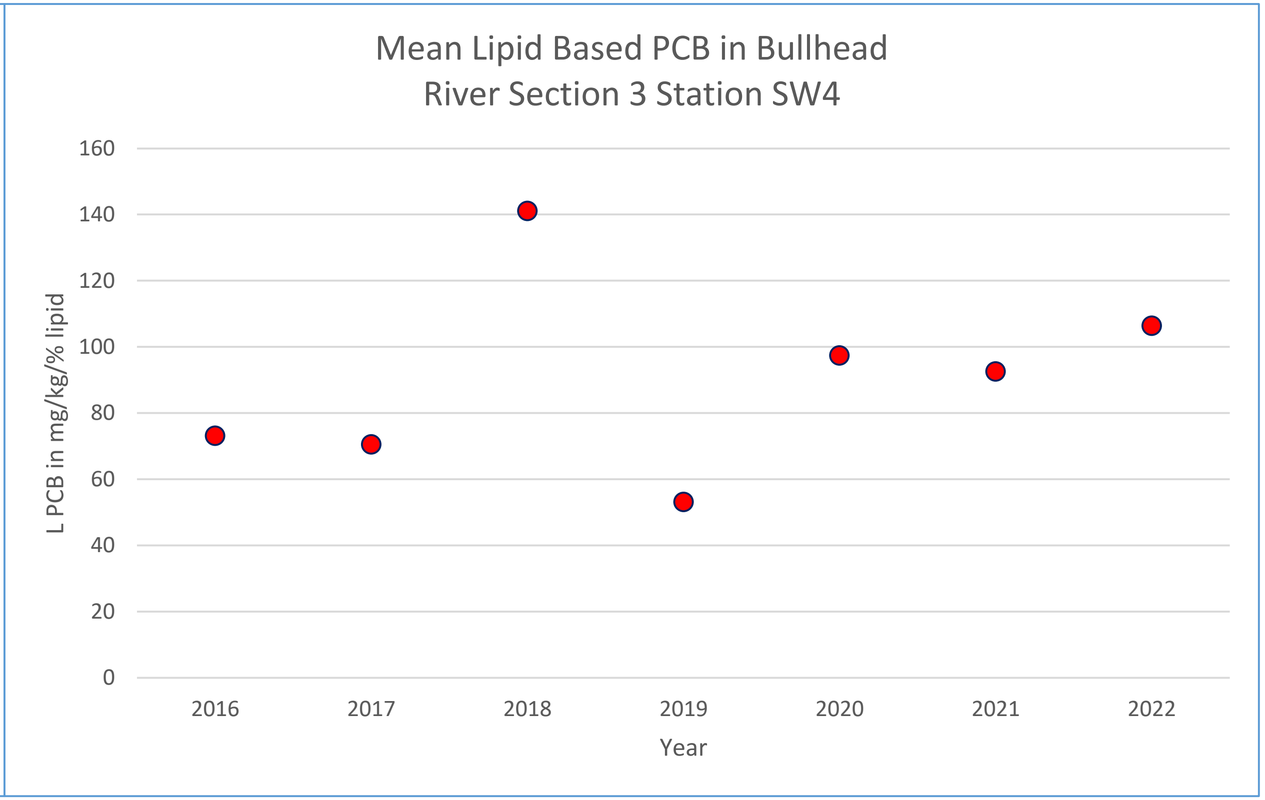
SW4 Bullhead Total PCB



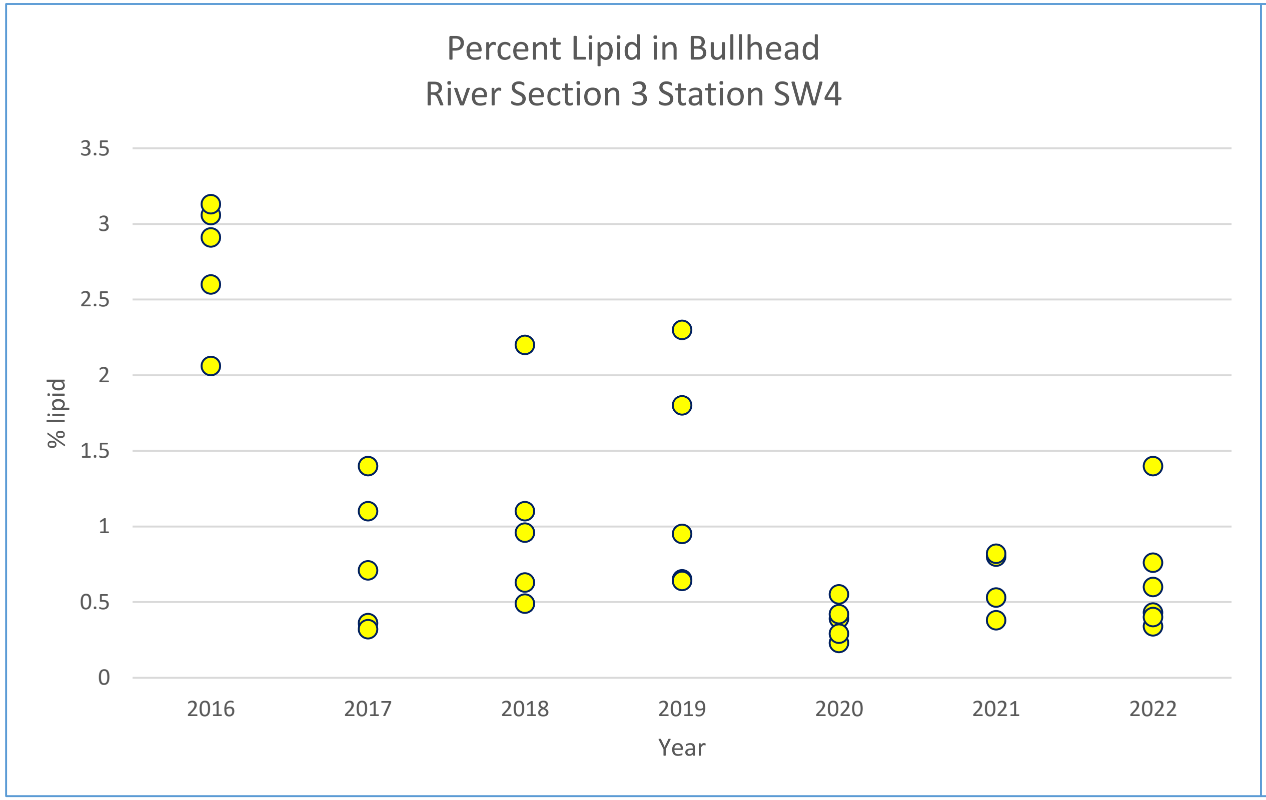


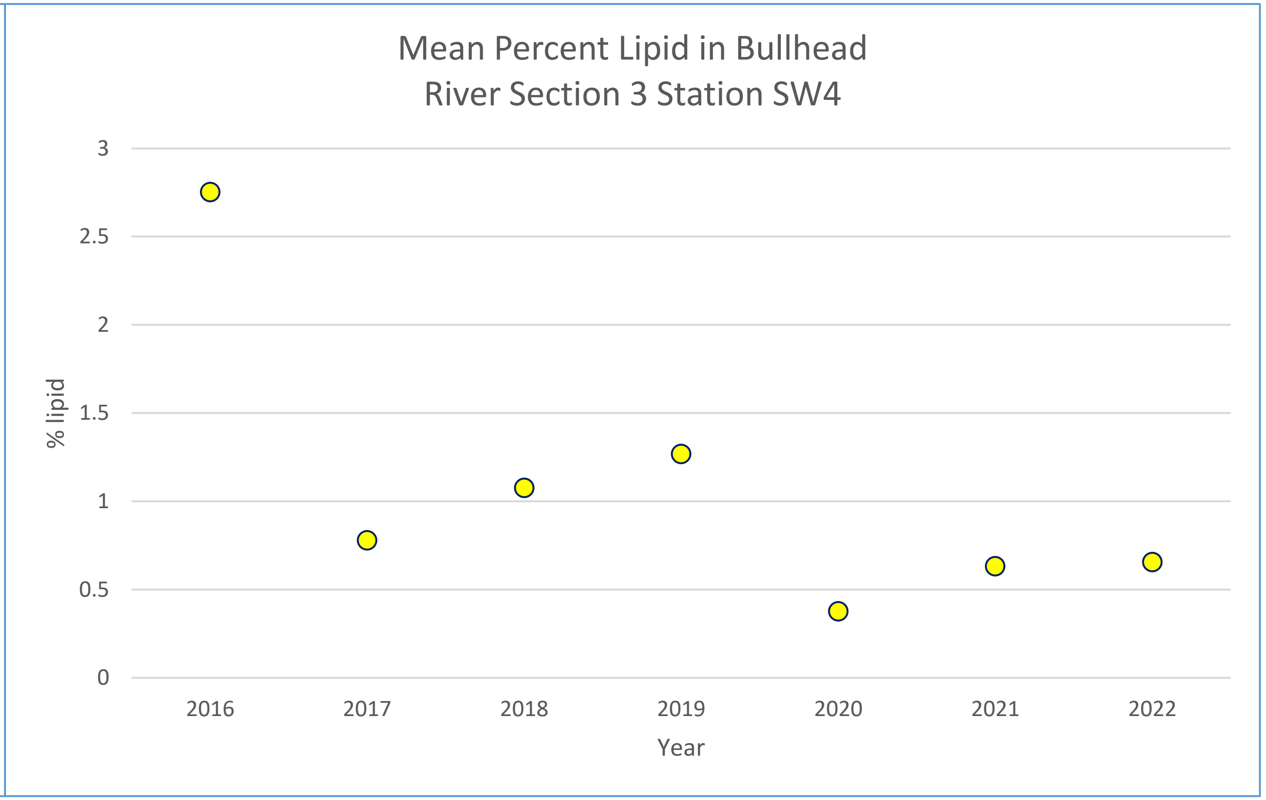
SW4 Bullhead Lipid Based PCB



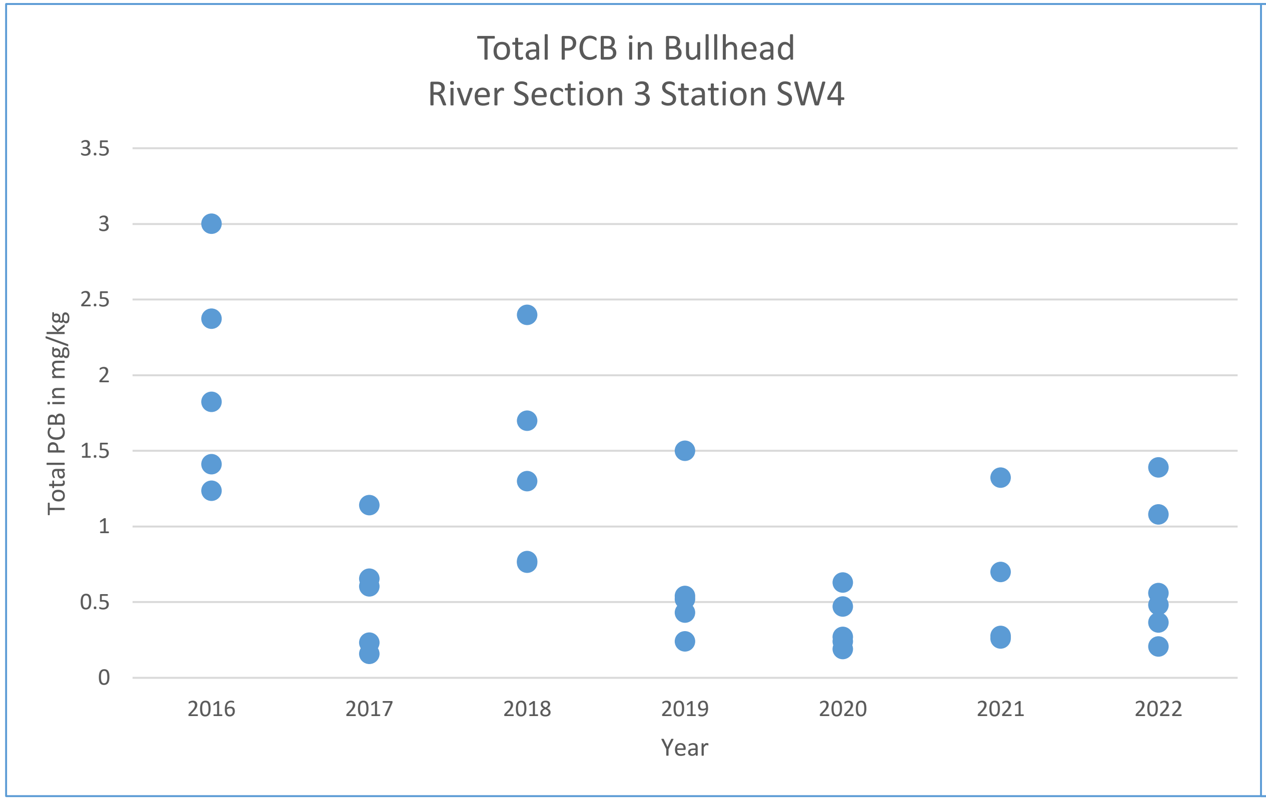


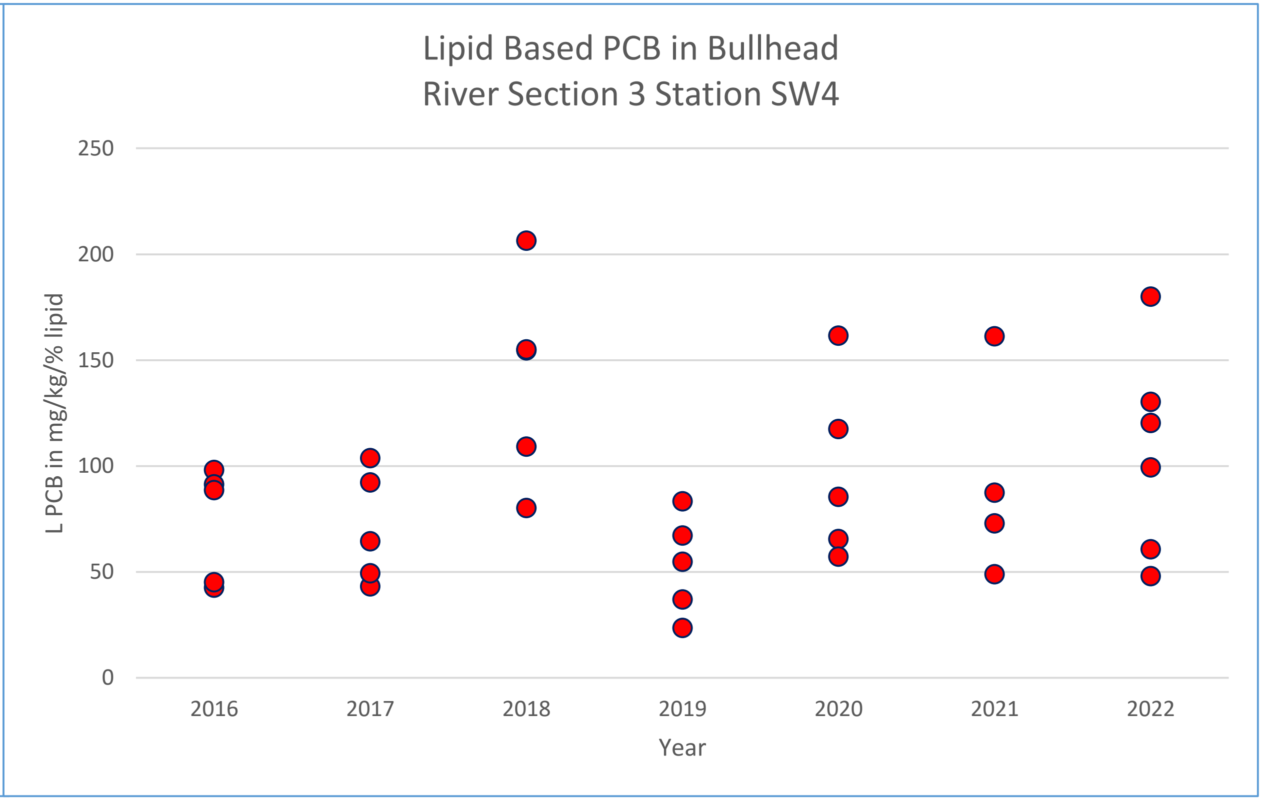
SW4 Bullhead Percent Lipid



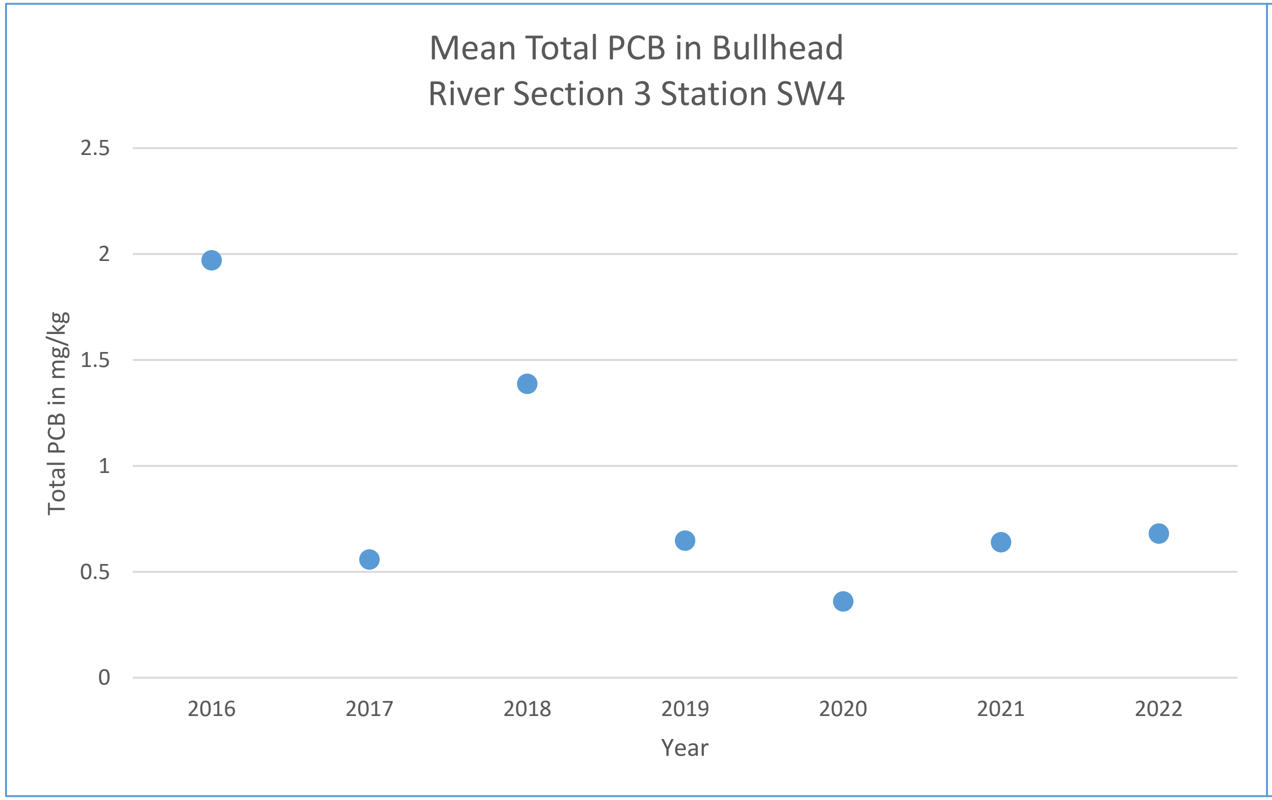


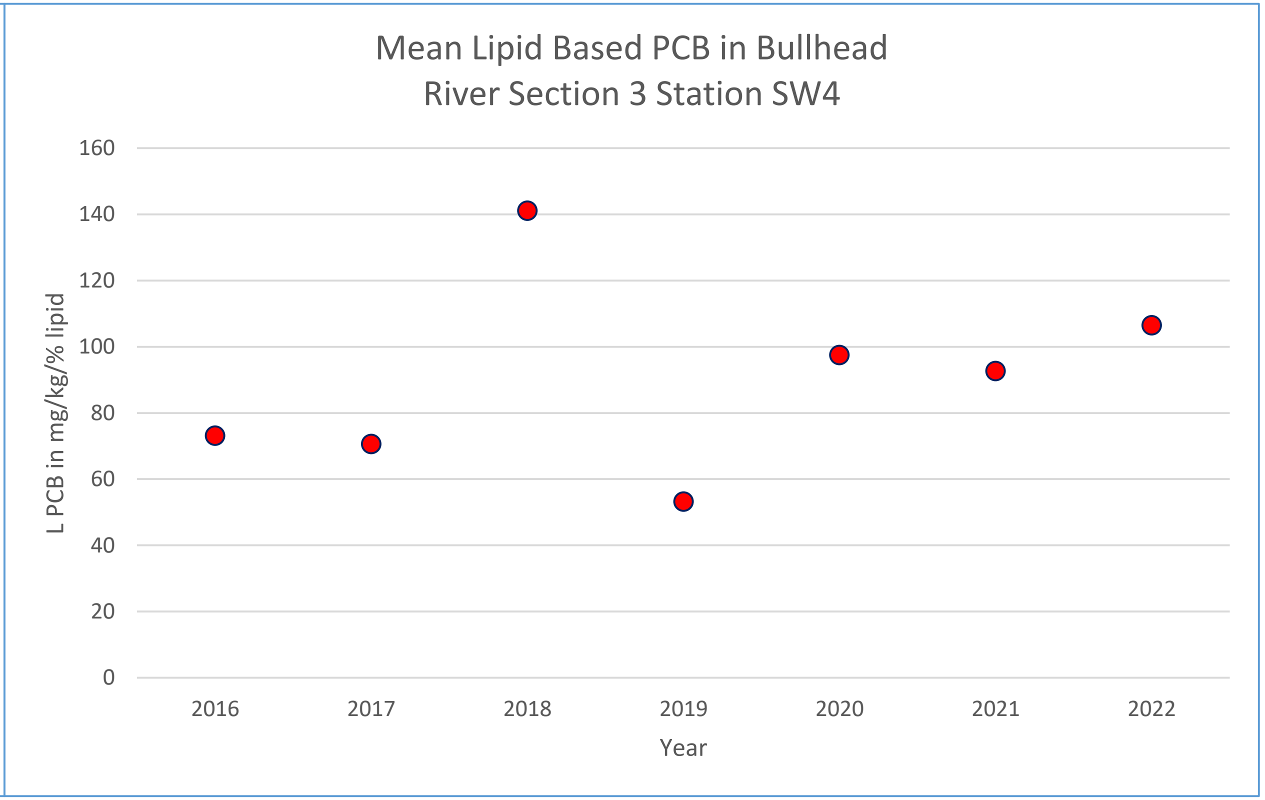
SW4 Bullhead Total PCB and Lipid Based PCB





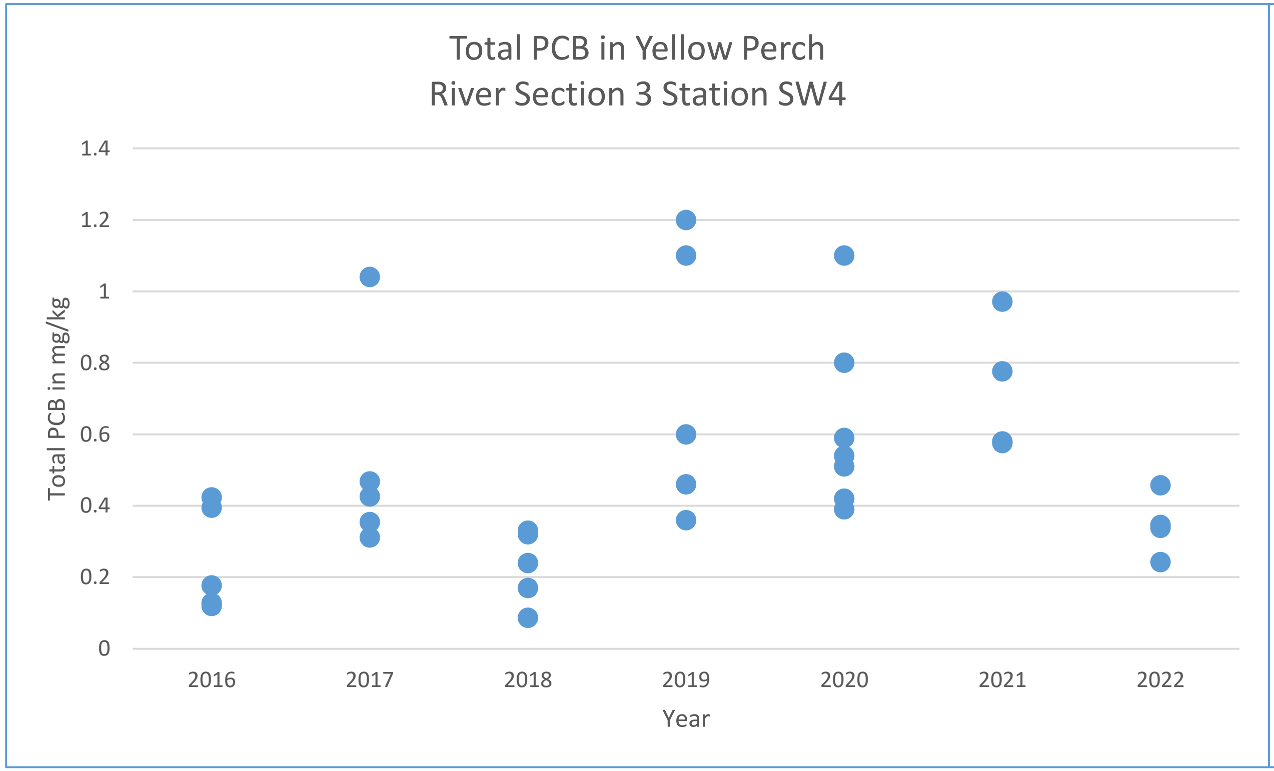
SW4 Bullhead Mean Total PCB and Mean Lipid Based PCB

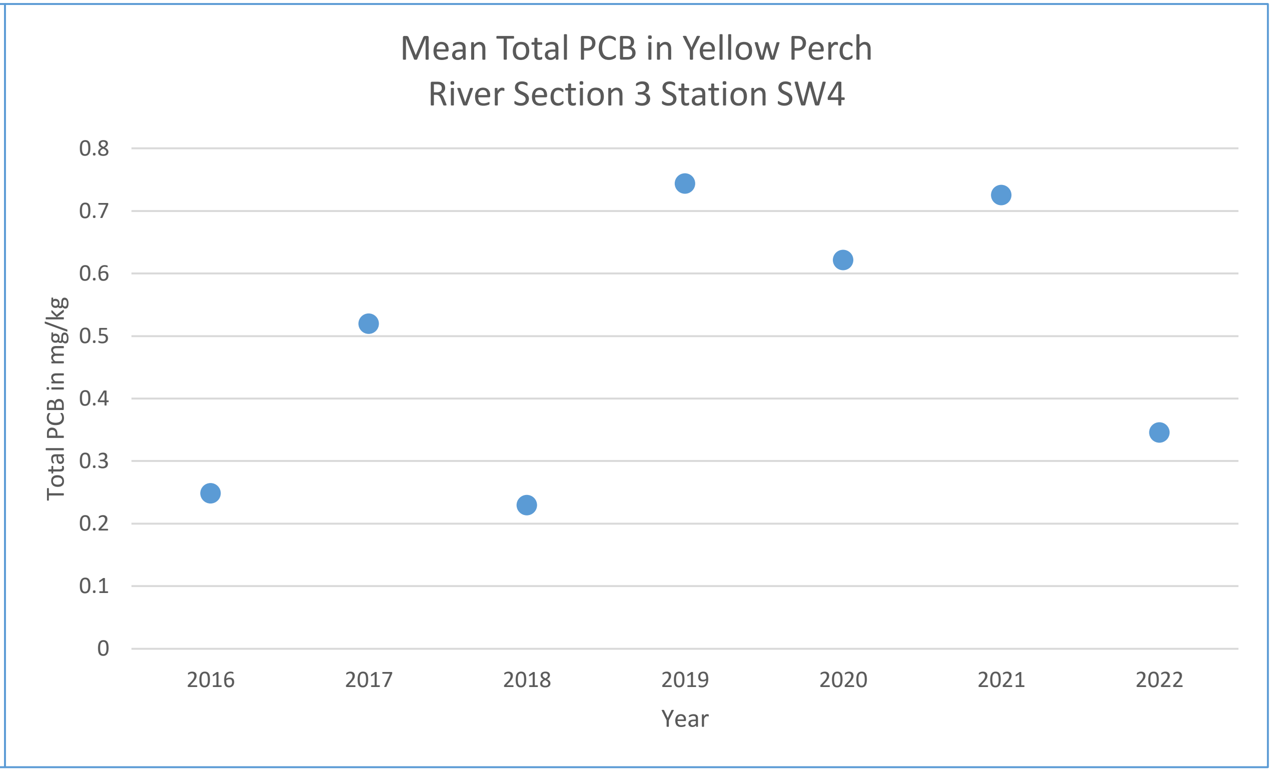




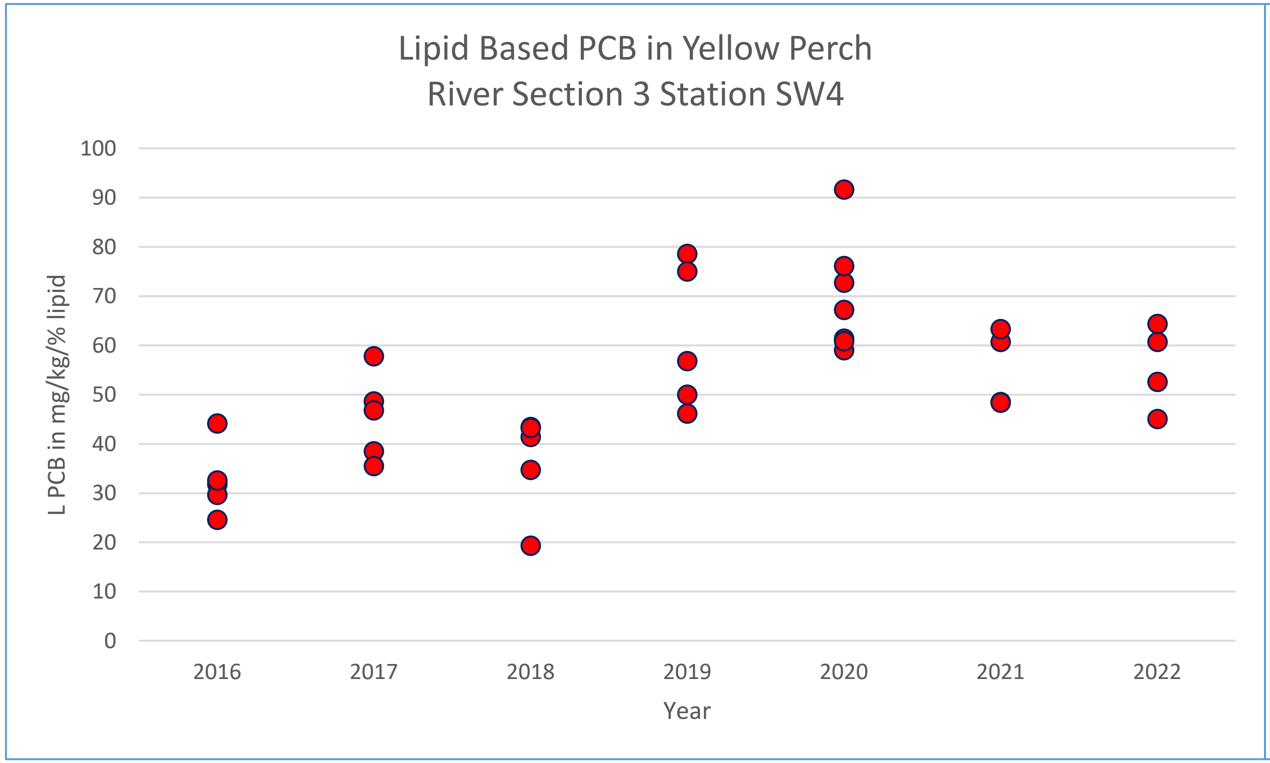
SW4 Yellow Perch Data

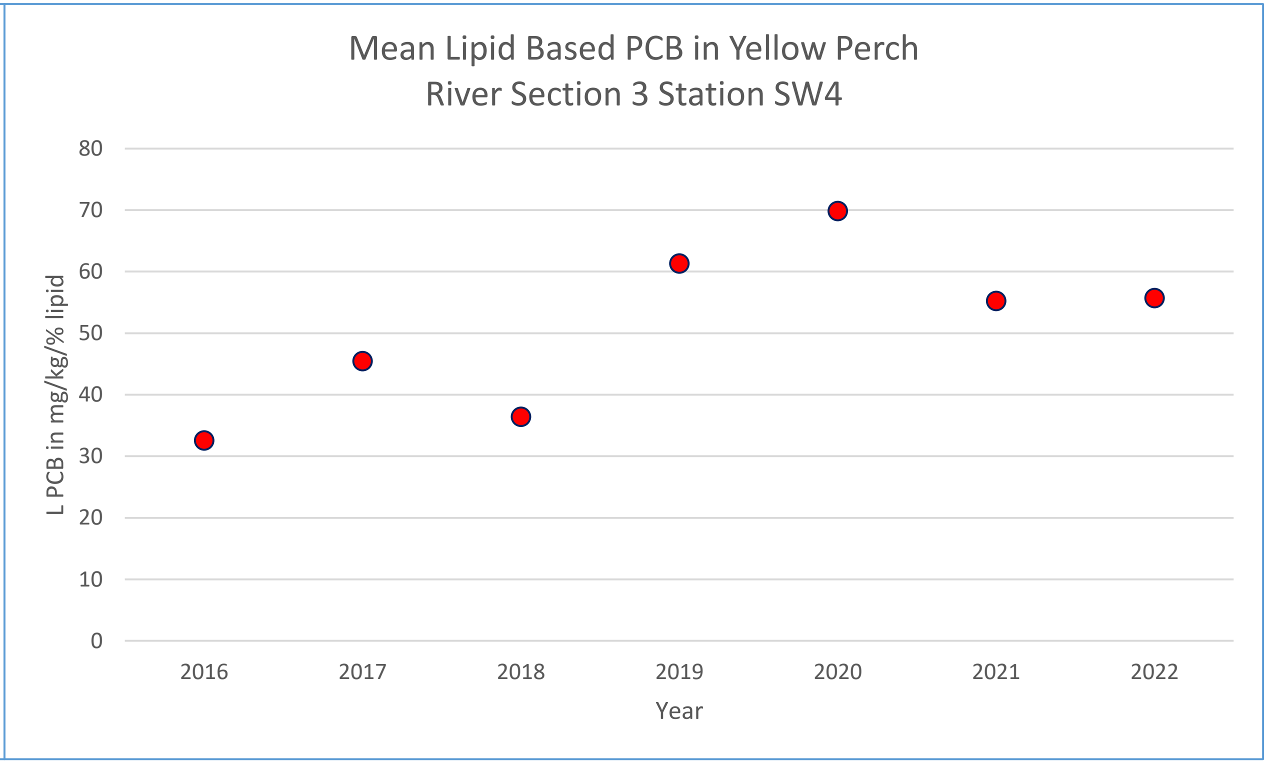
SW4 Yellow Perch PCB



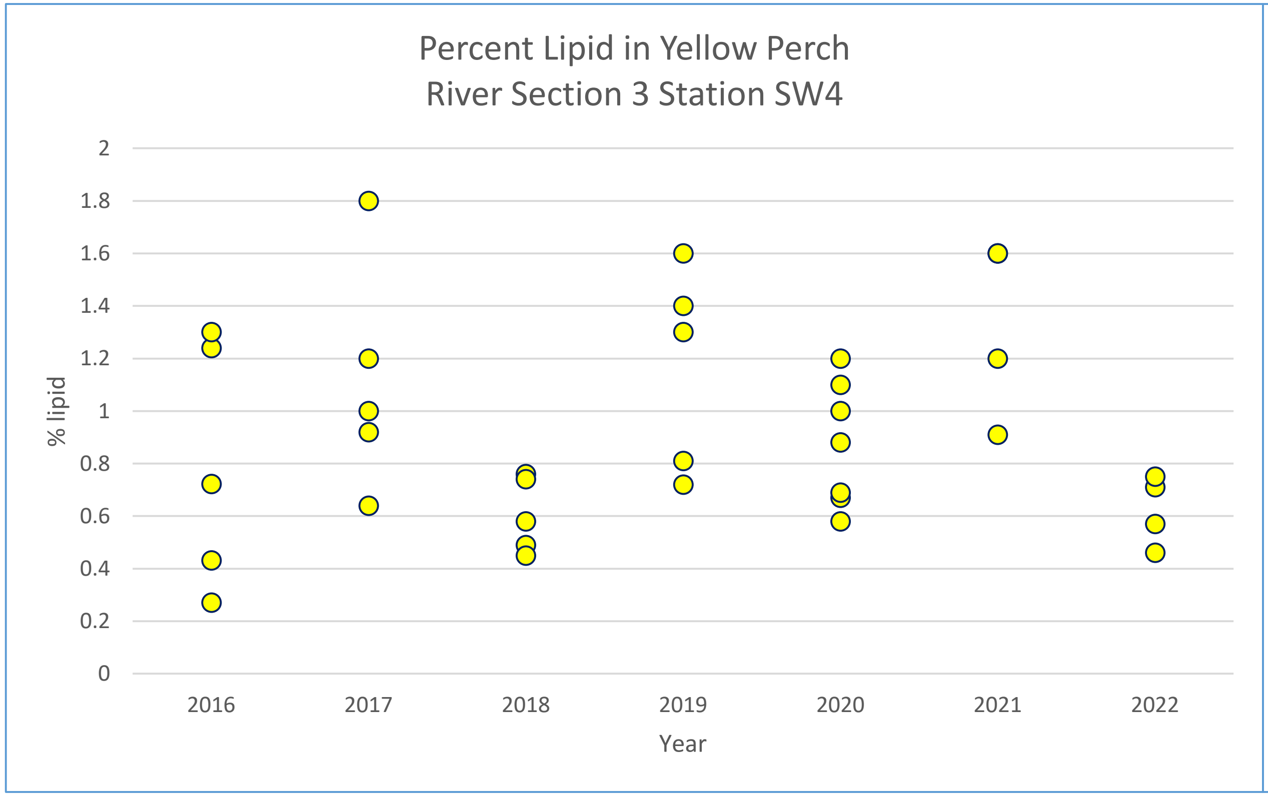


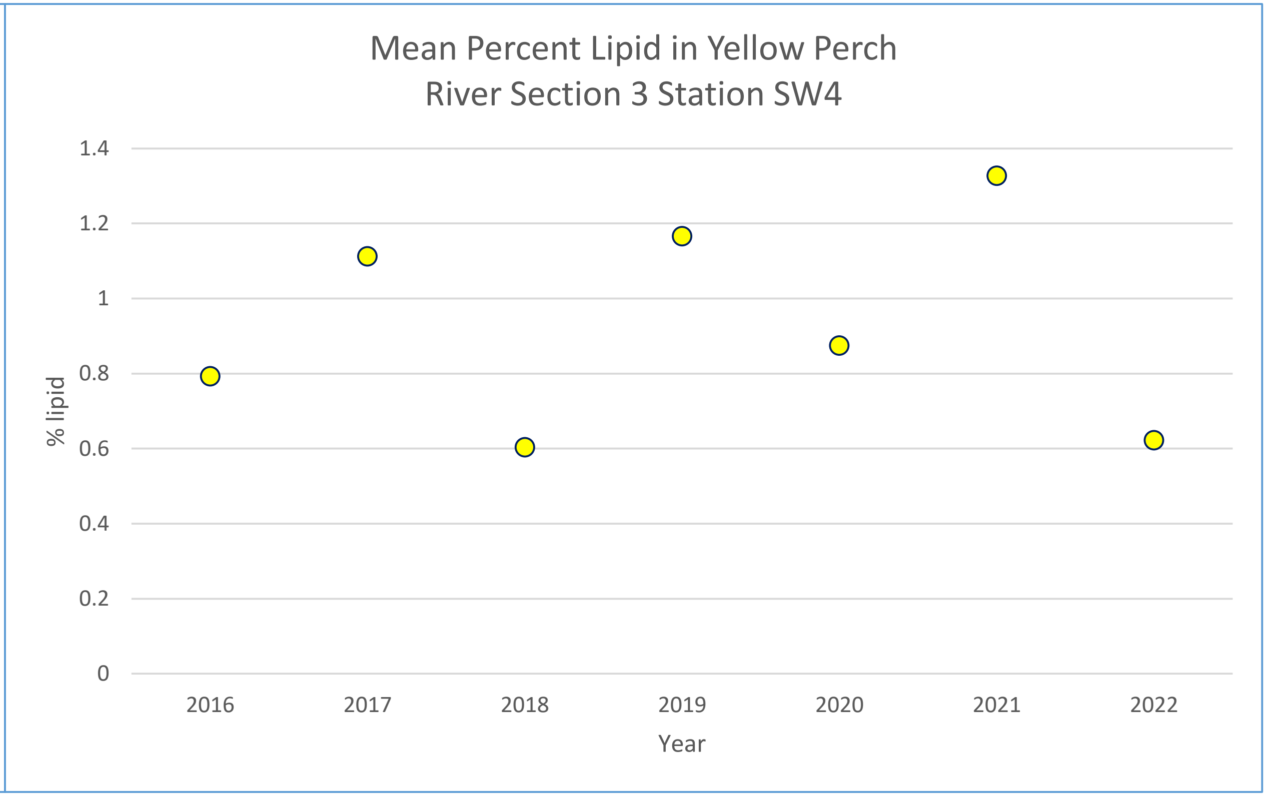
SW4 Yellow Perch Lipid Based PCB



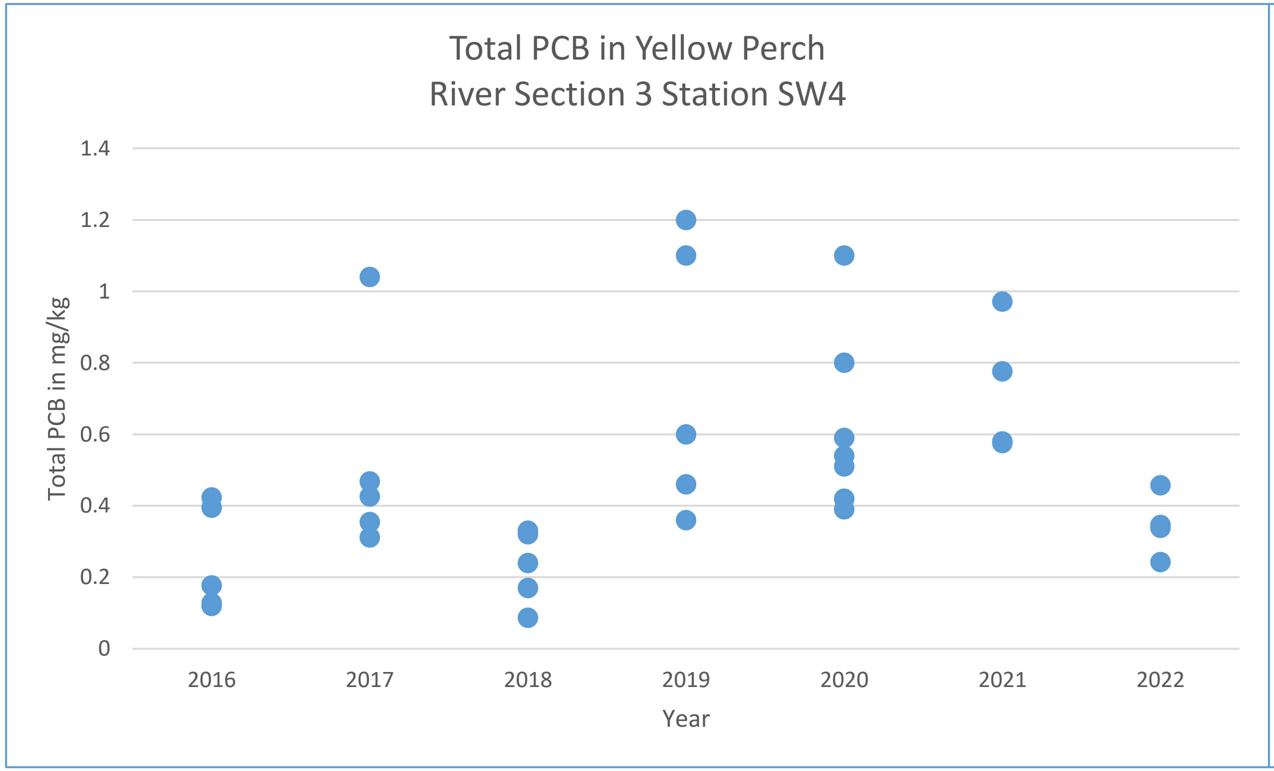


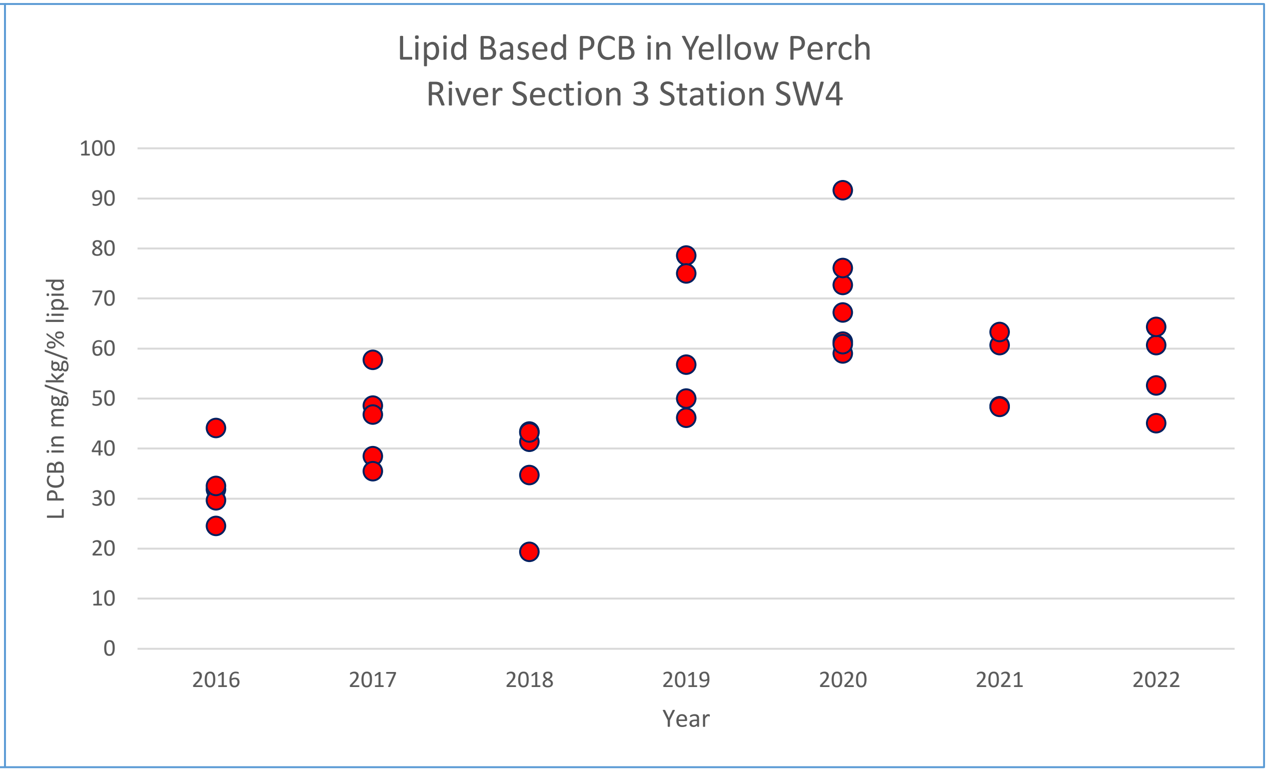
SW4 Yellow Perch Percent Lipid



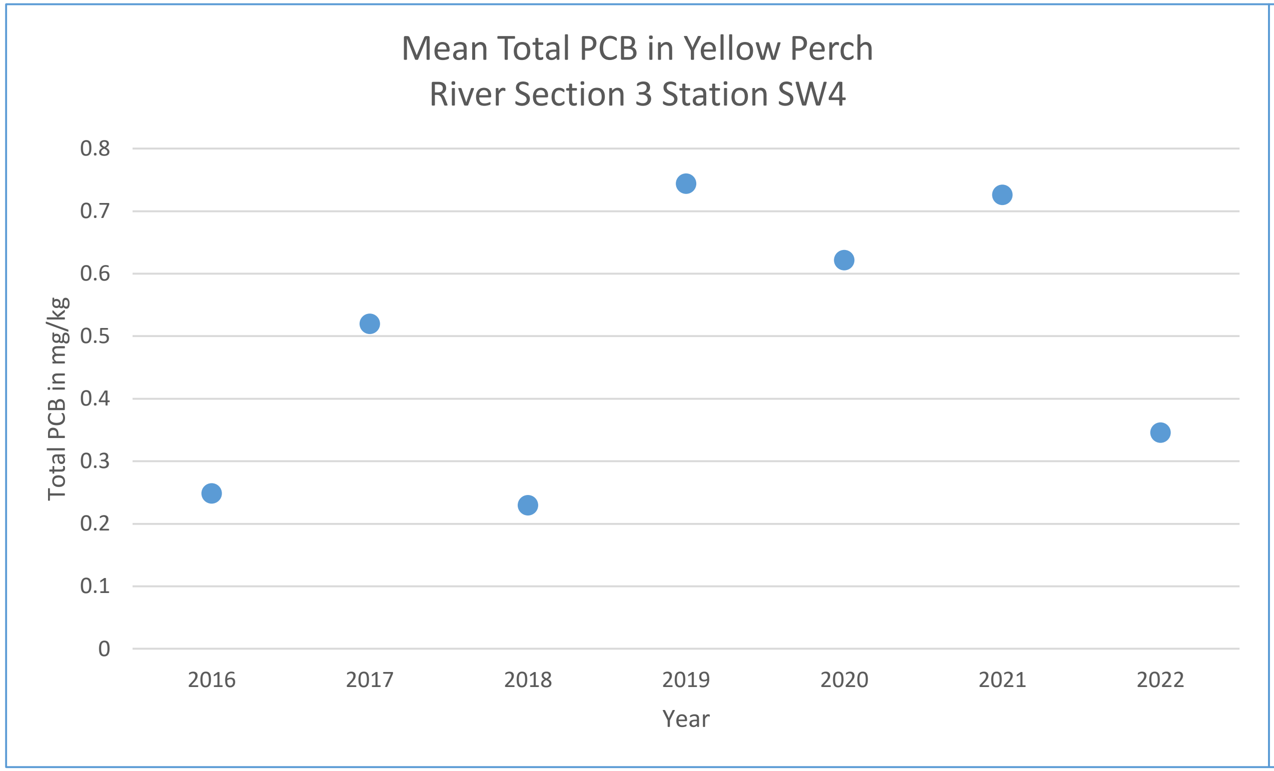


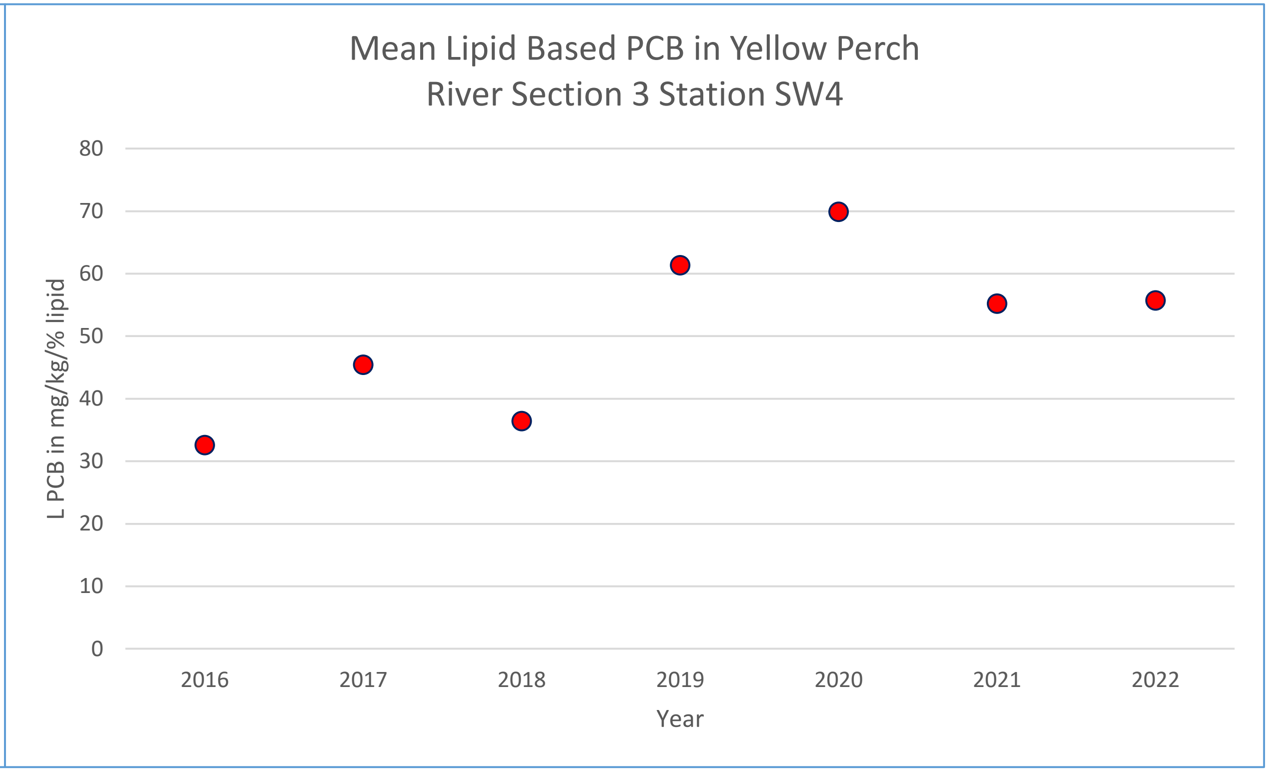
SW4 Yellow Perch Total PCB and Lipid Based PCB





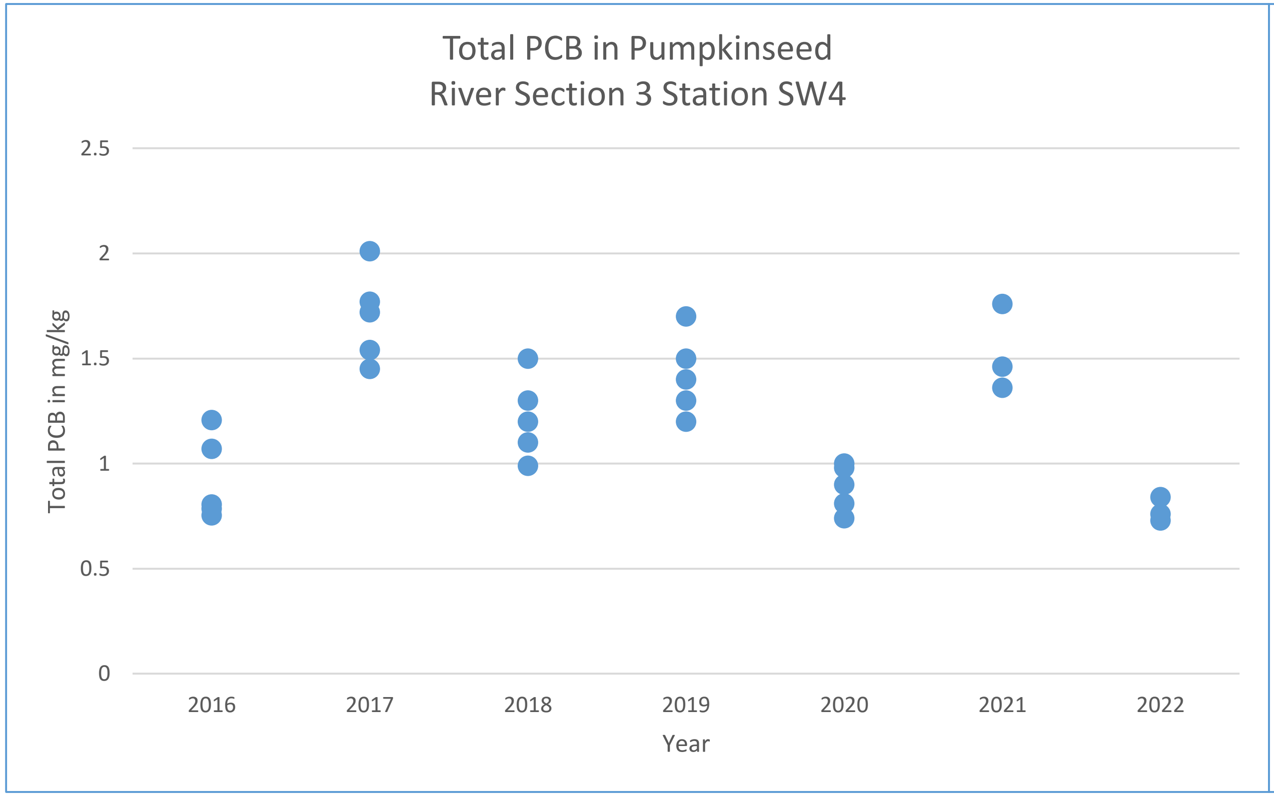
SW4 Yellow Perch Mean Total PCB and Mean Lipid Based PCB

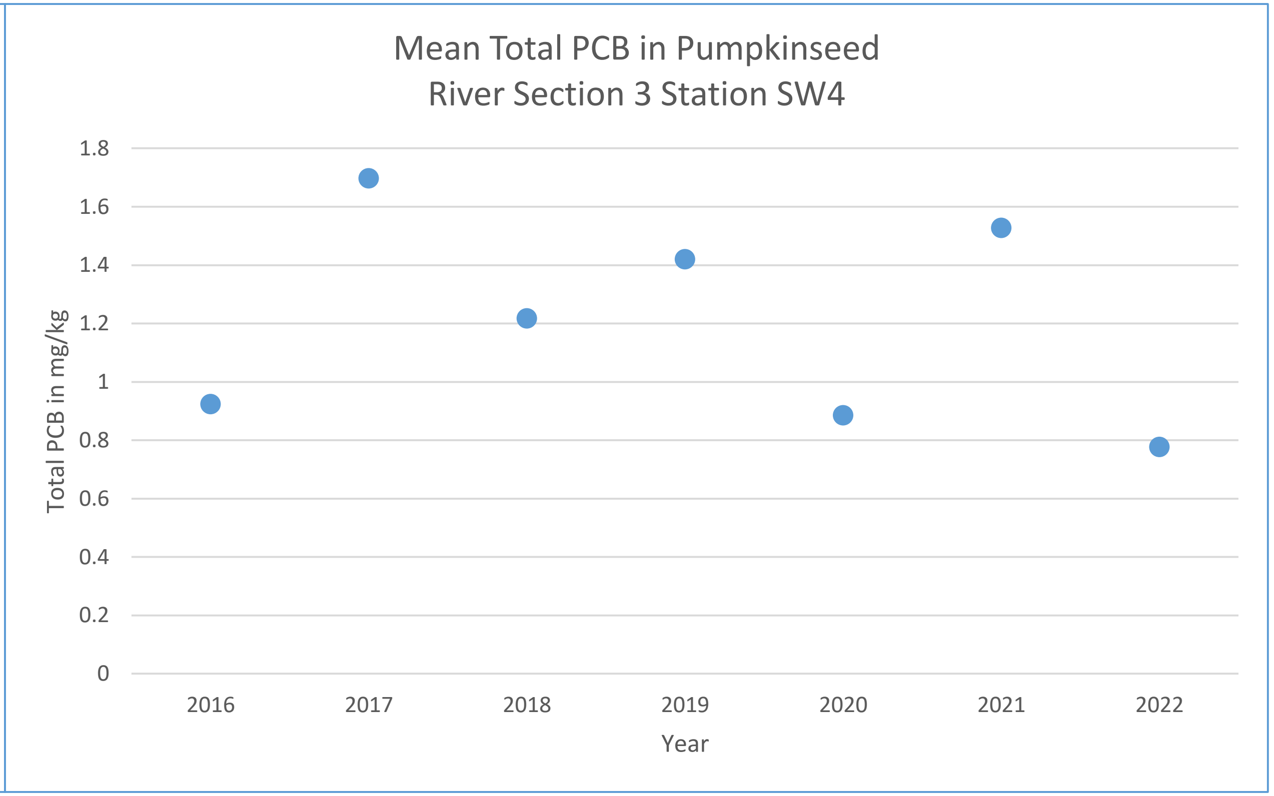




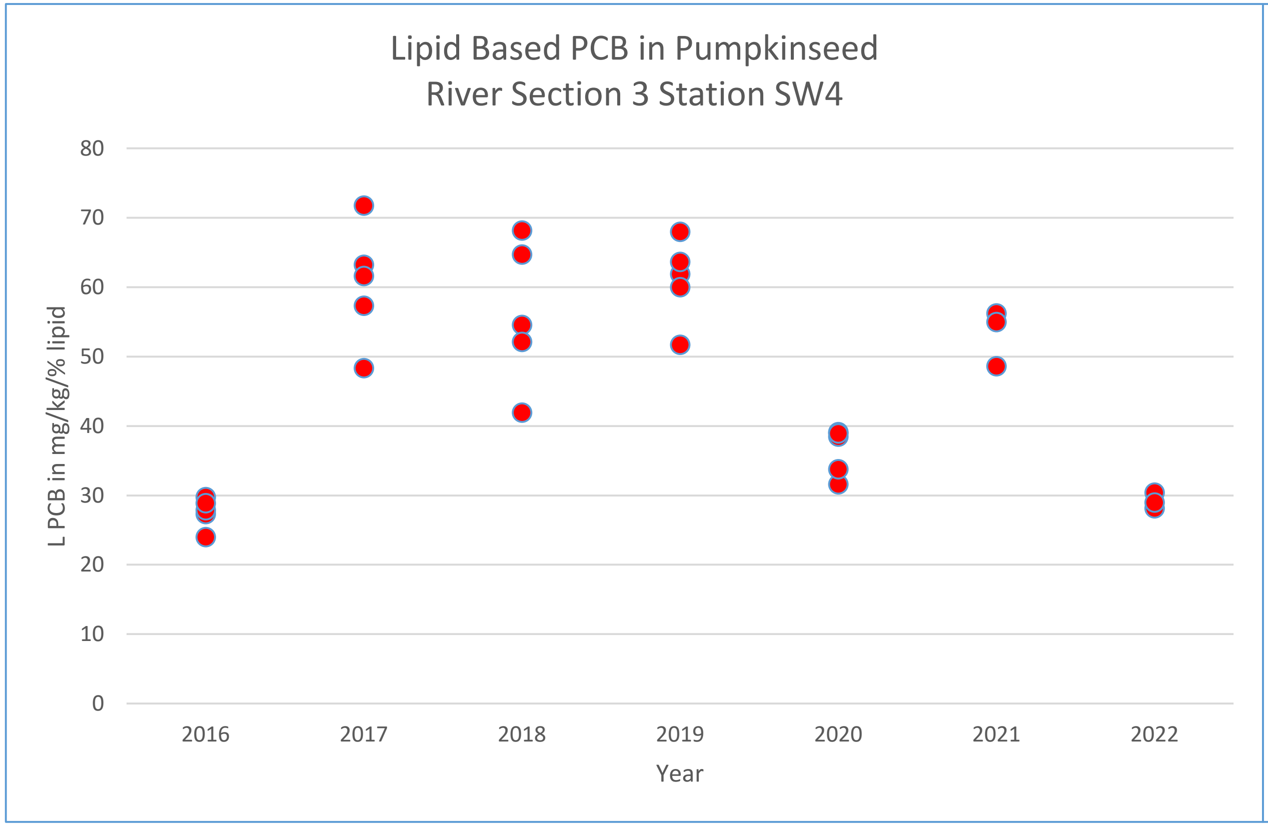
SW4 Pumpkinseed Data

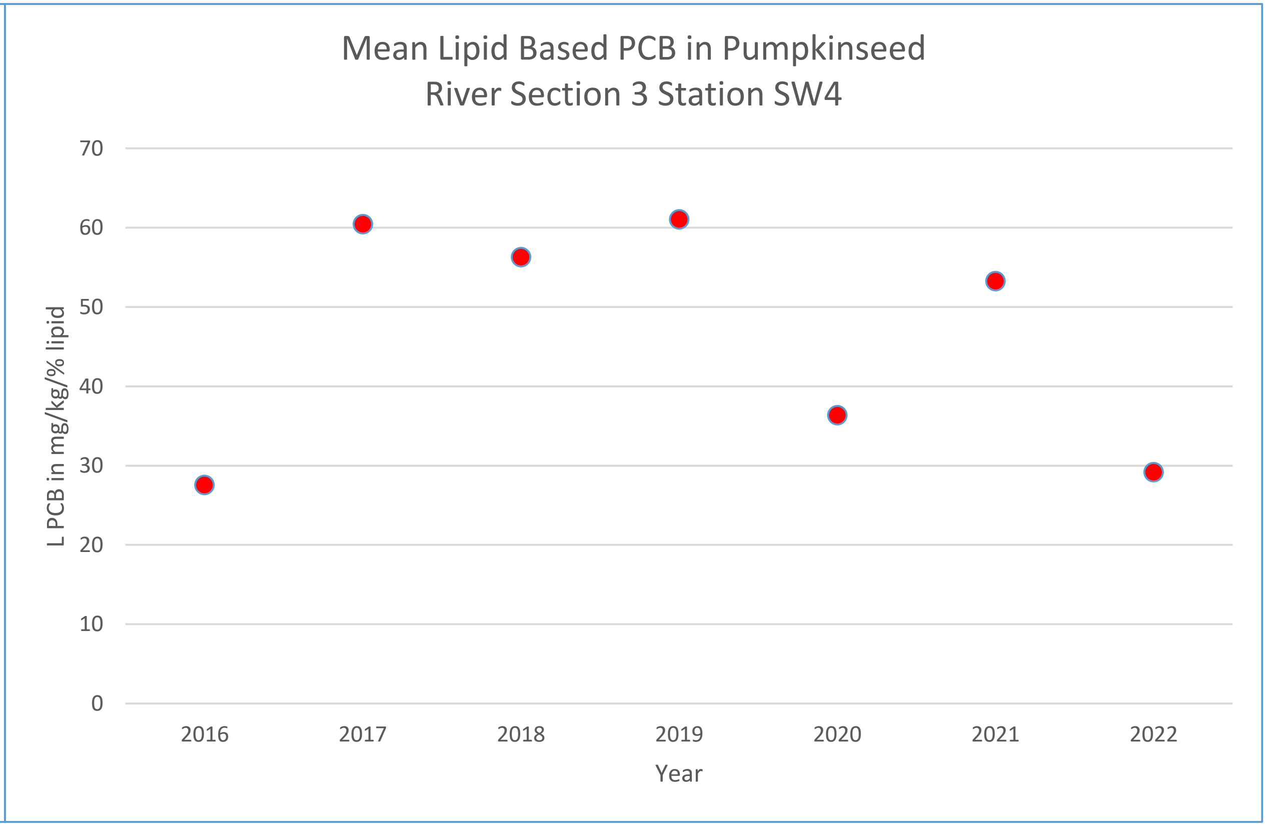
SW4 Pumpkinseed Total PCB



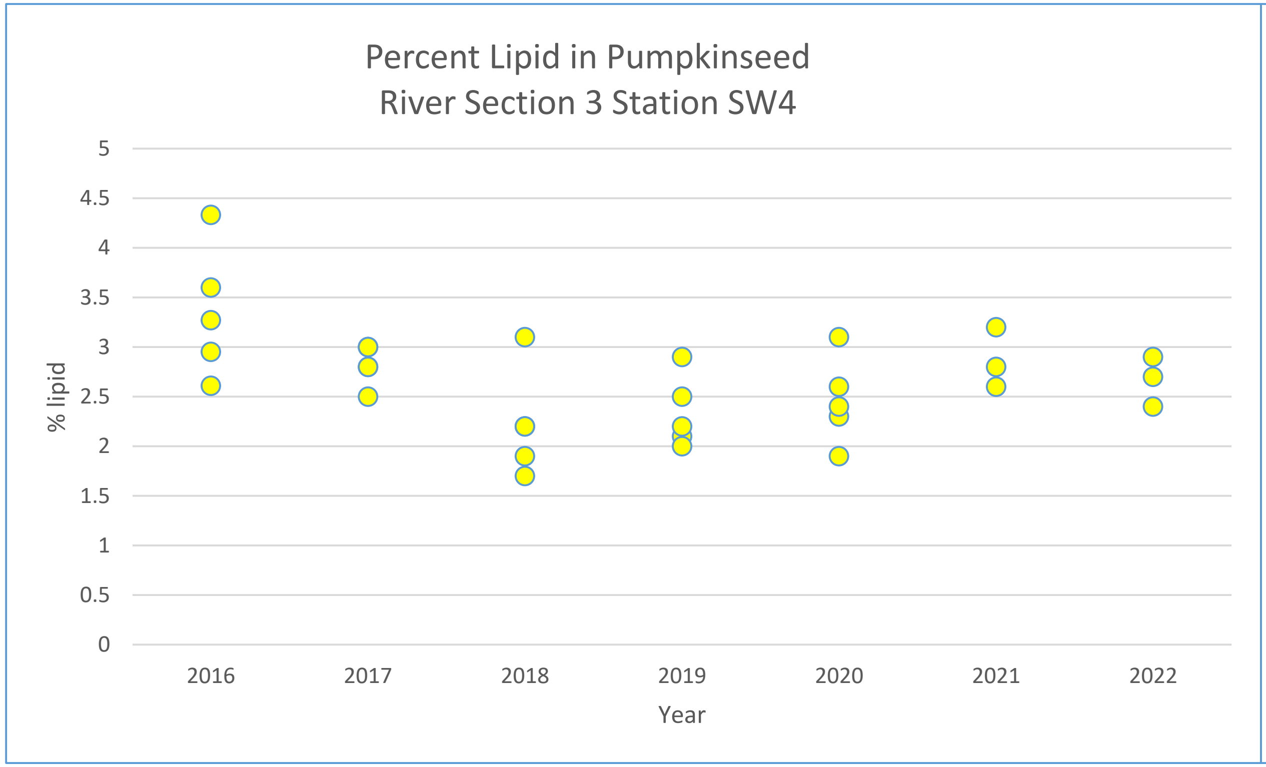


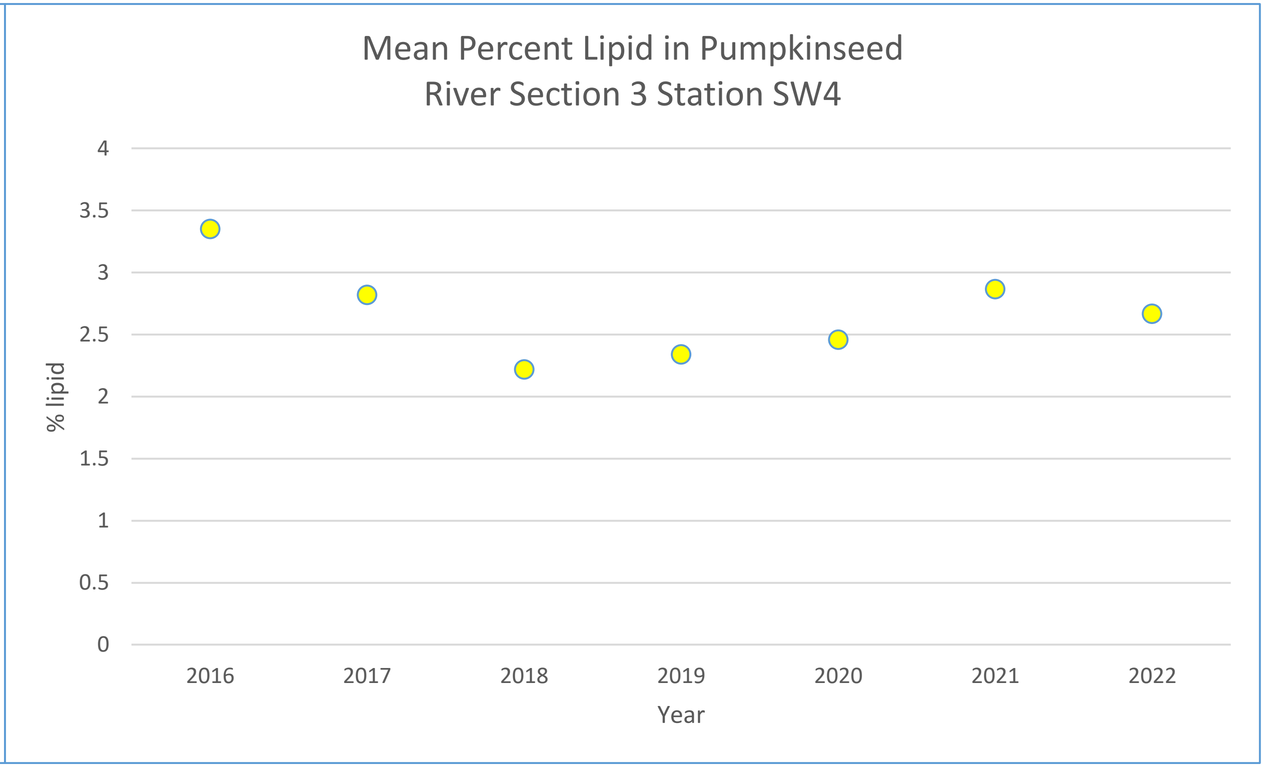
SW4 Pumpkinseed Lipid Based PCB



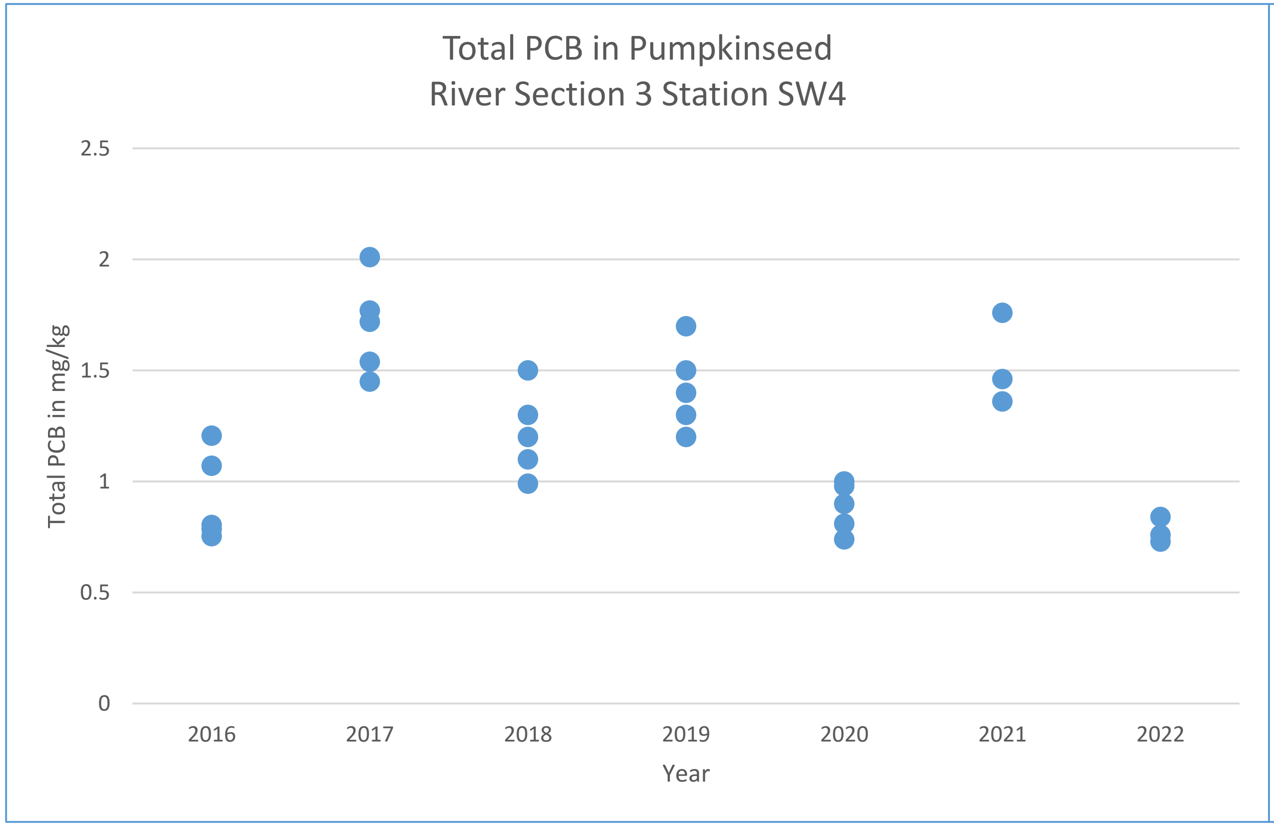


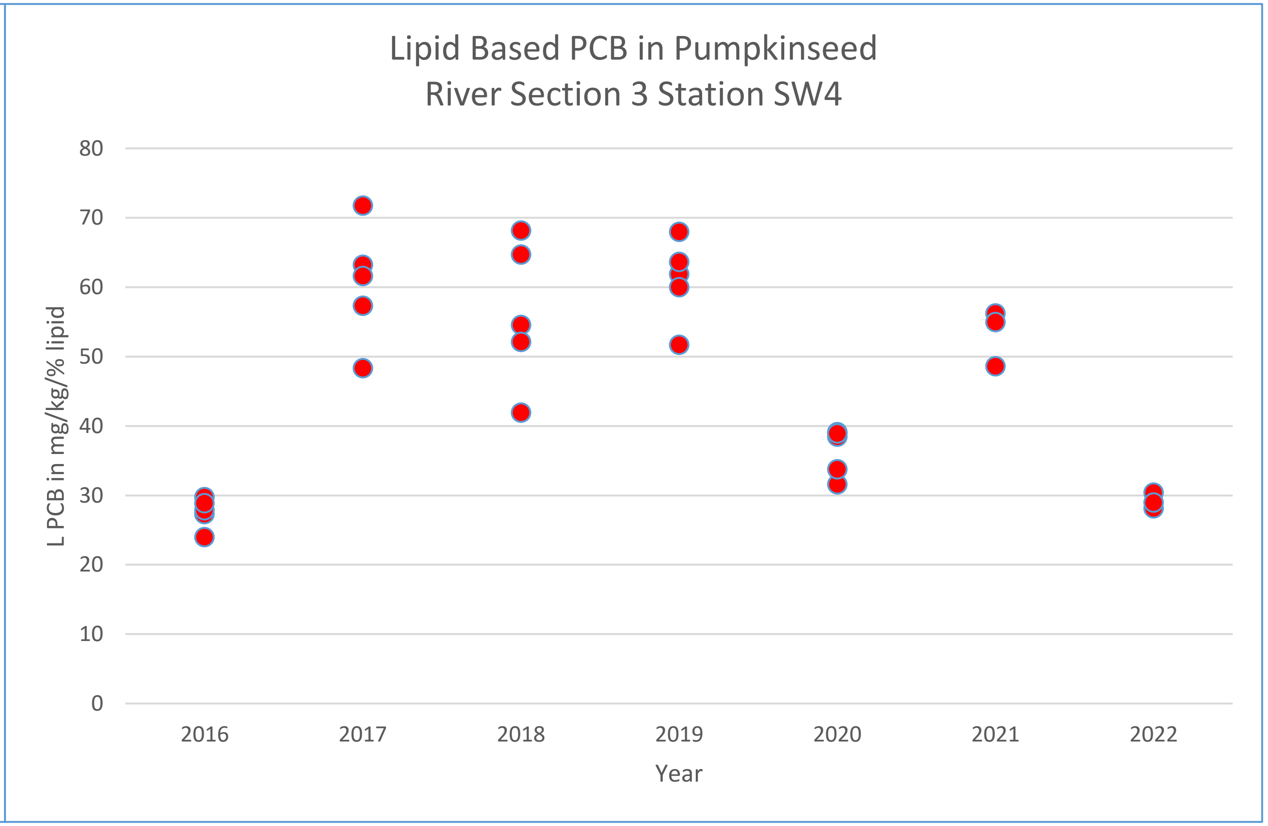
SW4 Pumpkinseed Percent Lipid



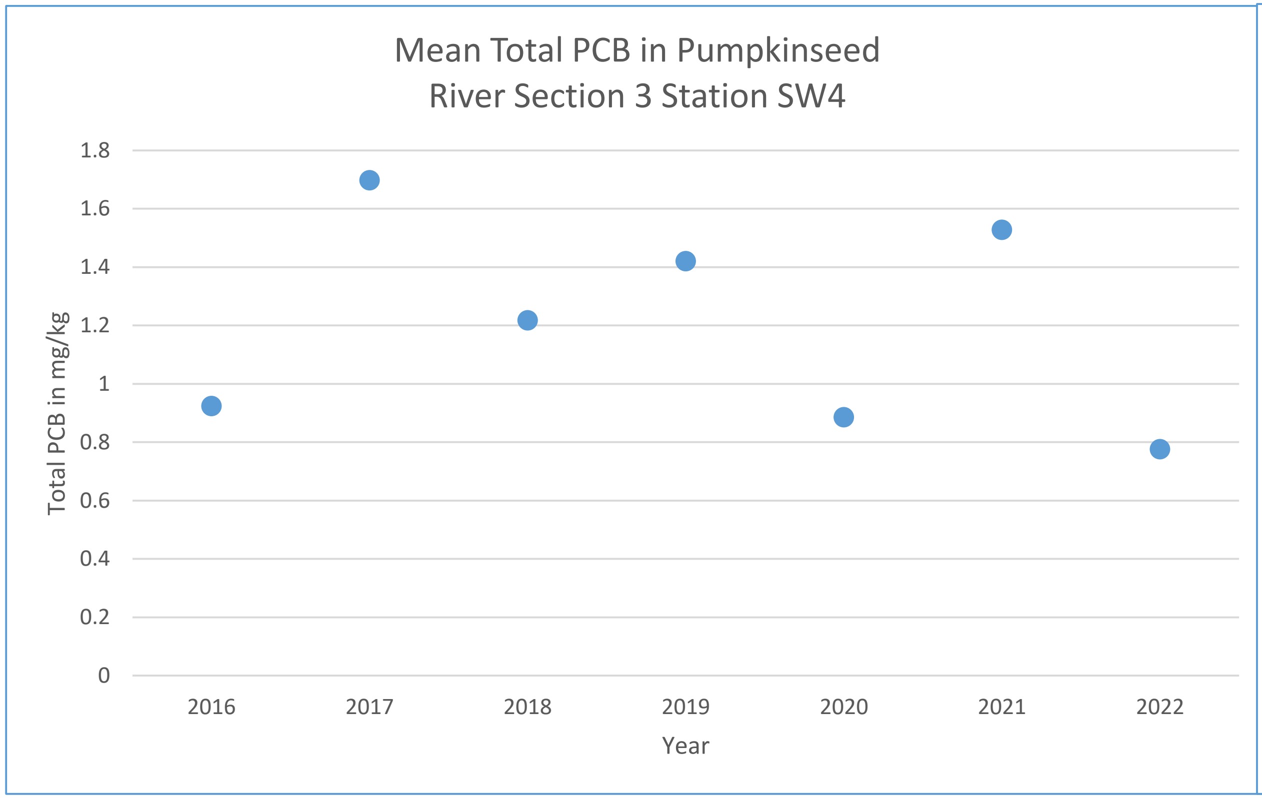


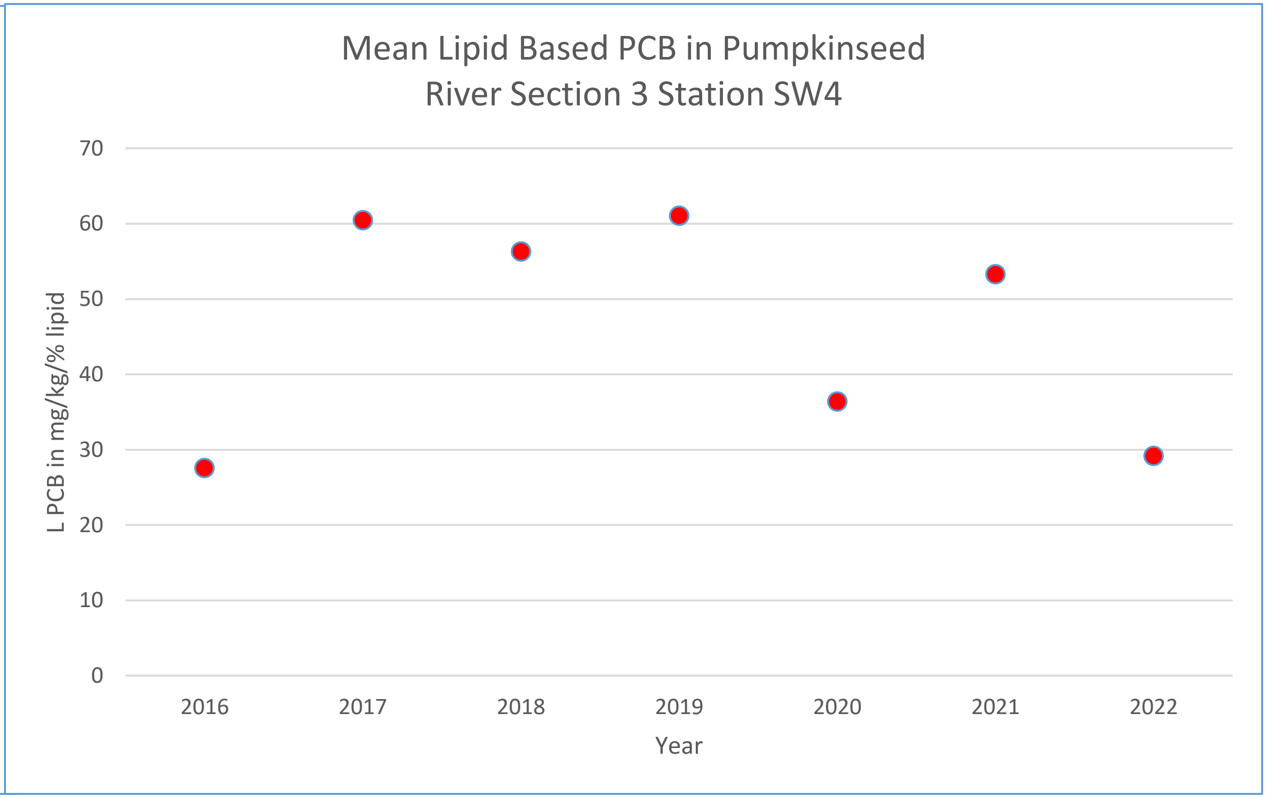
SW4 Pumpkinseed Total PCB and Lipid Based PCB





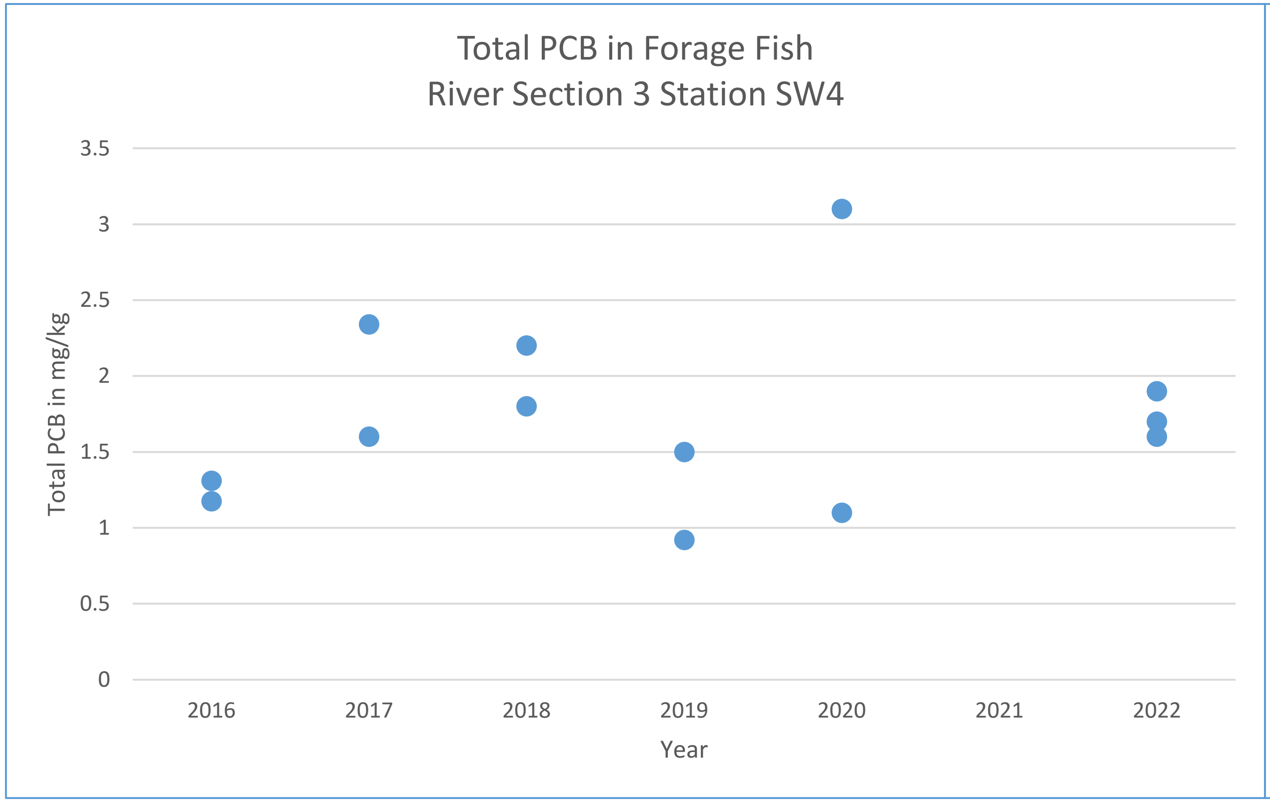
SW4 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

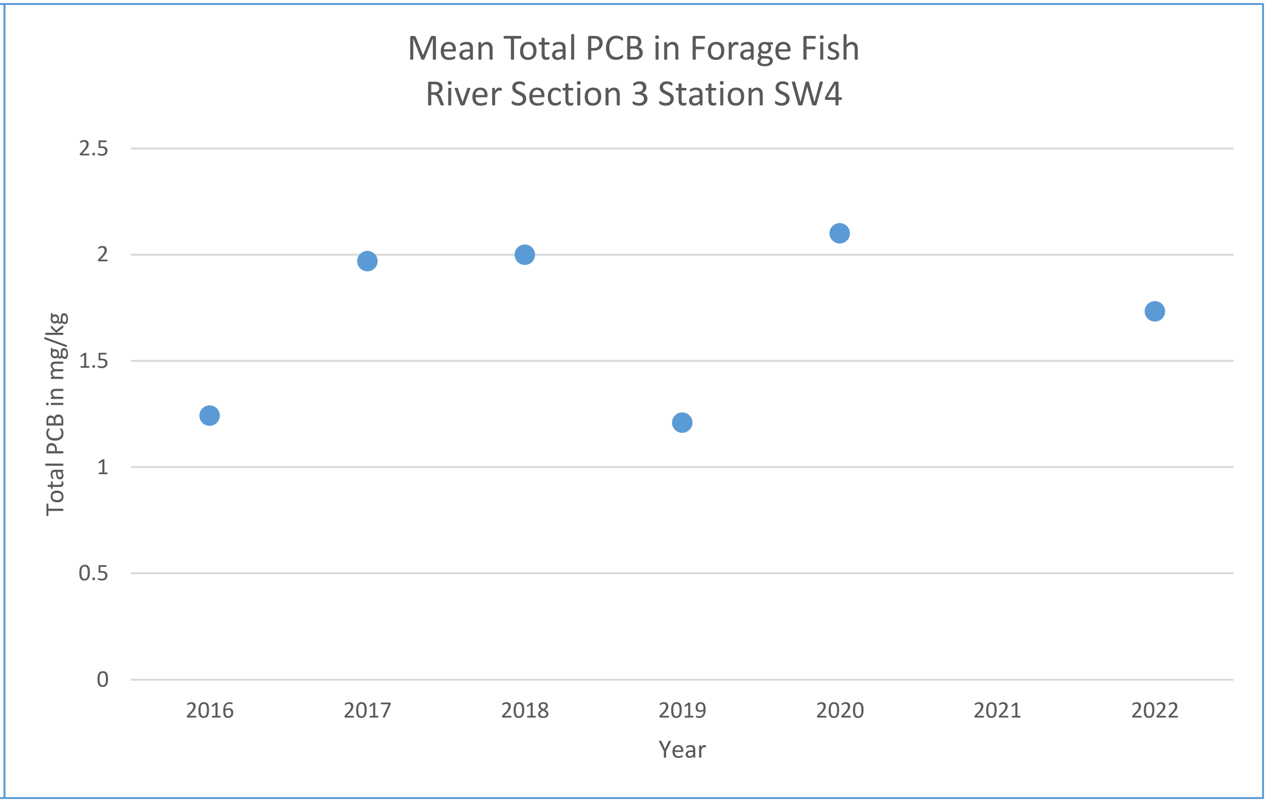




SW4 Forage Fish Data

SW4 Forage Fish Total PCB





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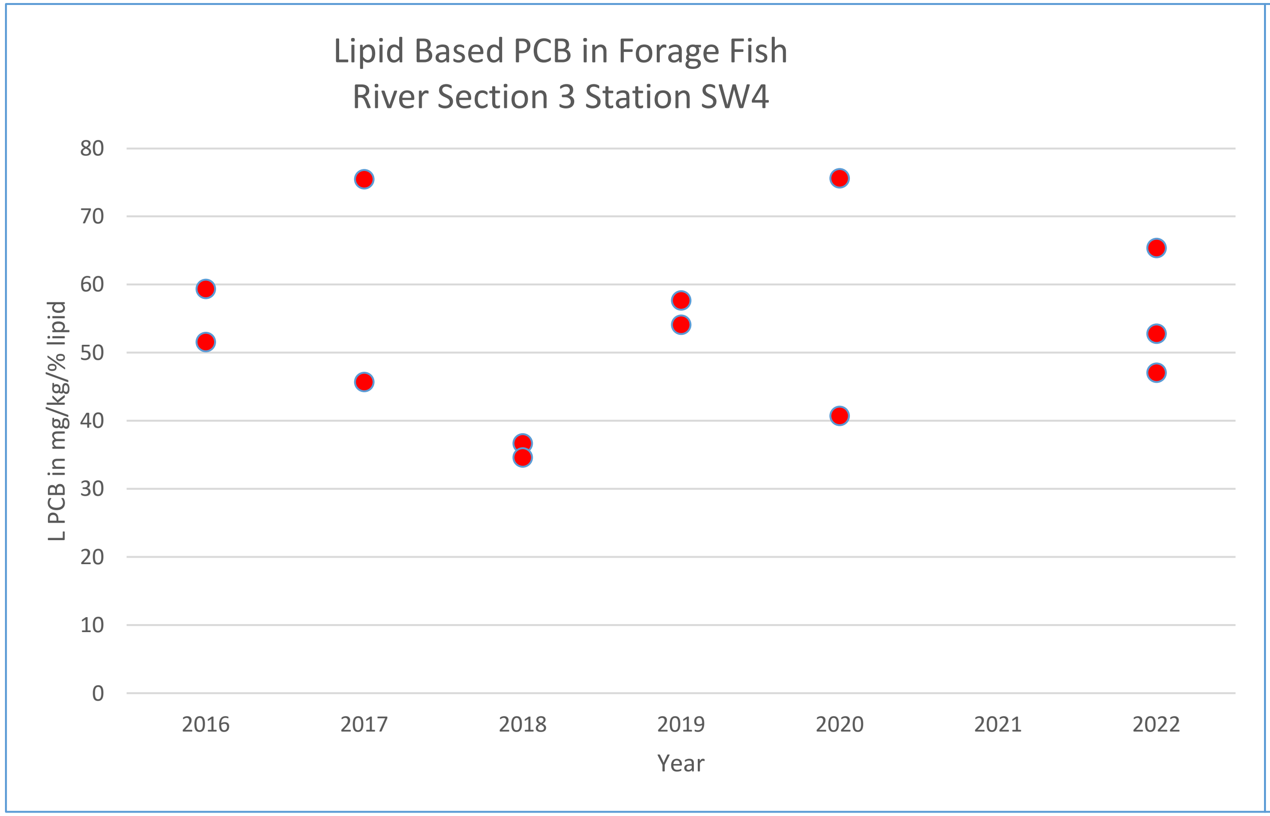
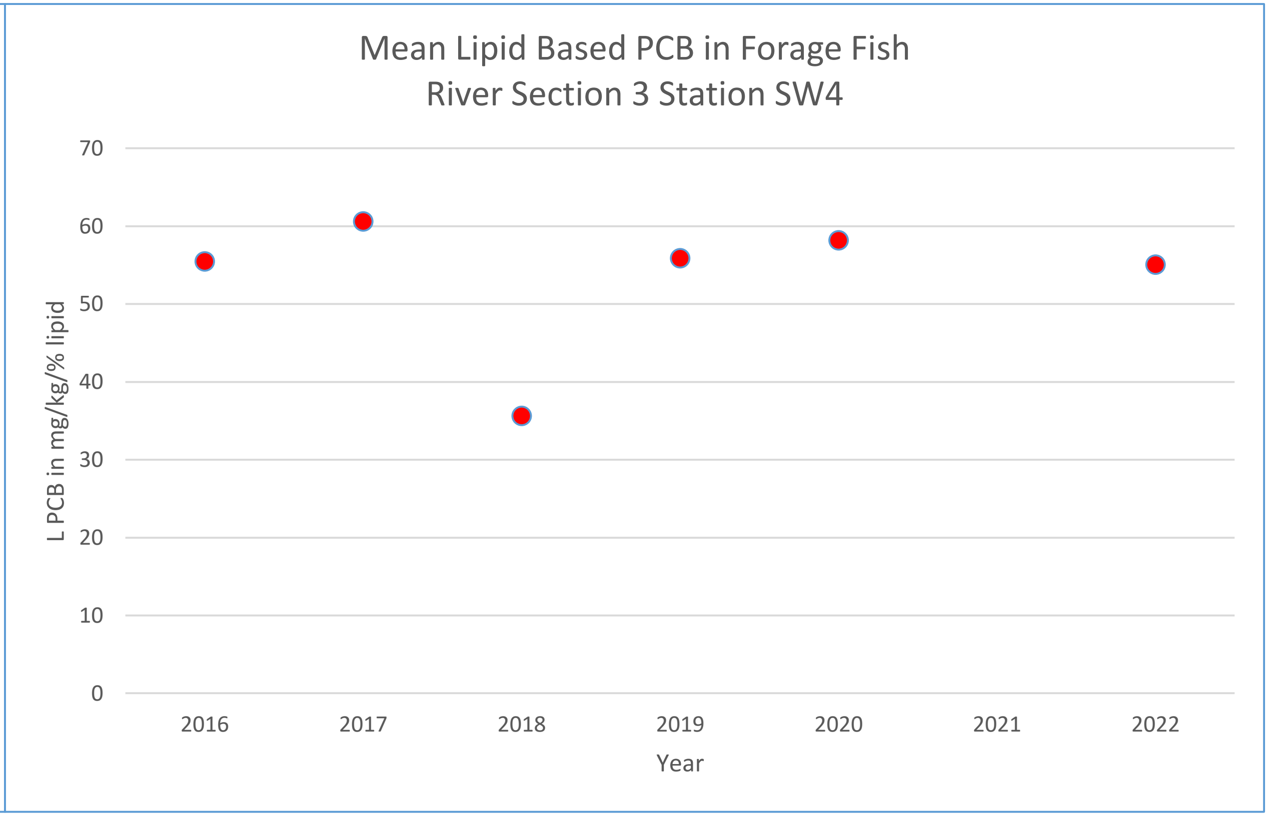
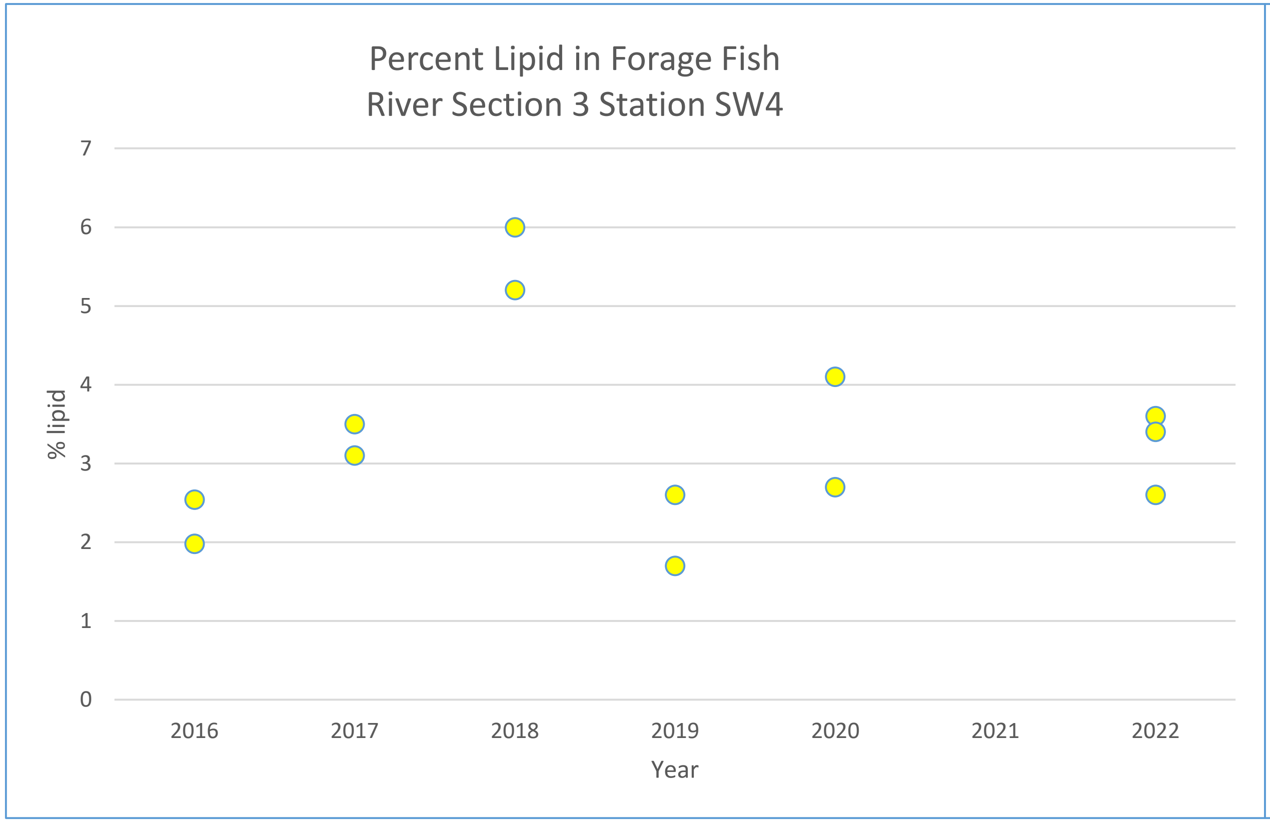
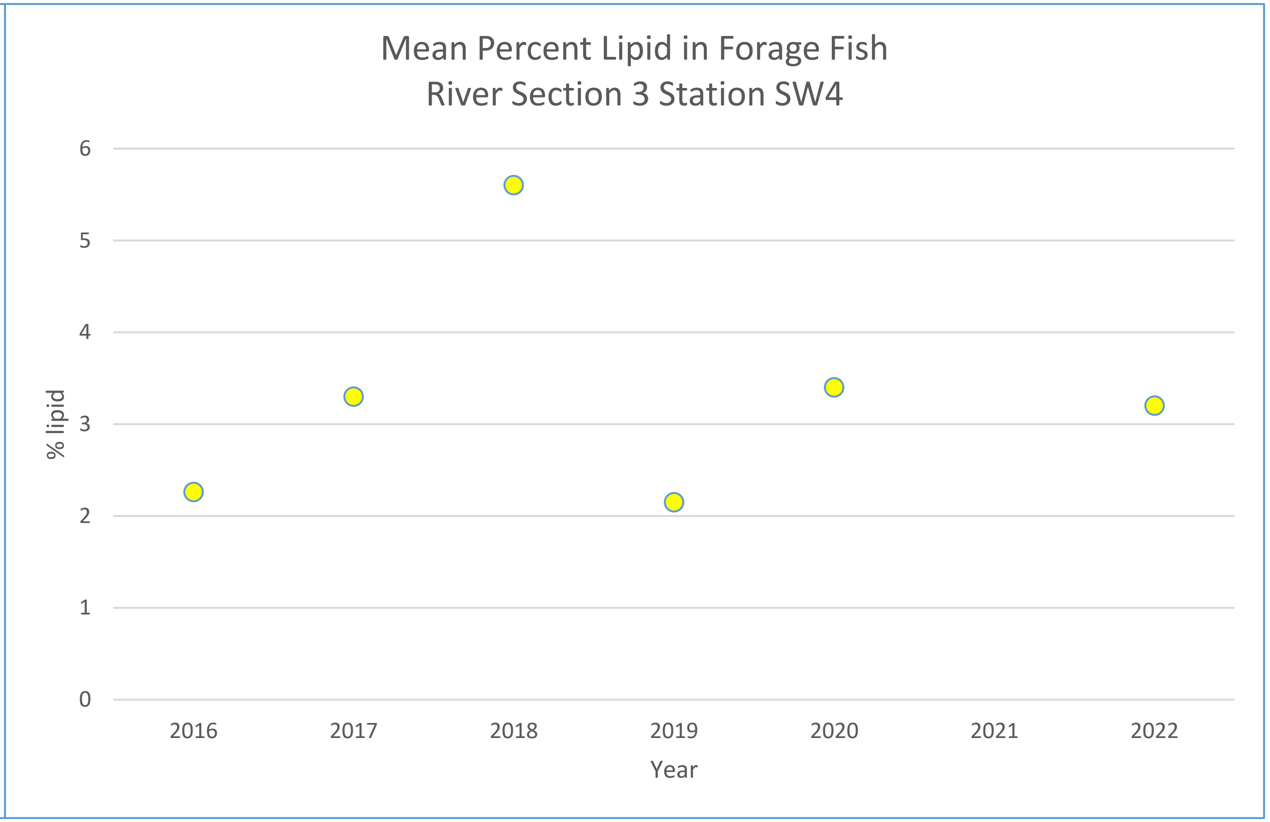


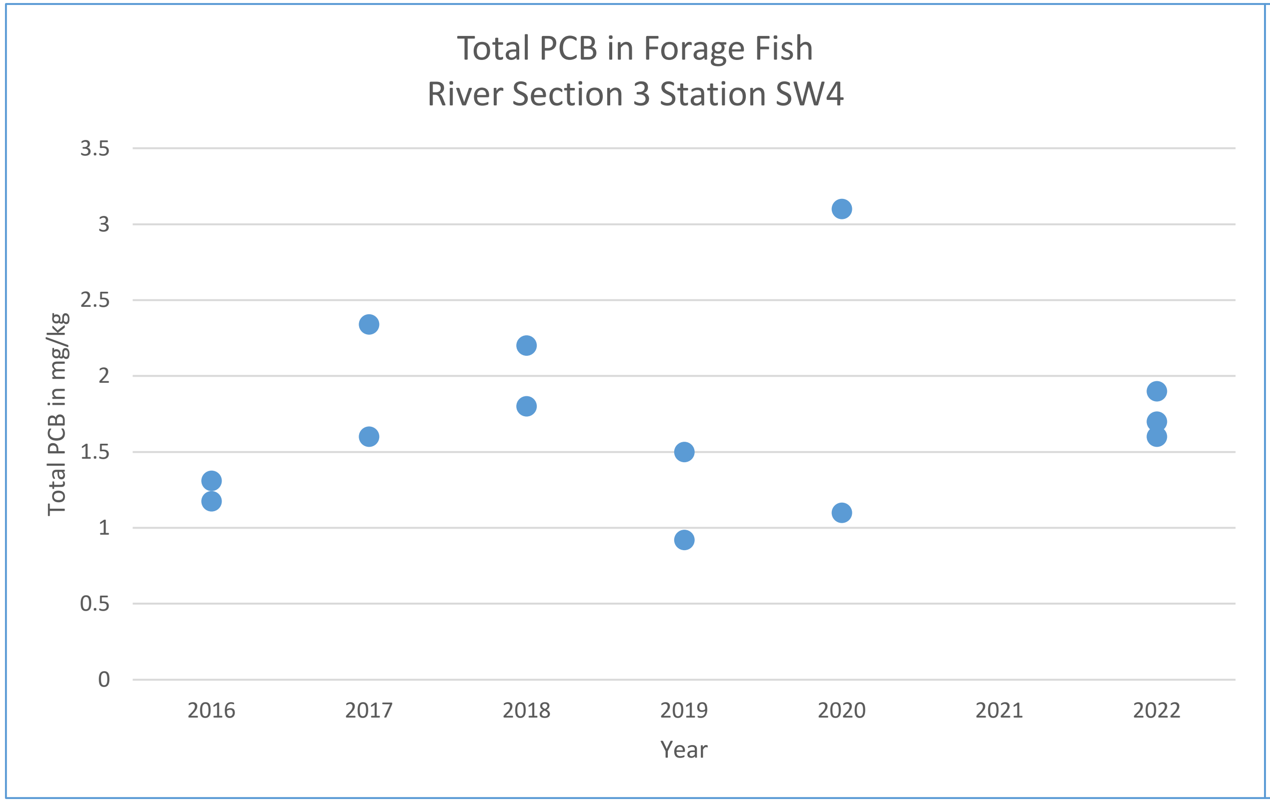


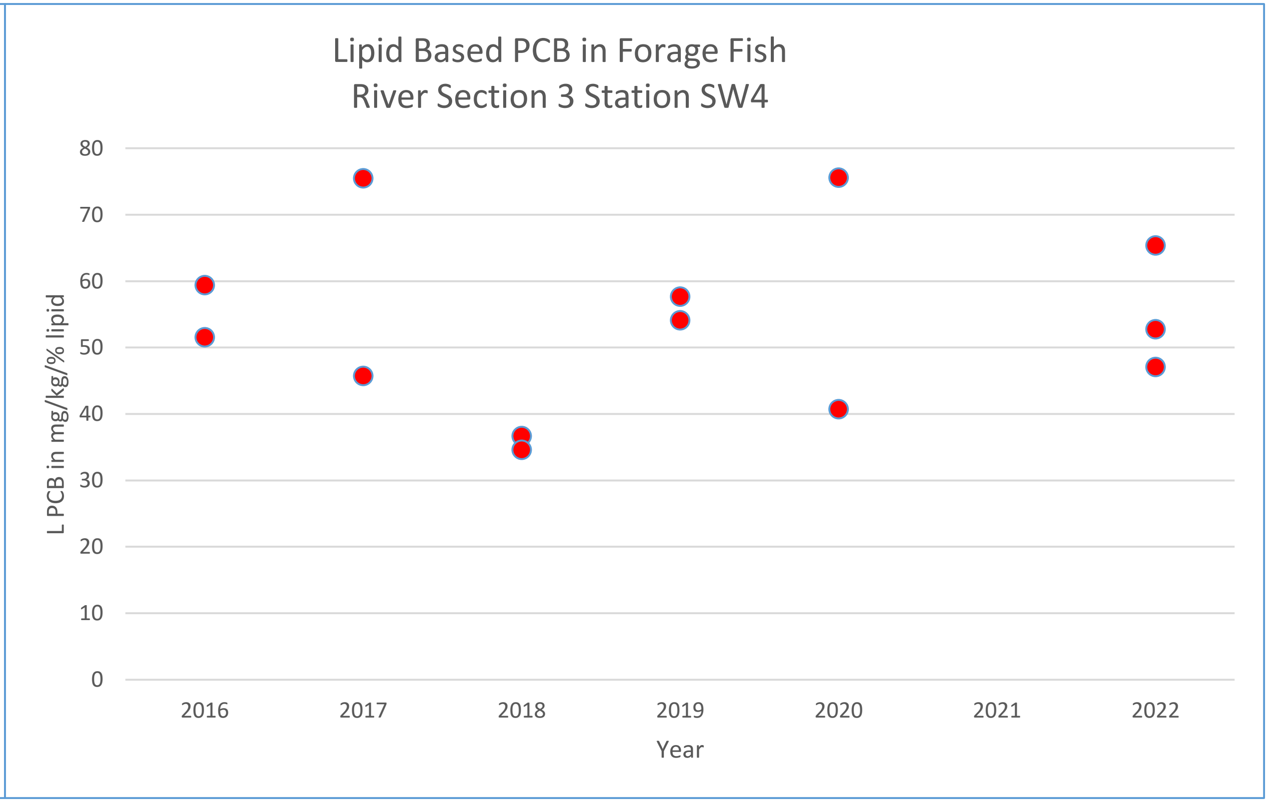
SW4 Forage Fish Percent Lipid



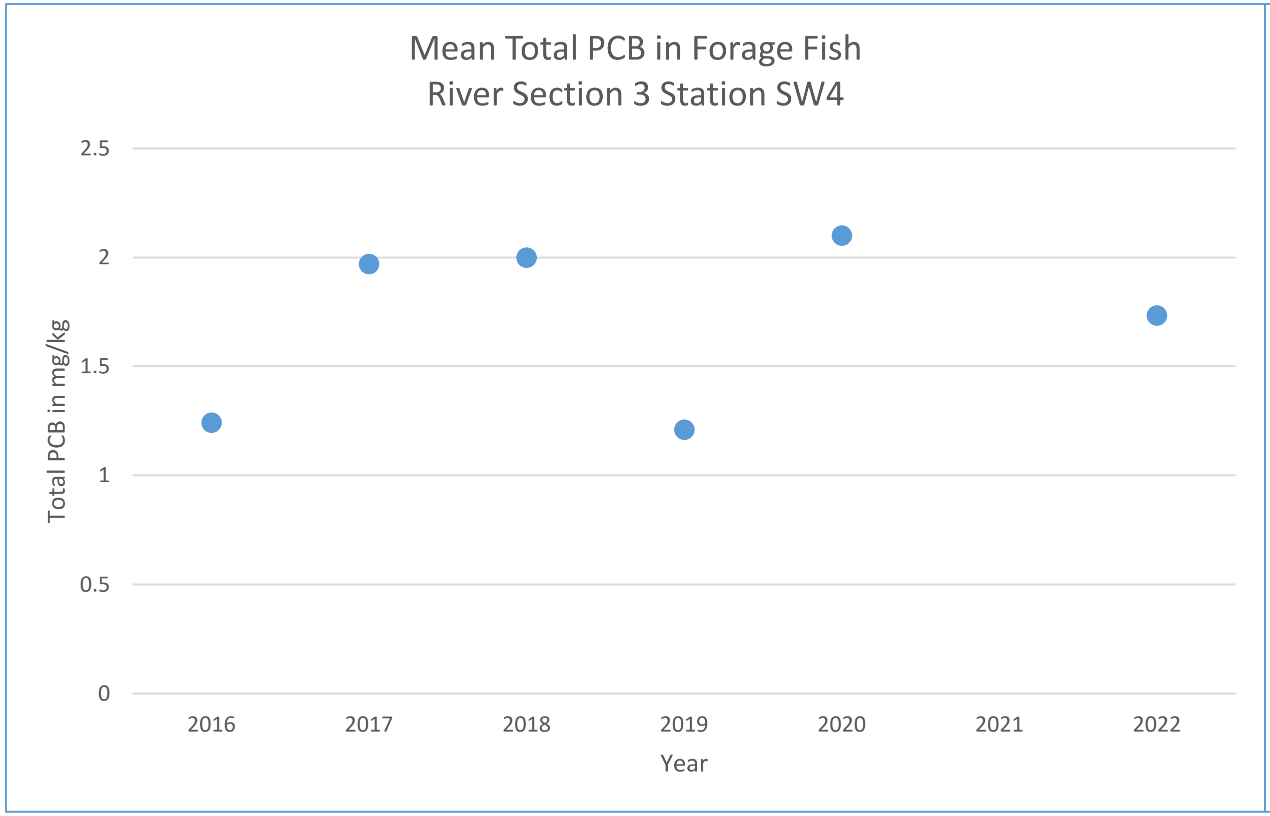


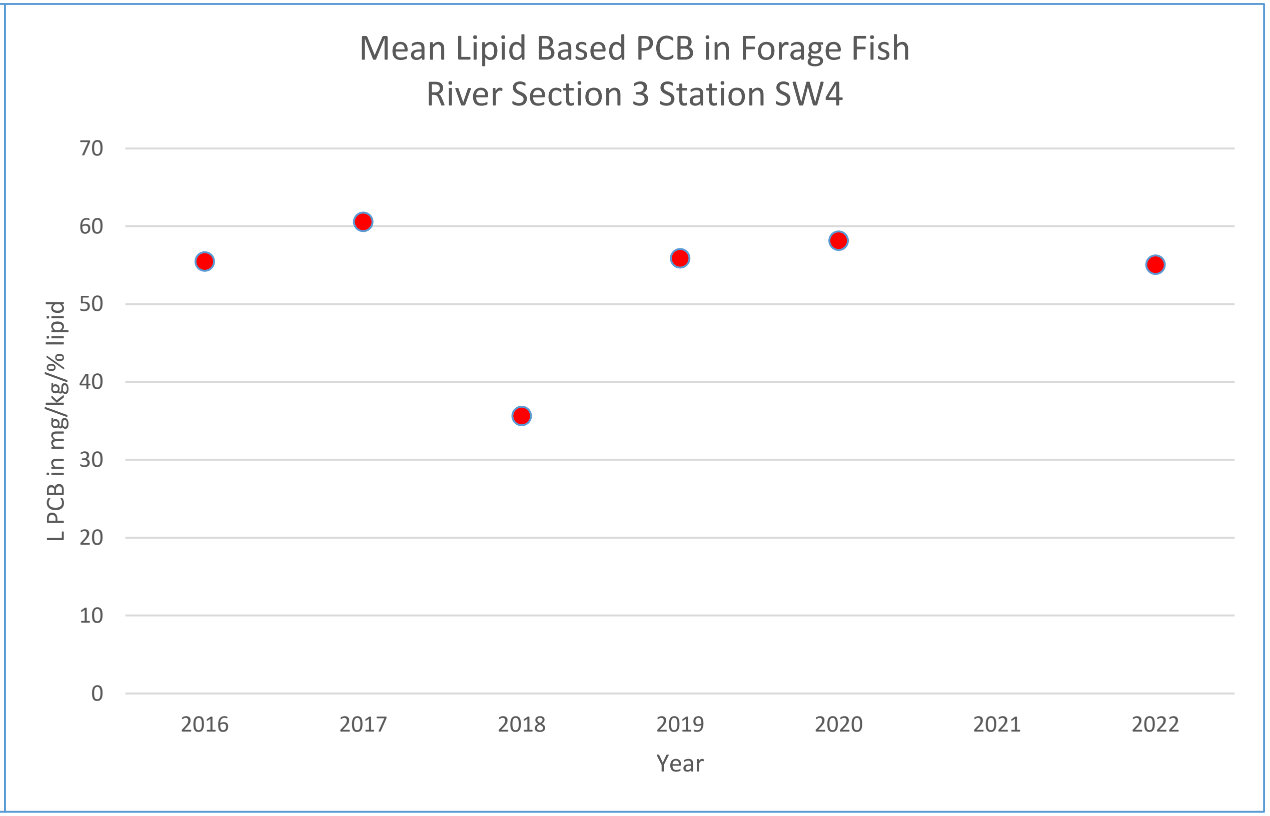
SW4 Forage Fish Total PCB and Lipid Based PCB





SW4 Forage Fish Mean Total PCB and Mean Lipid Based PCB





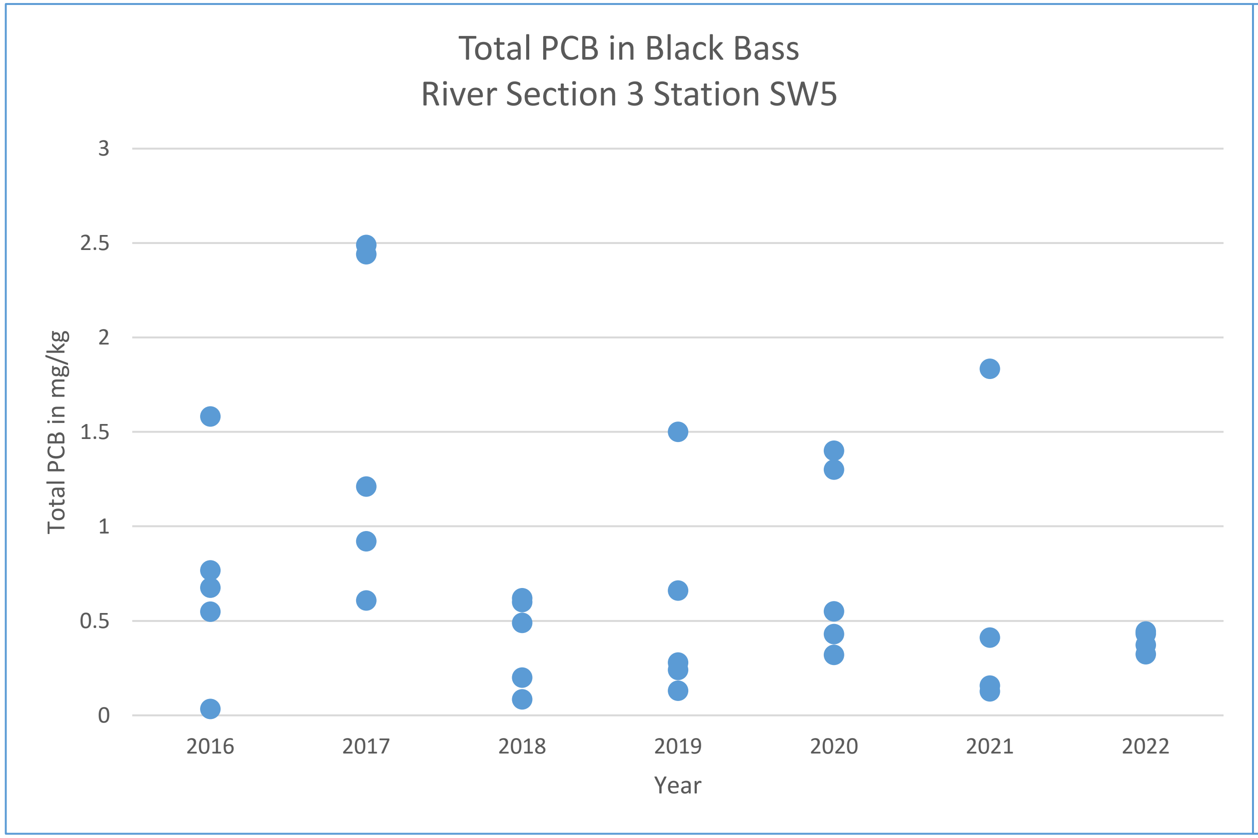
Station SW5

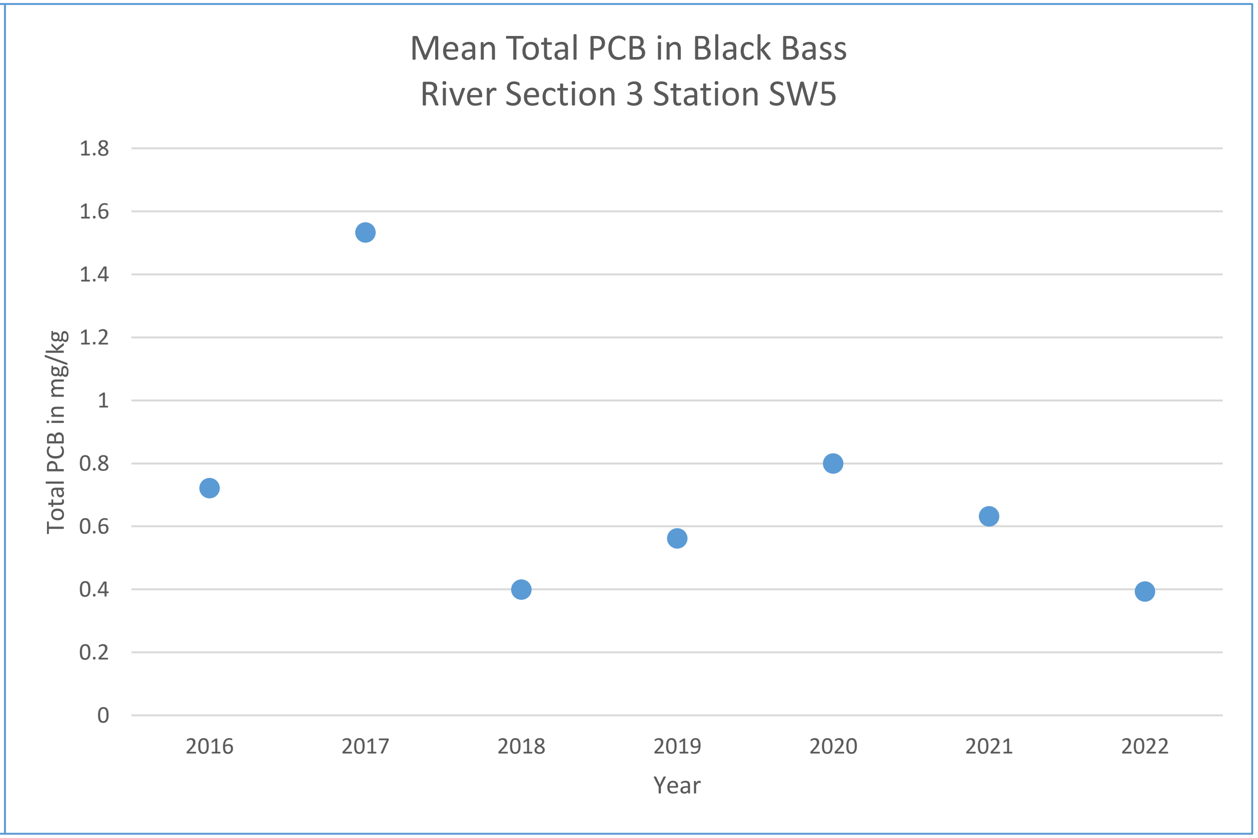
Station SW5

170
Saratoga County
Washington County
Schulyer Creek
SW5
Stillwater
Stillwater Dam
168
Green Island
Lock #4
Rensselaer County
167

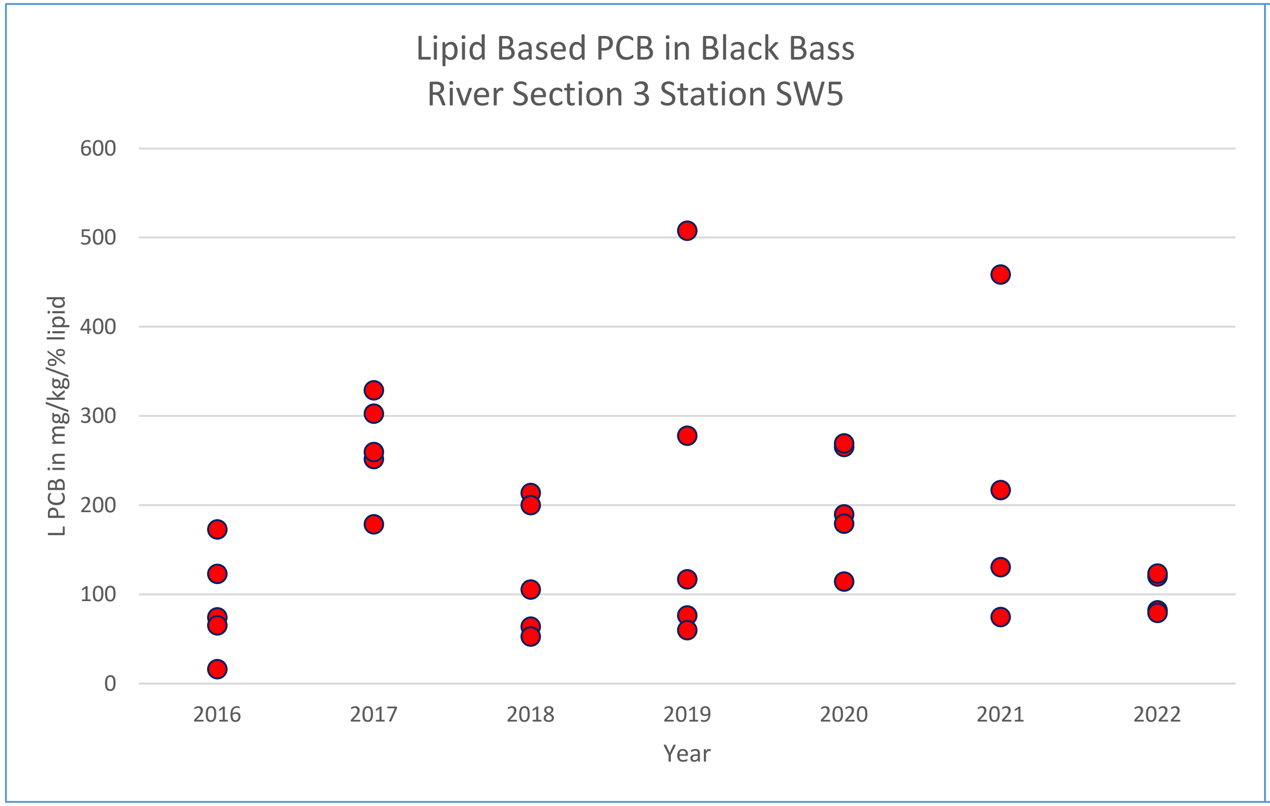
SW5 Black Bass Data

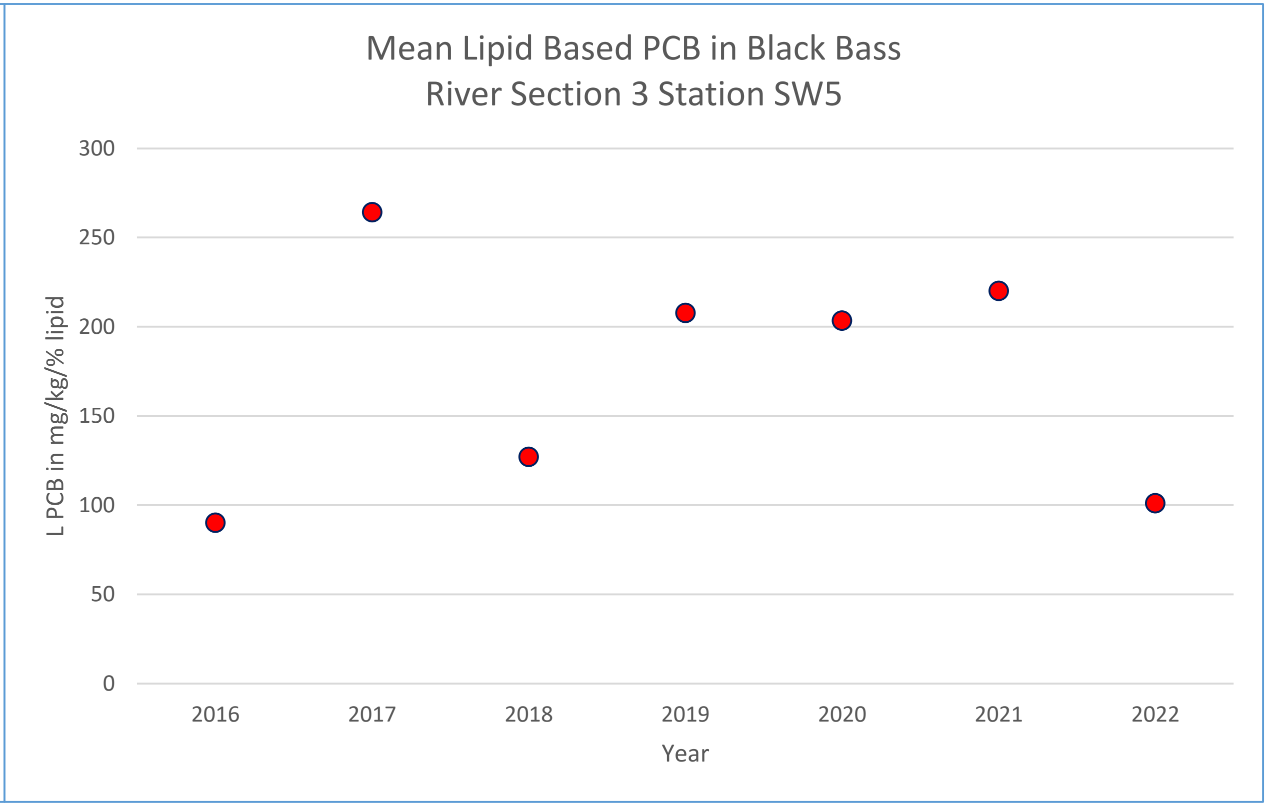
SW5 Black Bass Total PCB



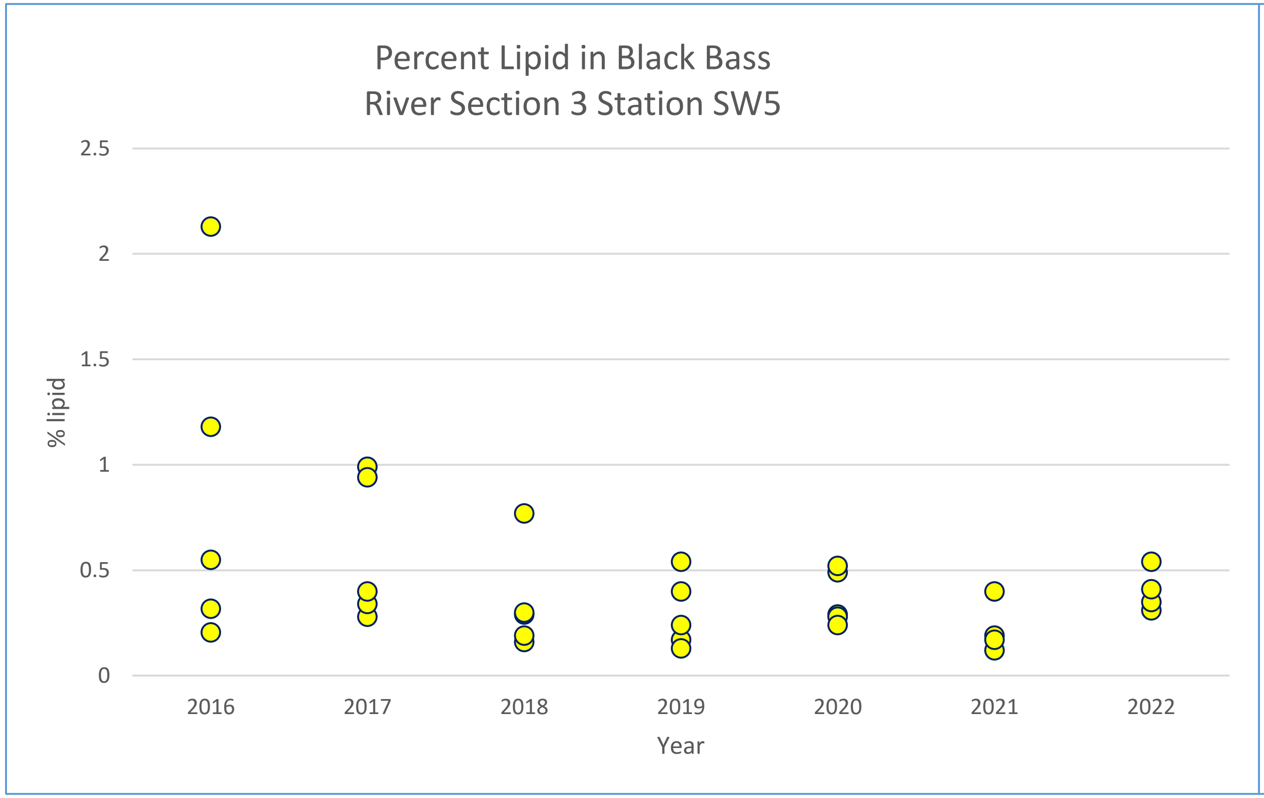


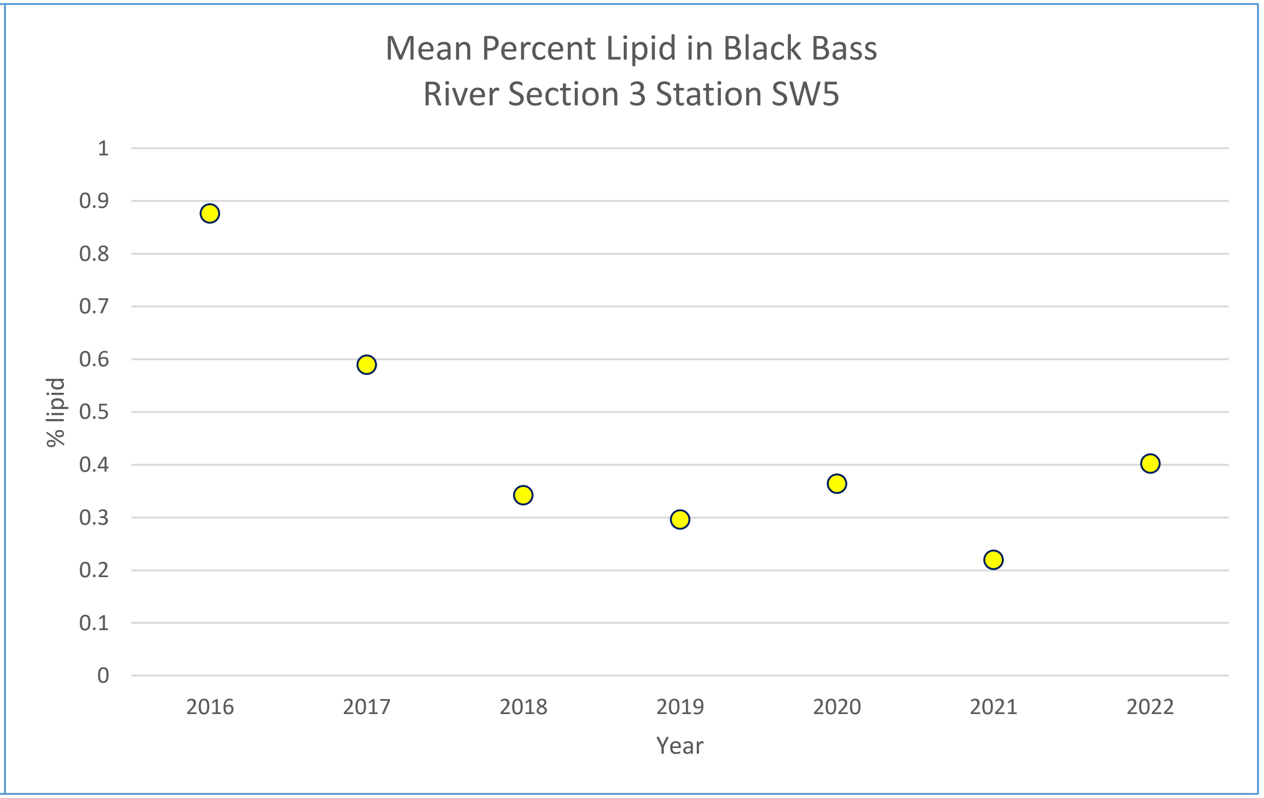
SW5 Black Bass Lipid Based PCB



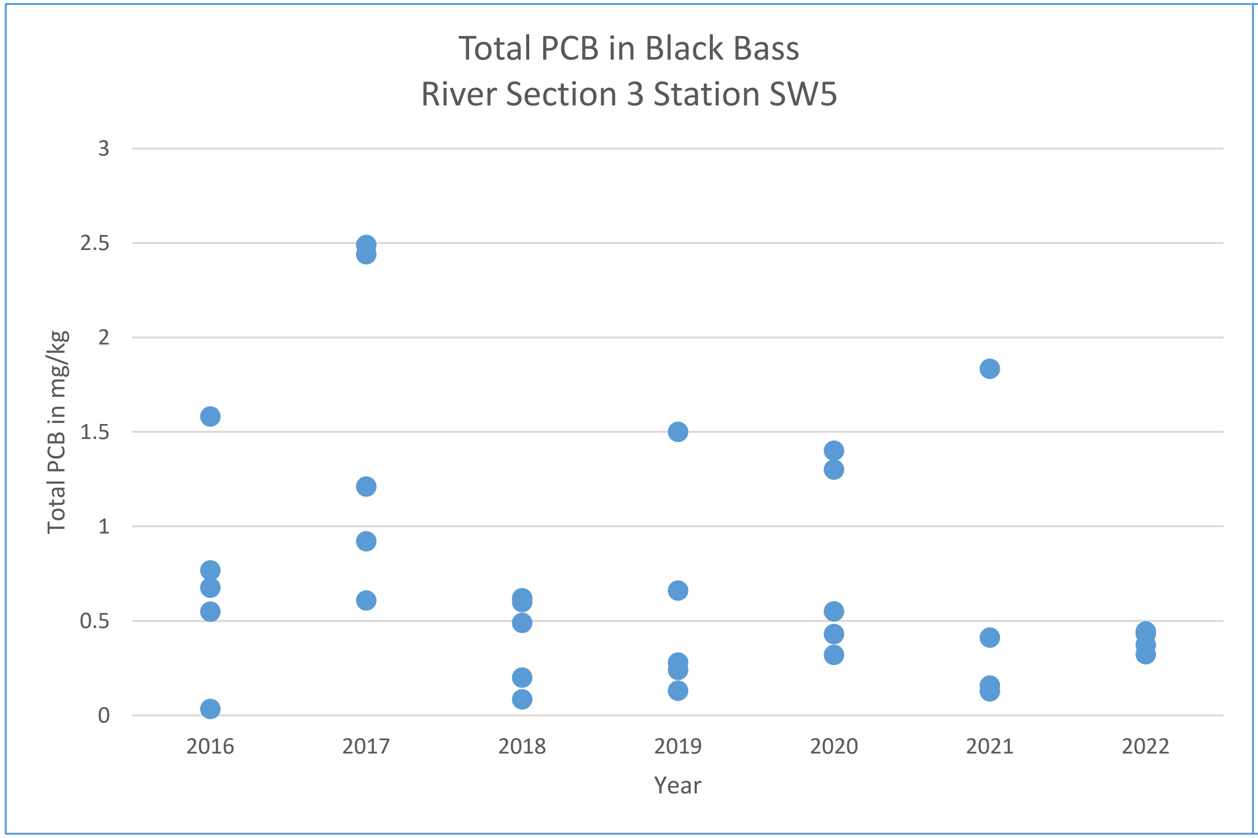


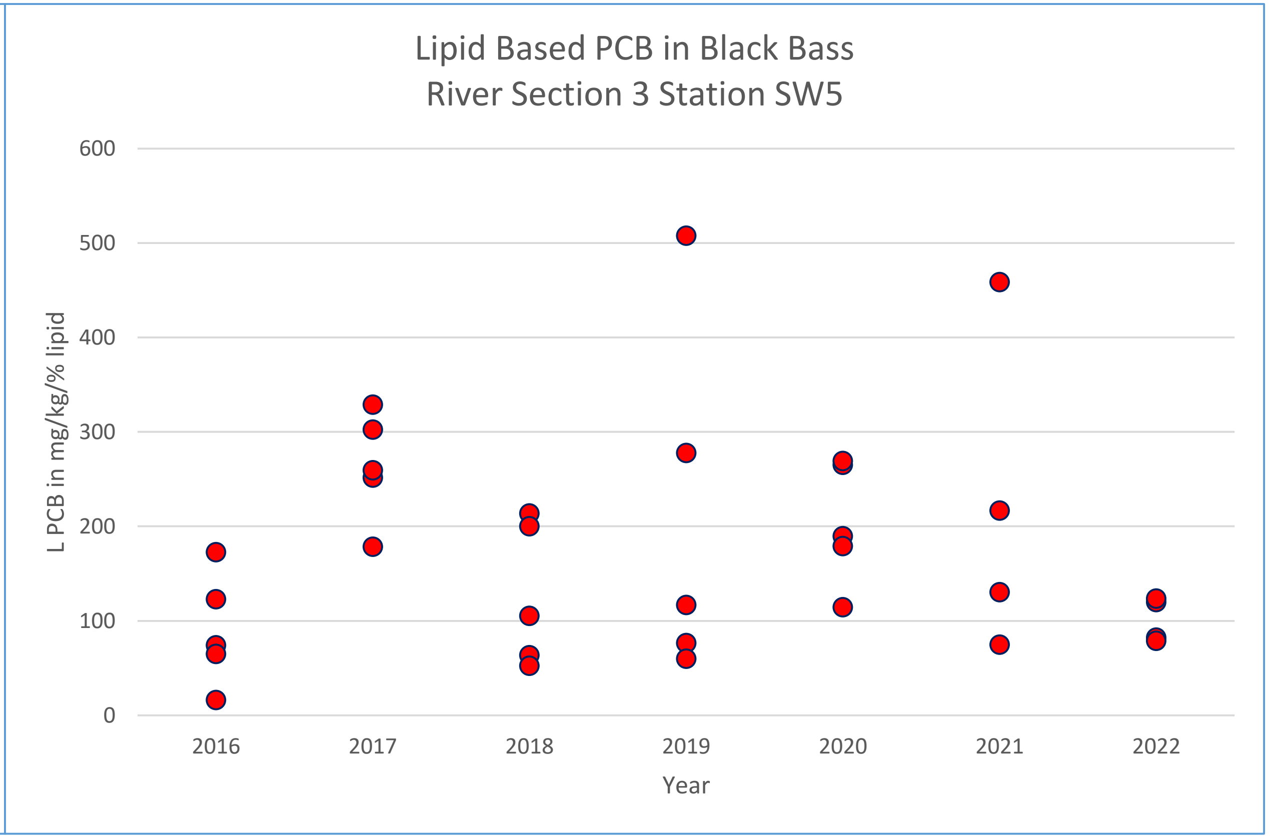
SW5 Black Bass Percent Lipid



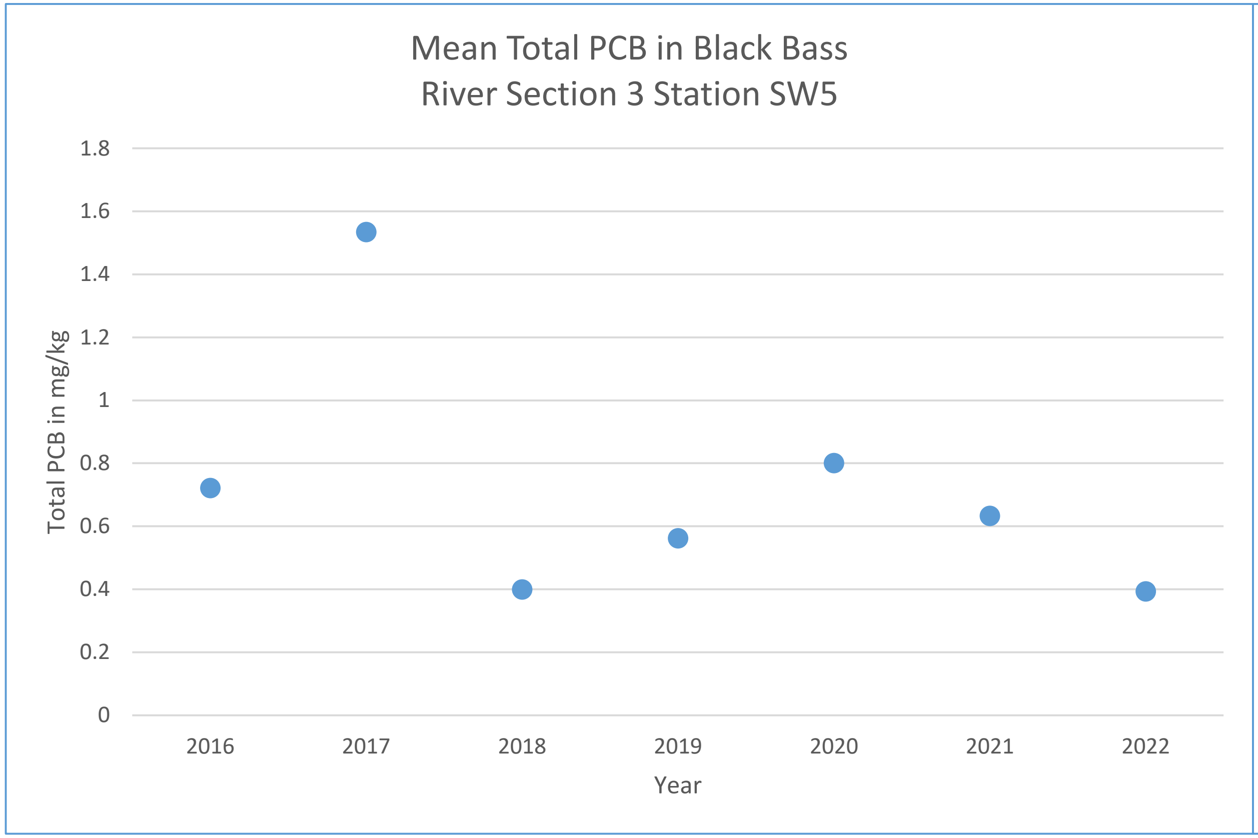


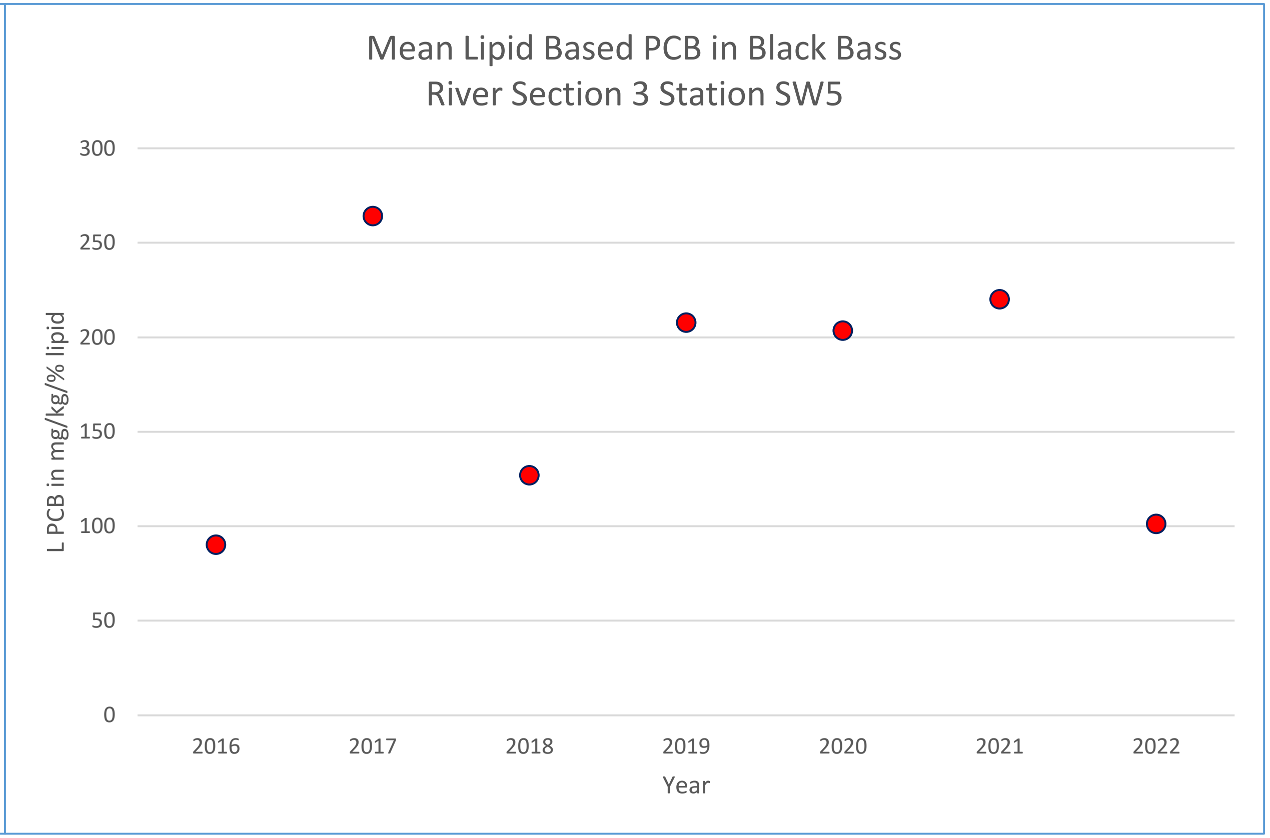
SW5 Black Bass Total PCB and Lipid Based PCB





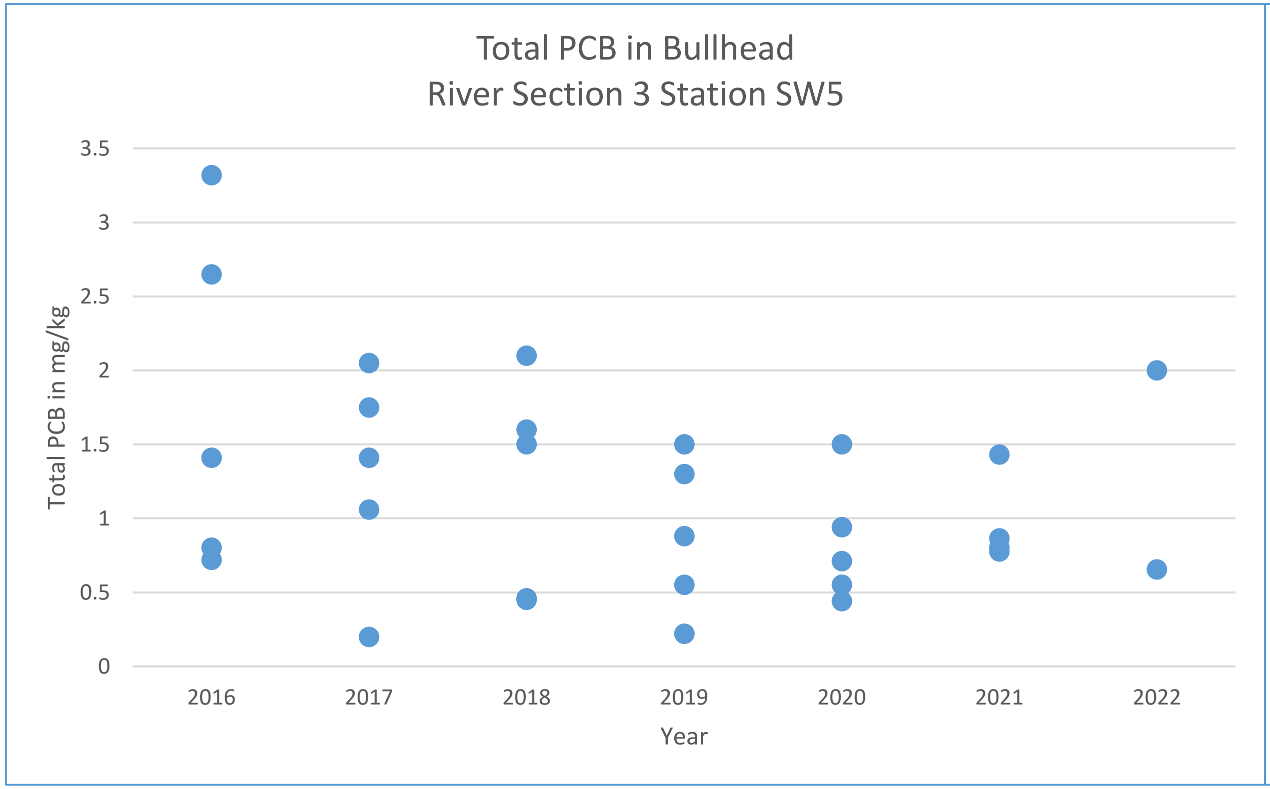
SW5 Black Bass Mean Total PCB and Mean Lipid Based PCB

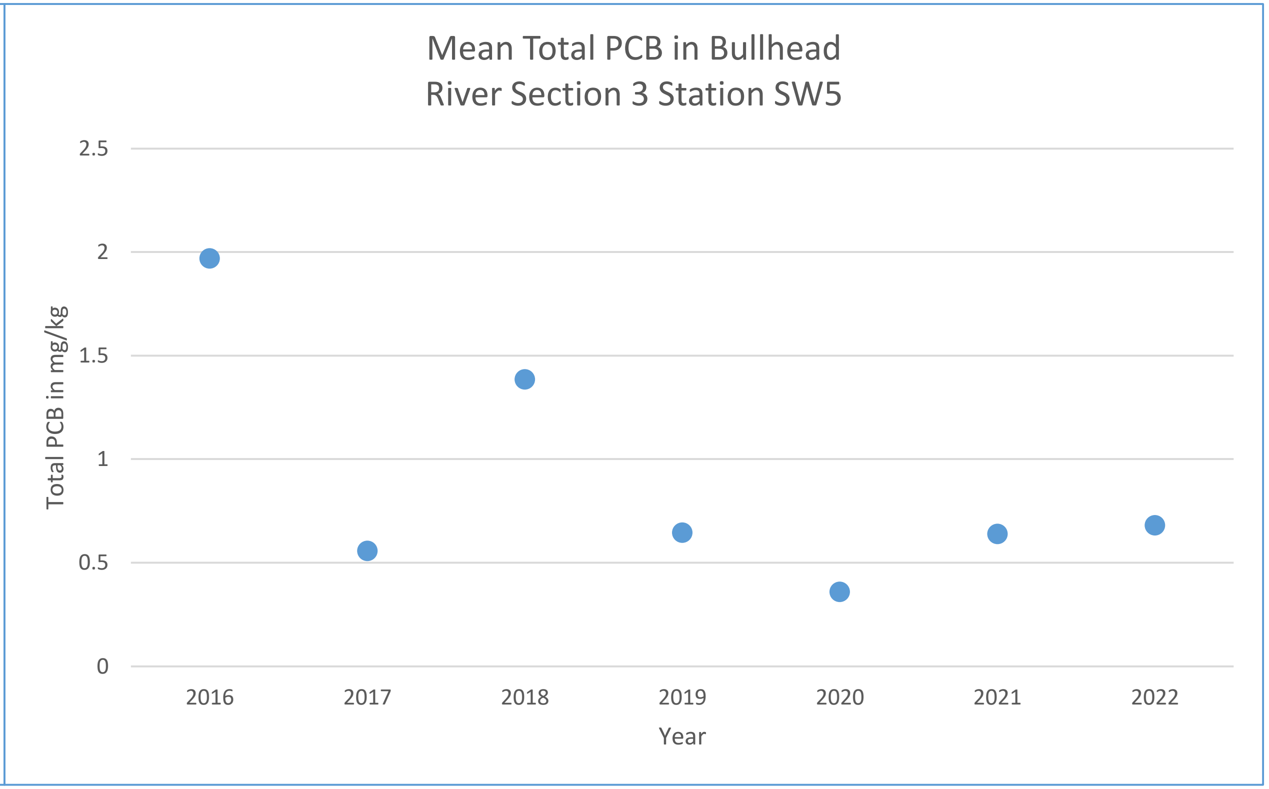




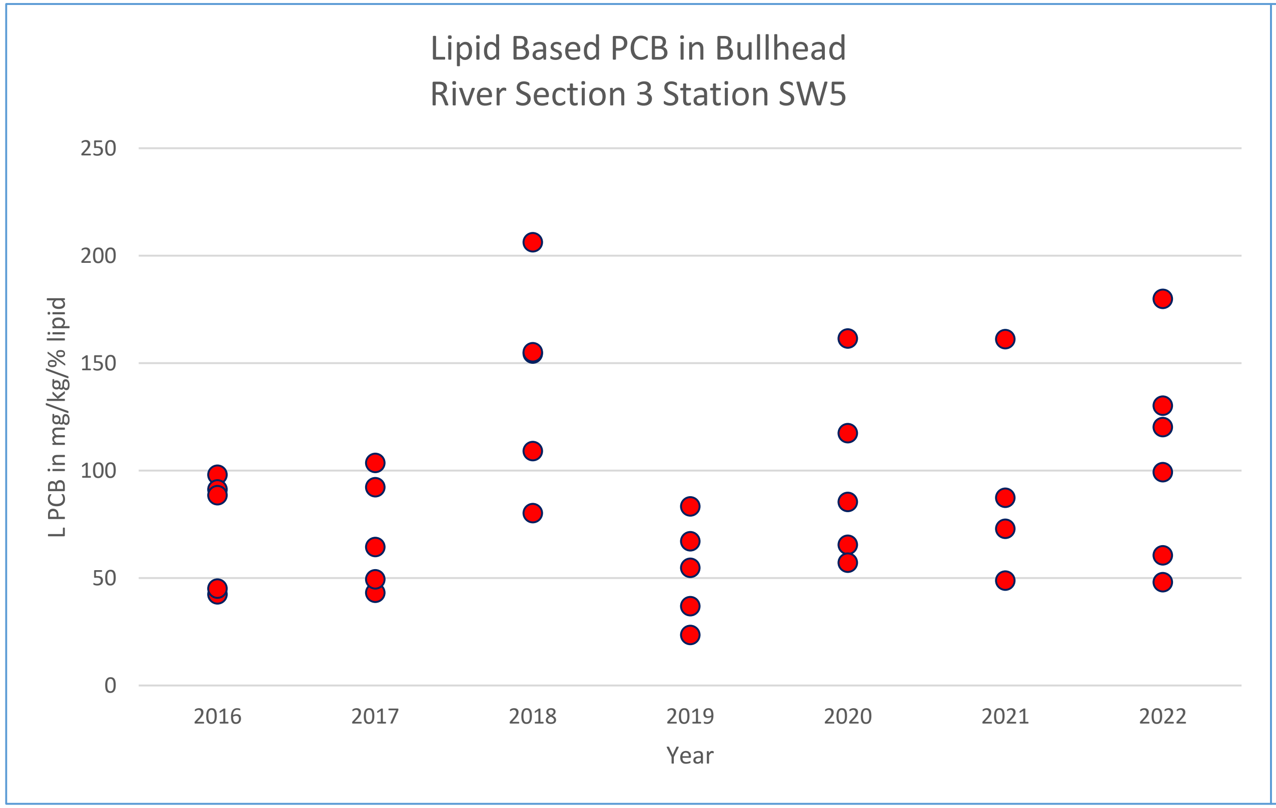
SW5 Bullhead Data

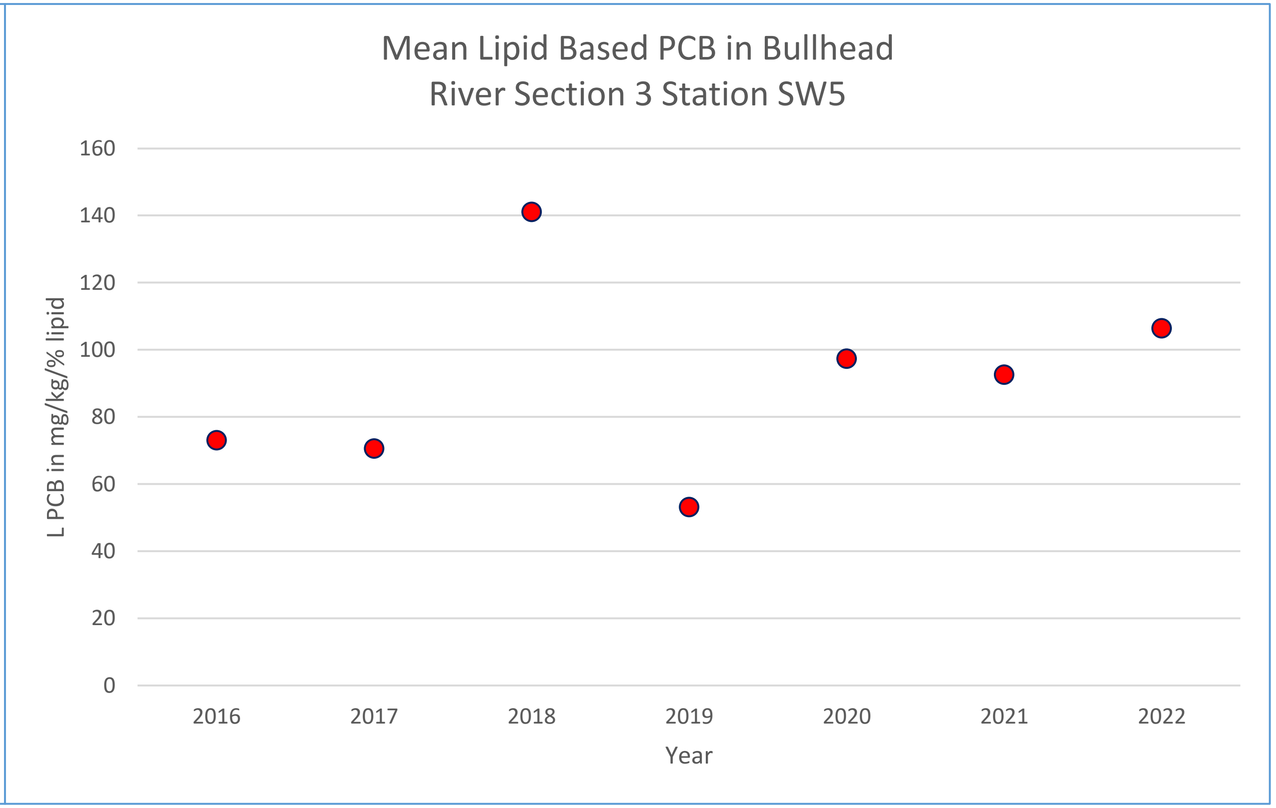
SW5 Bullhead Total PCB



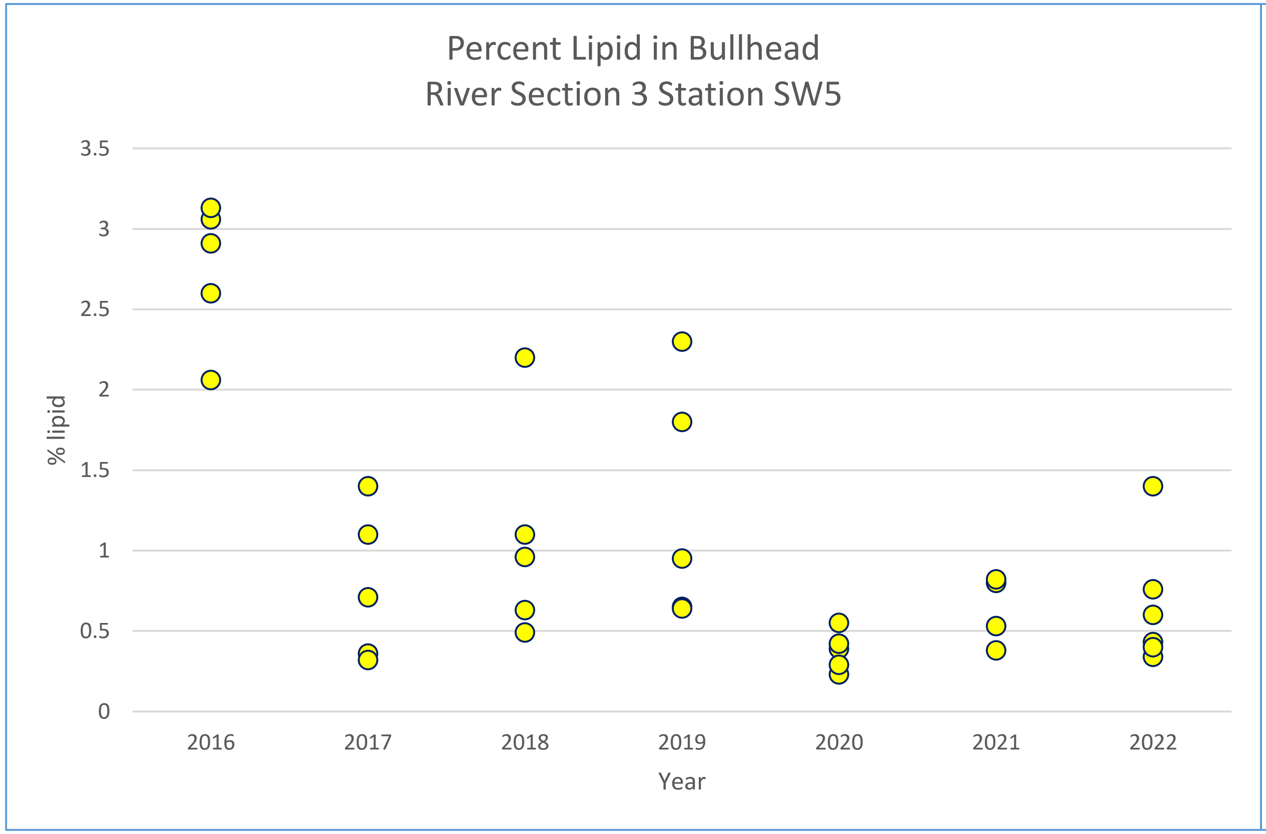


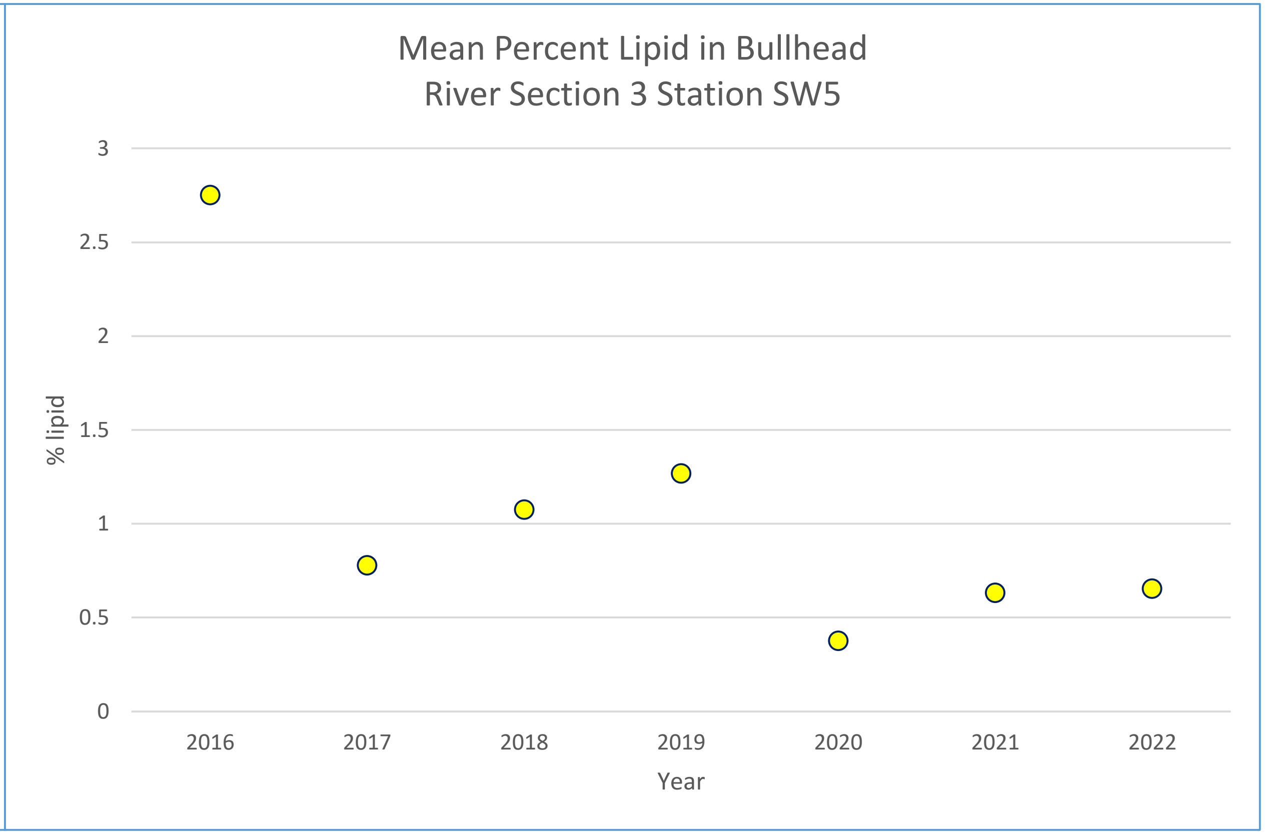
SW5 Bullhead Lipid Based PCB



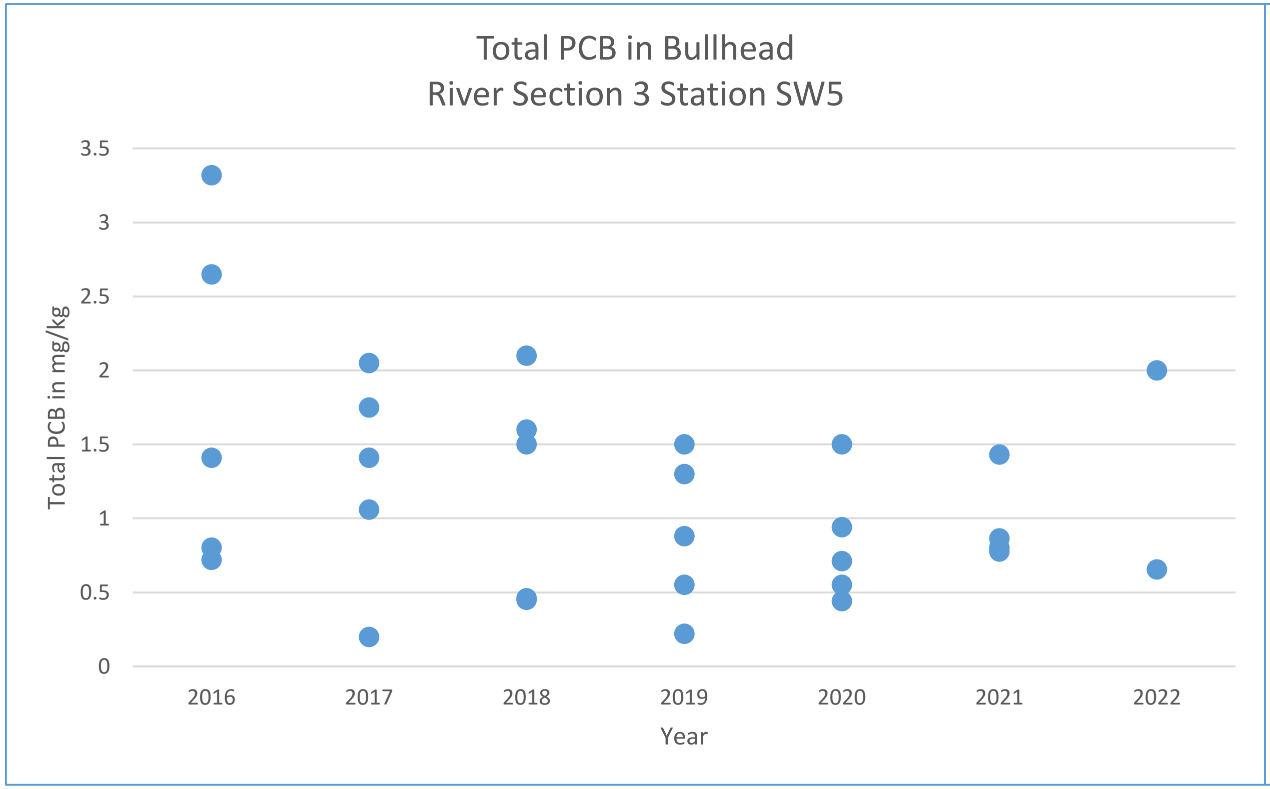


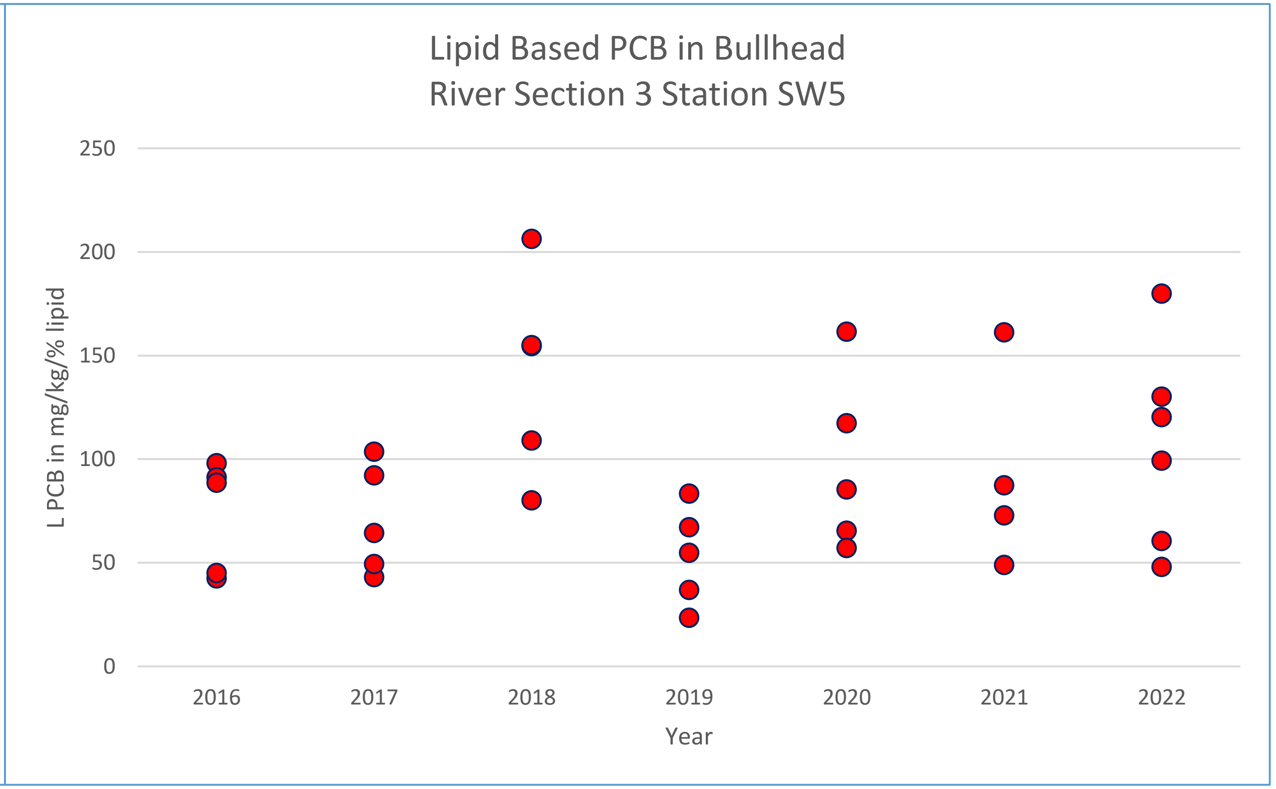
SW5 Bullhead Percent Lipid



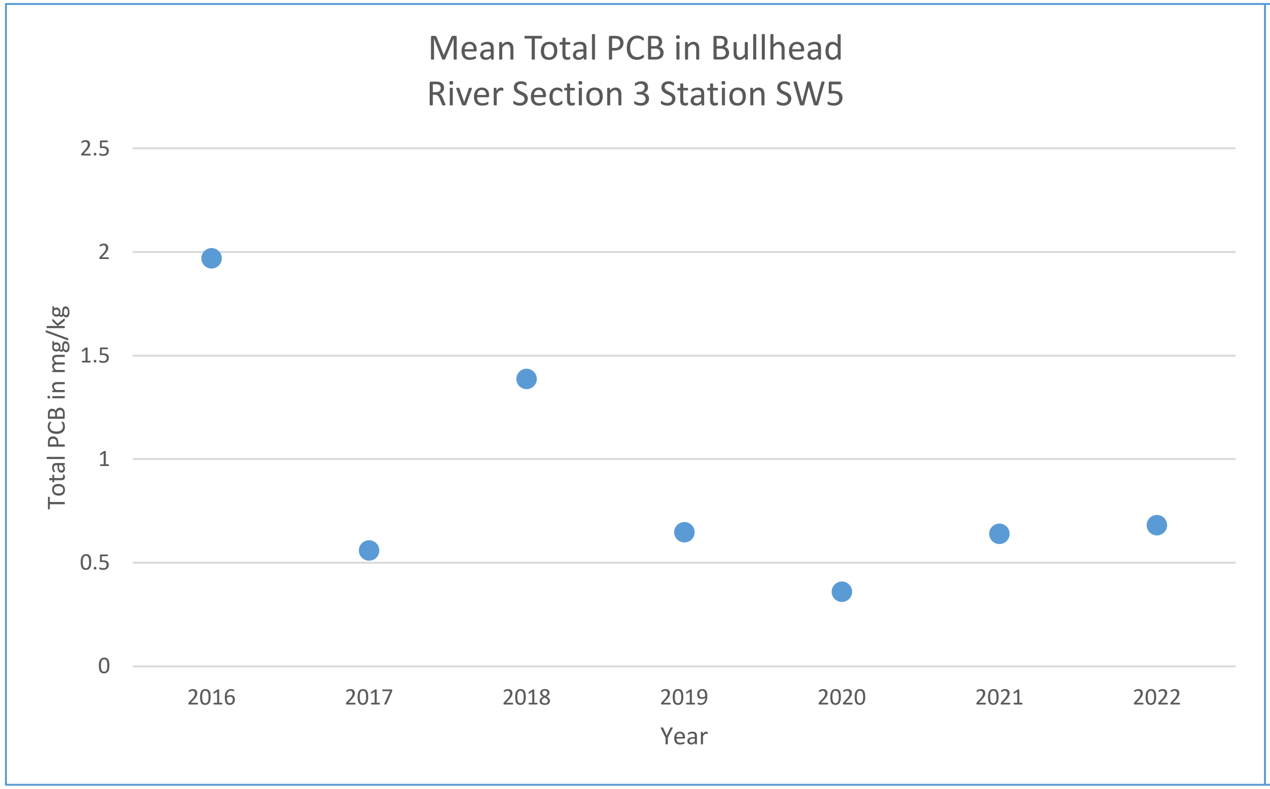


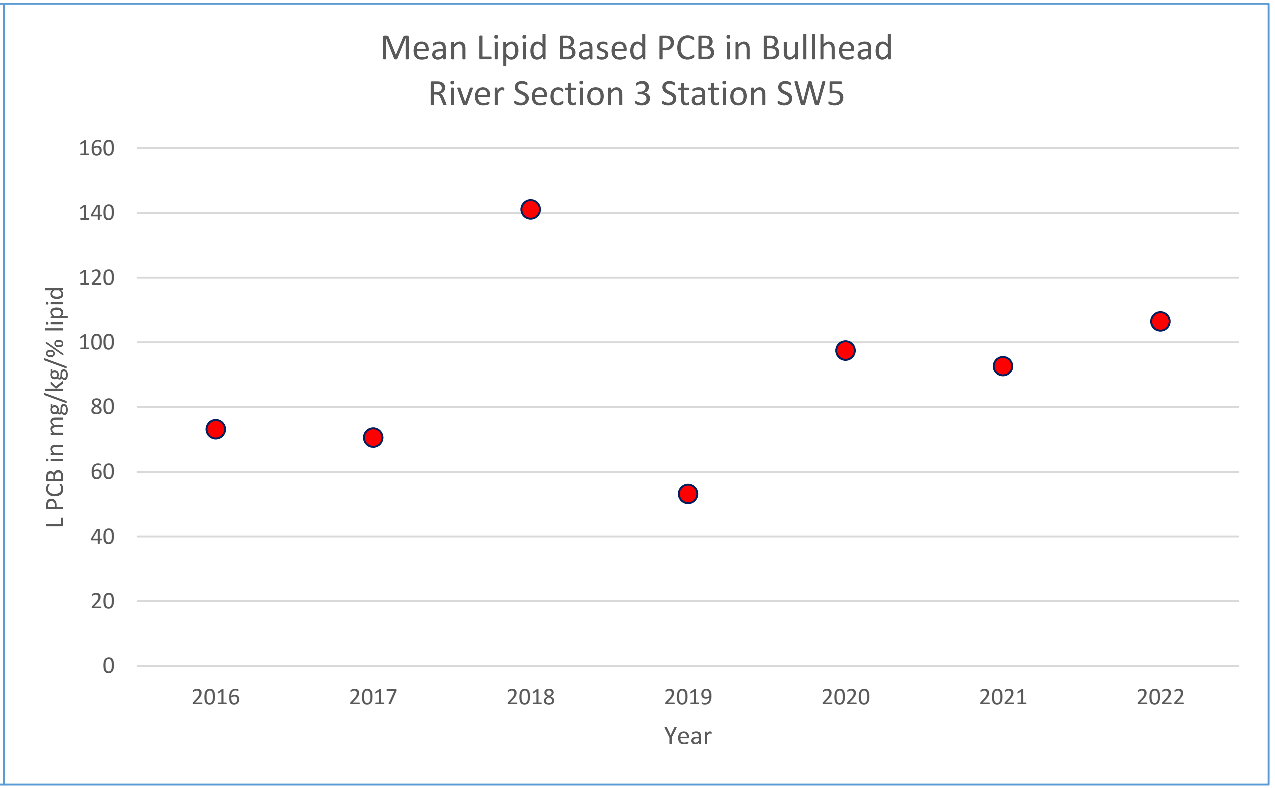
SW5 Bullhead Total PCB and Lipid Based PCB





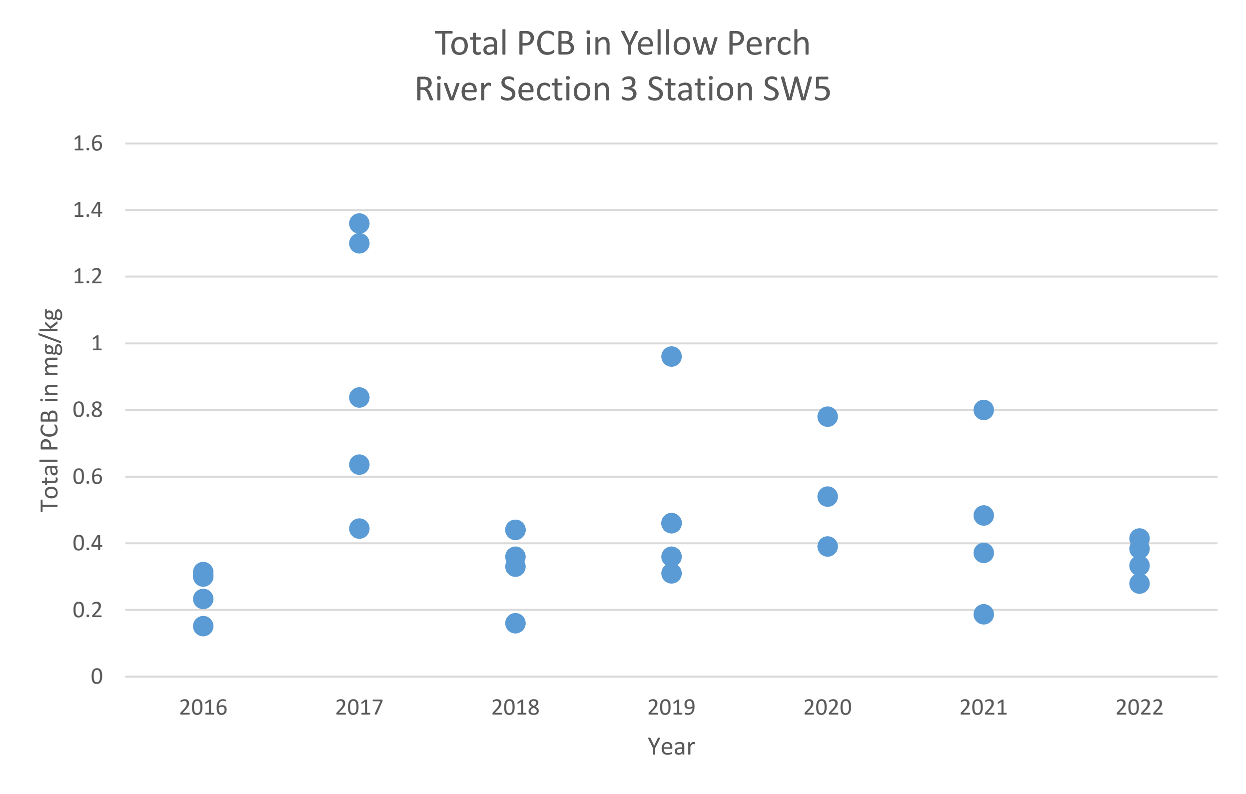
SW5 Bullhead Mean Total PCB and Mean Lipid Based PCB

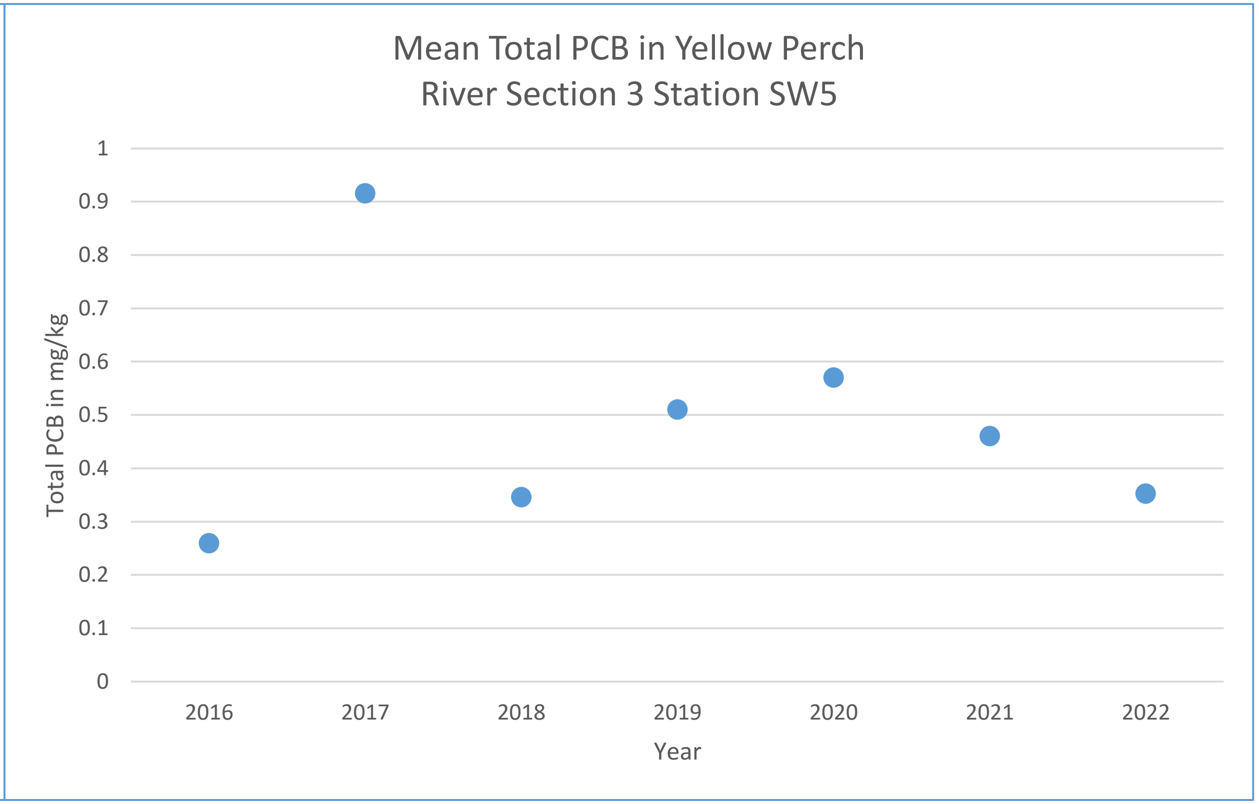




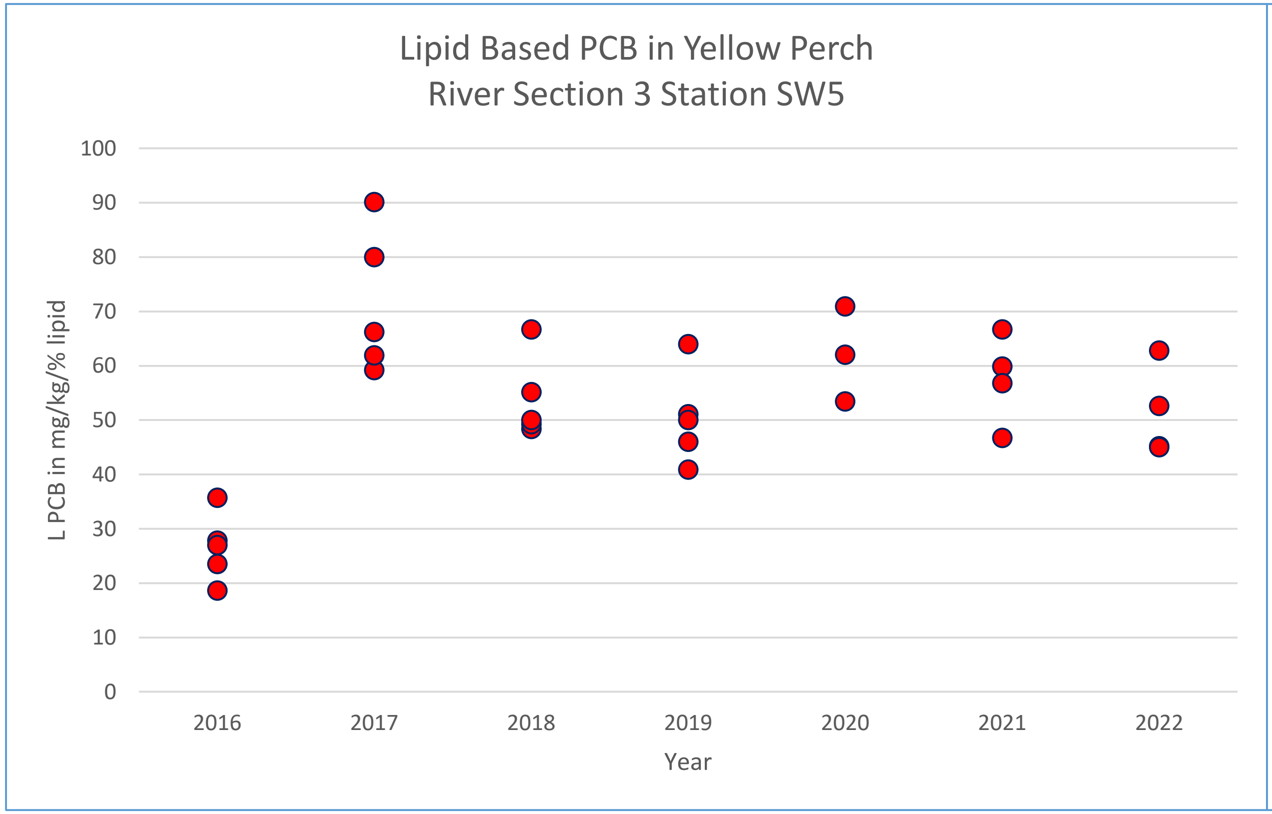
SW5 Yellow Perch Data

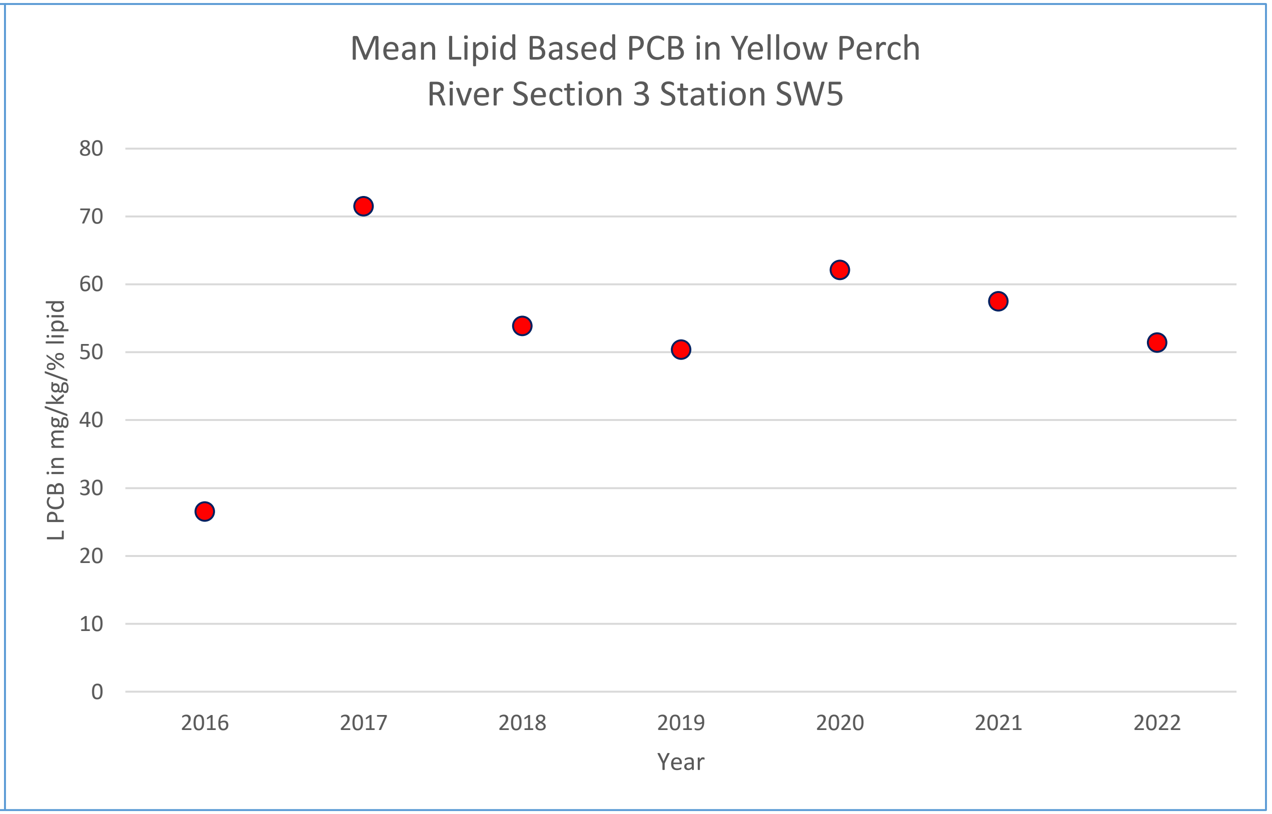
SW5 Yellow Perch PCB



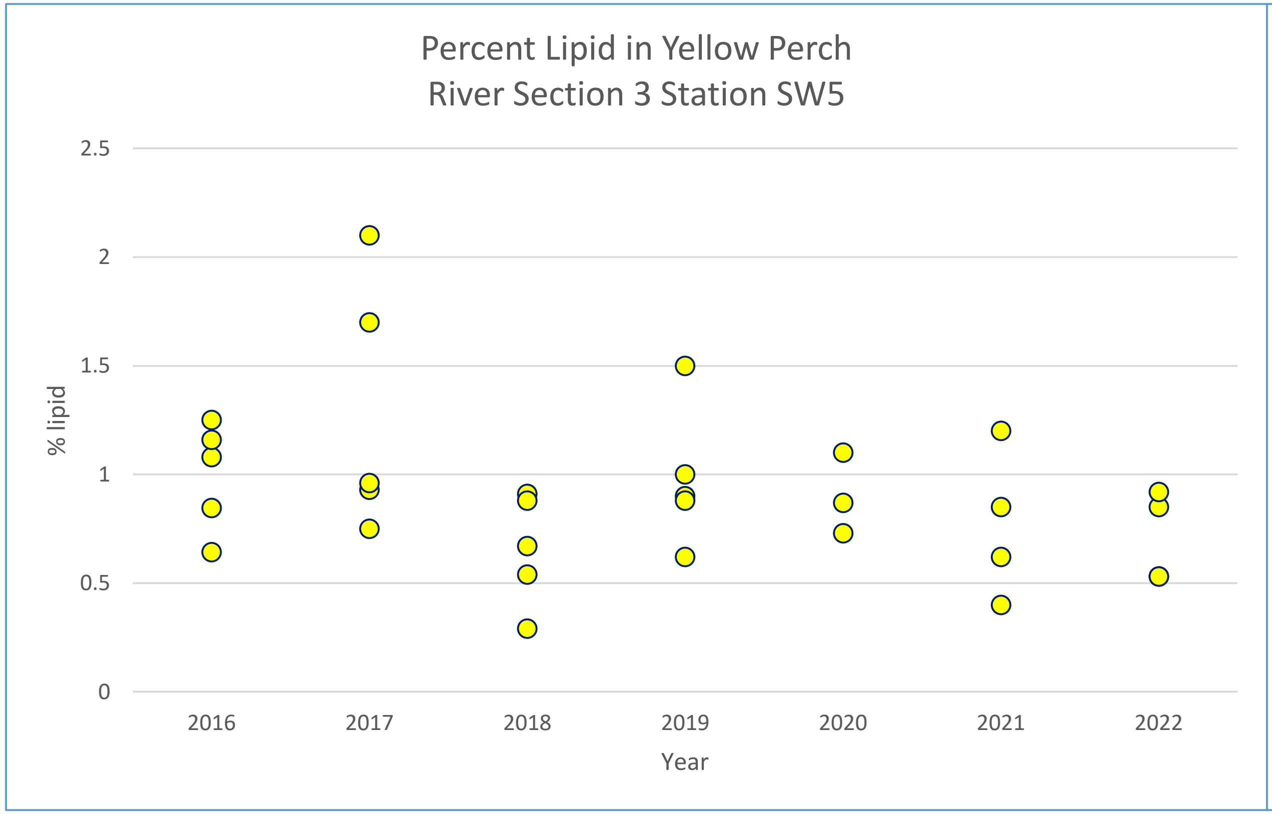


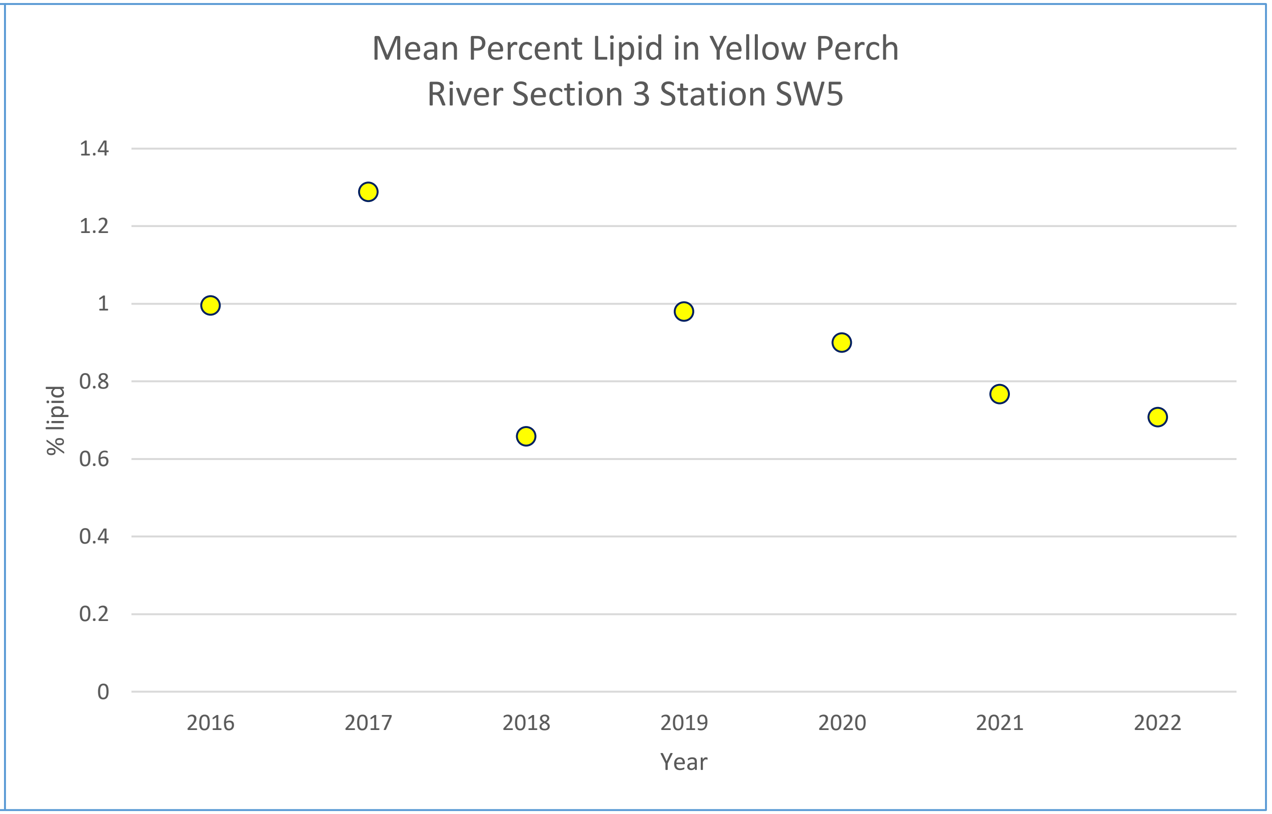
SW5 Yellow Perch Lipid Based PCB



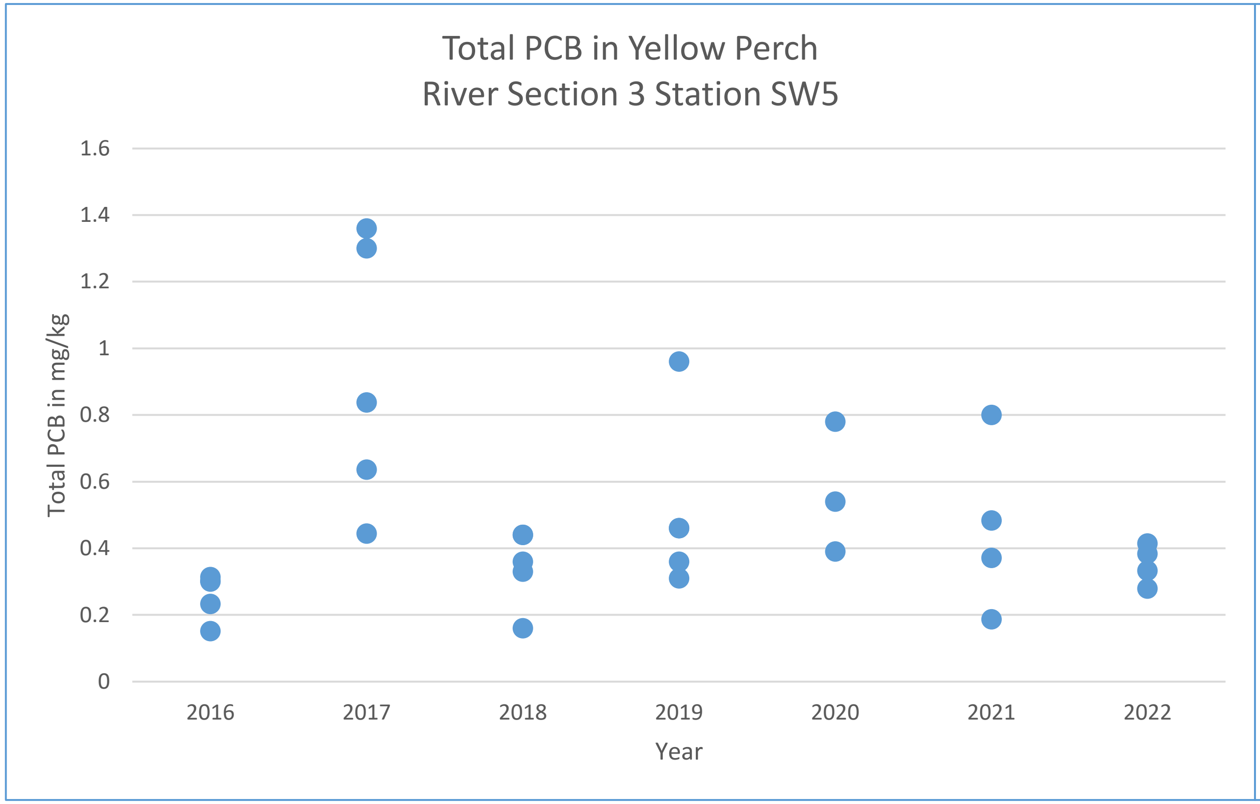


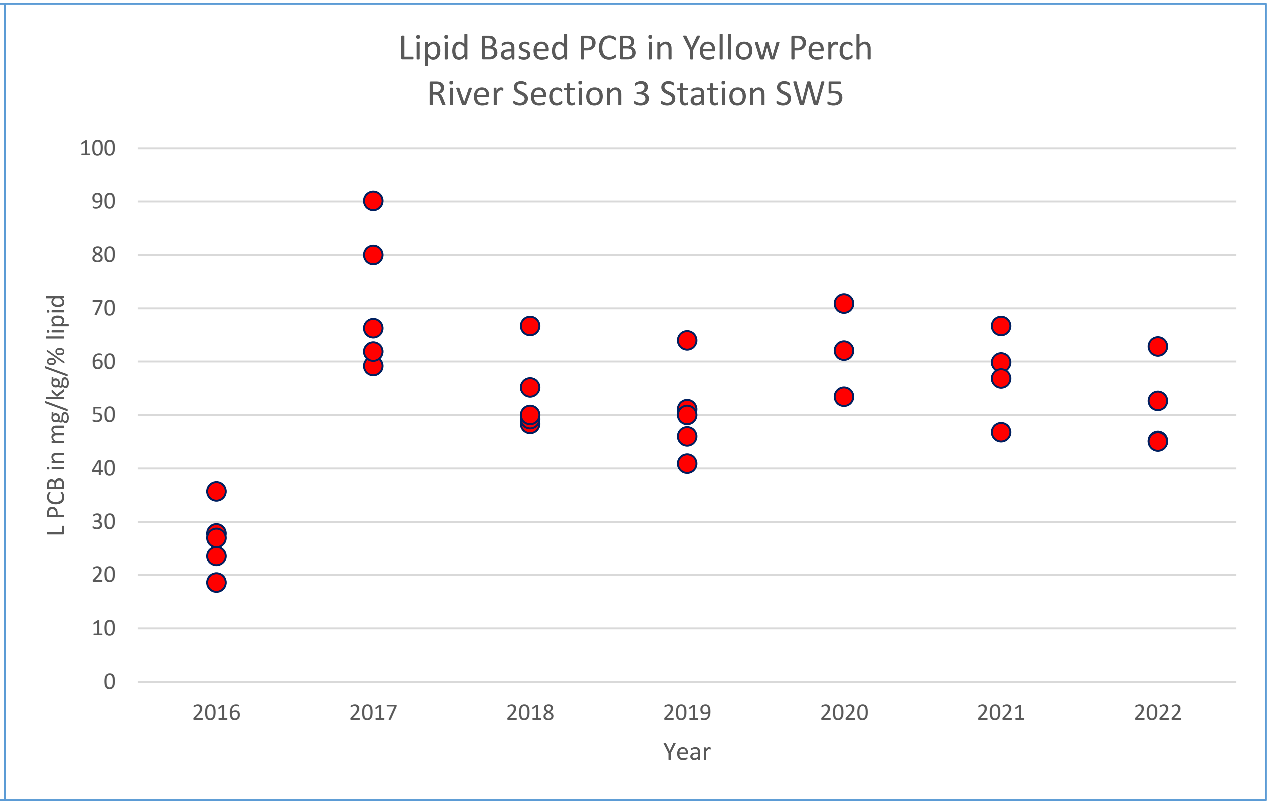
SW5 Yellow Perch Percent Lipid



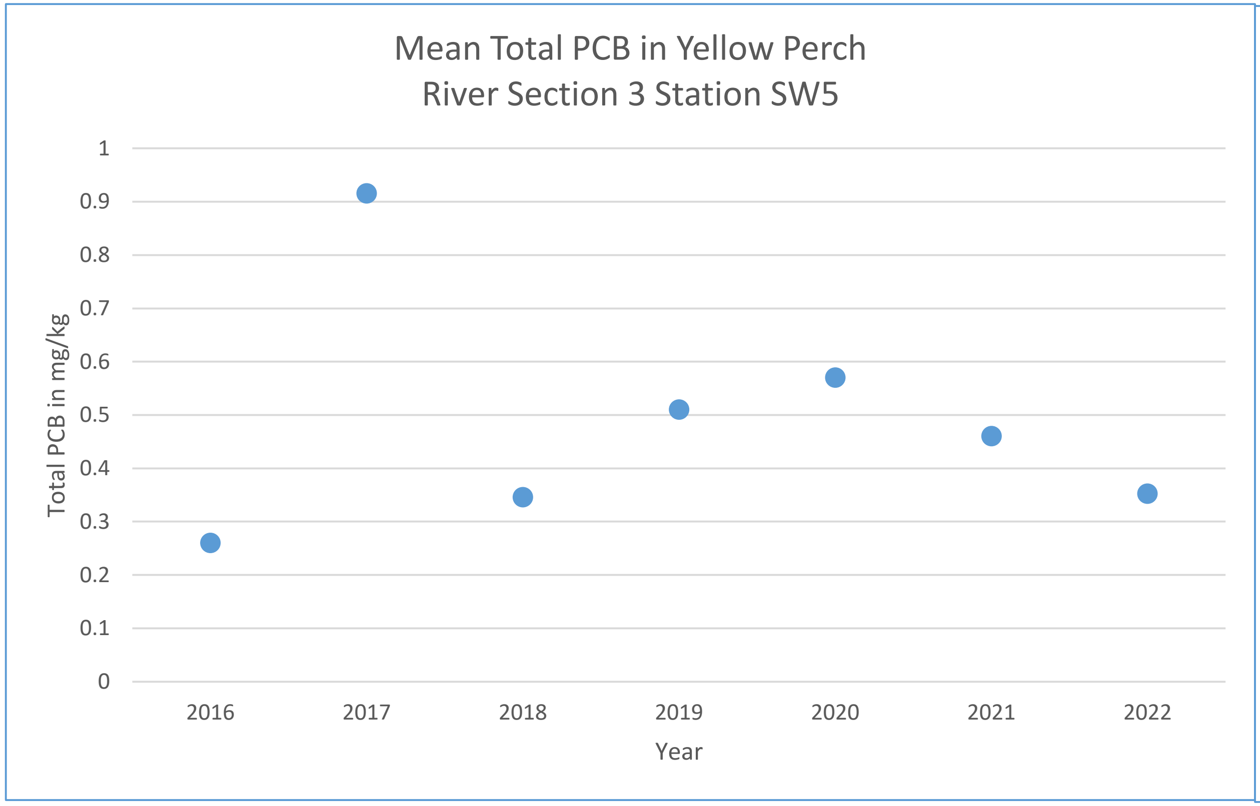


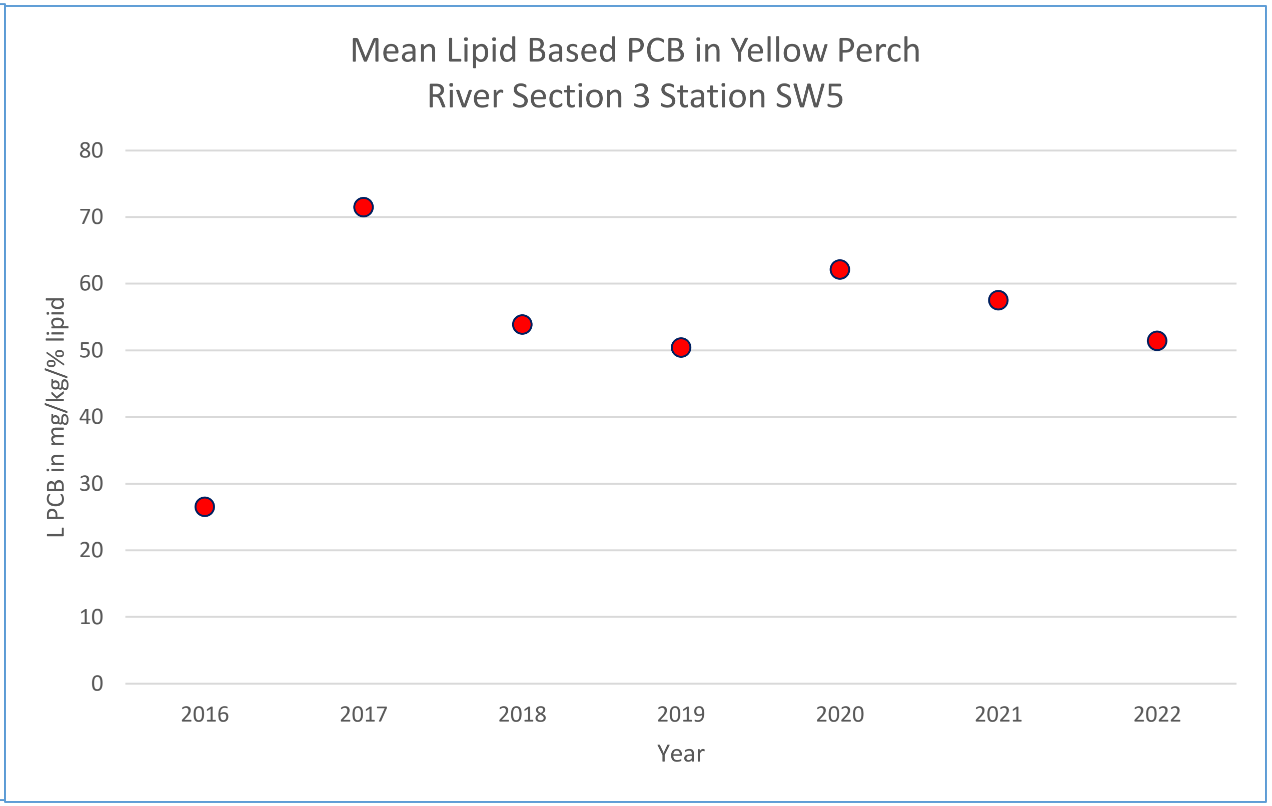
SW5 Yellow Perch Total PCB and Lipid Based PCB





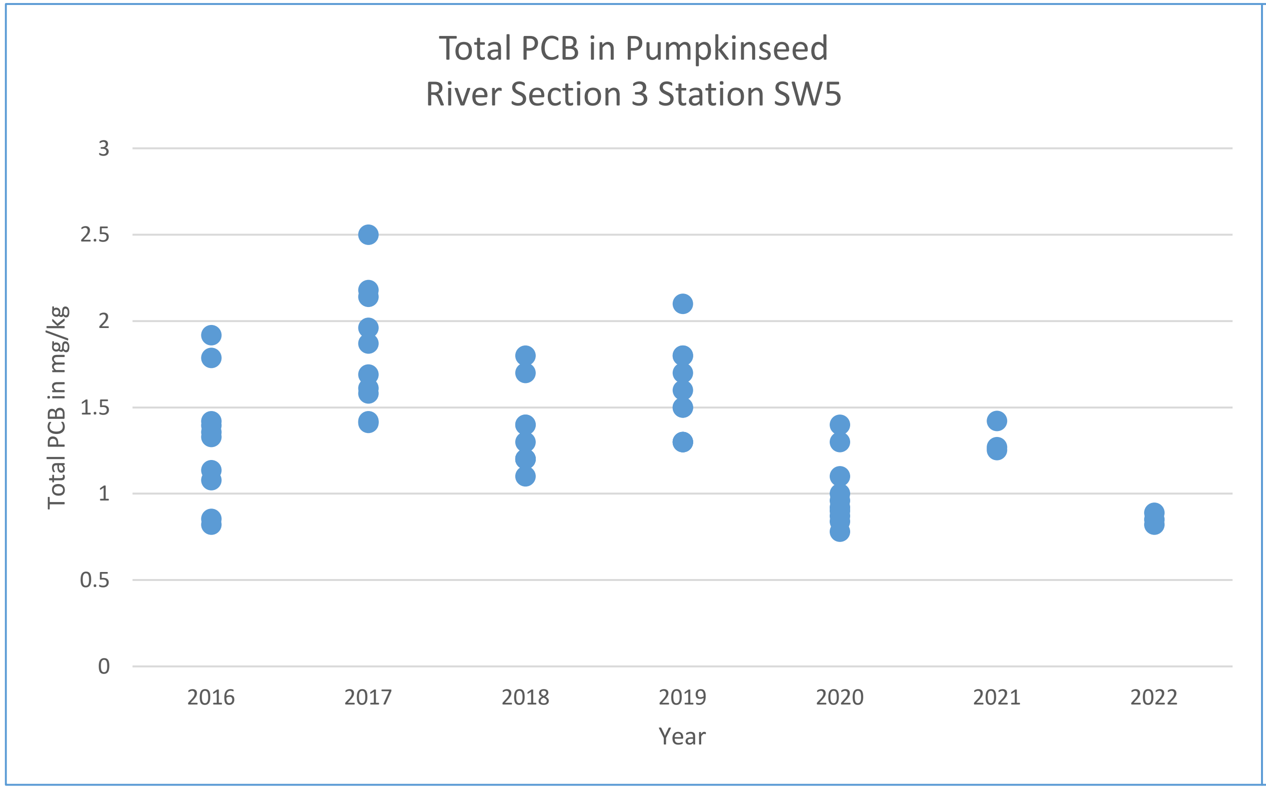
SW5 Yellow Perch Mean Total PCB and Mean Lipid Based PCB

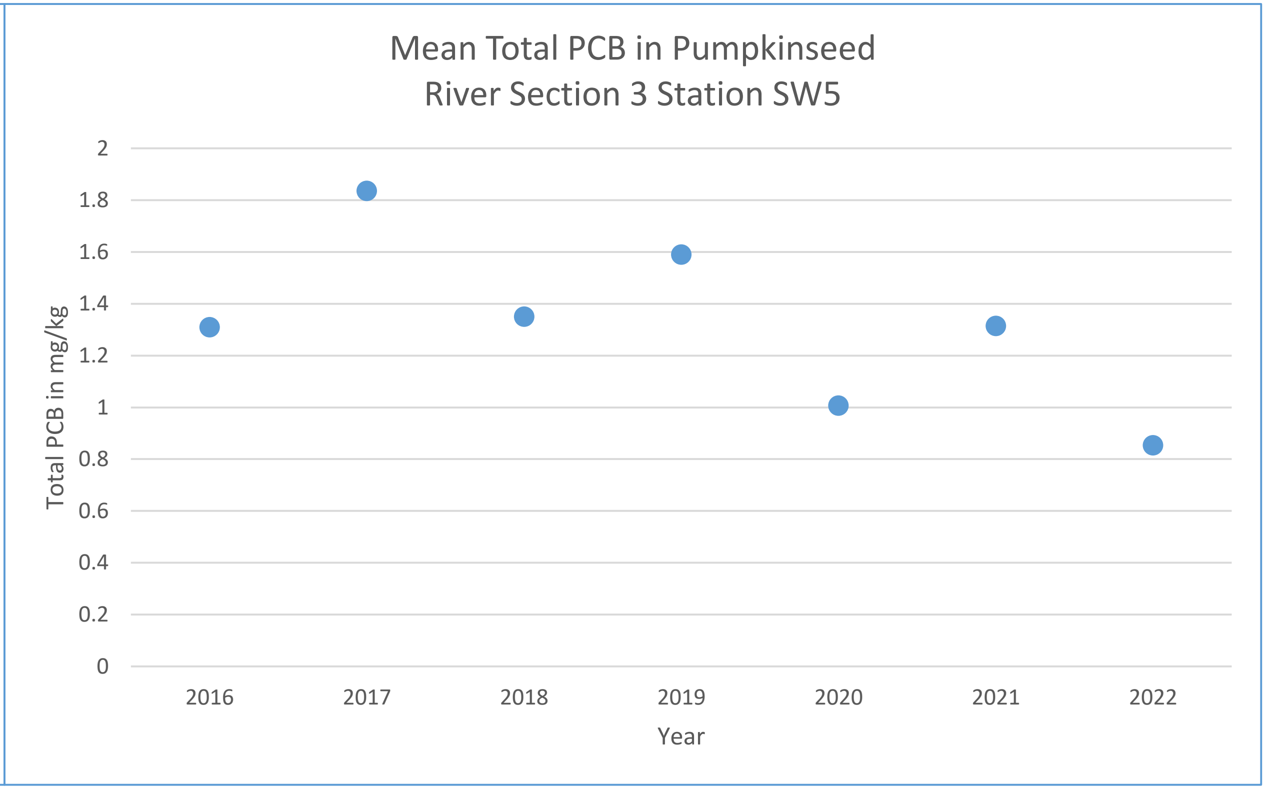




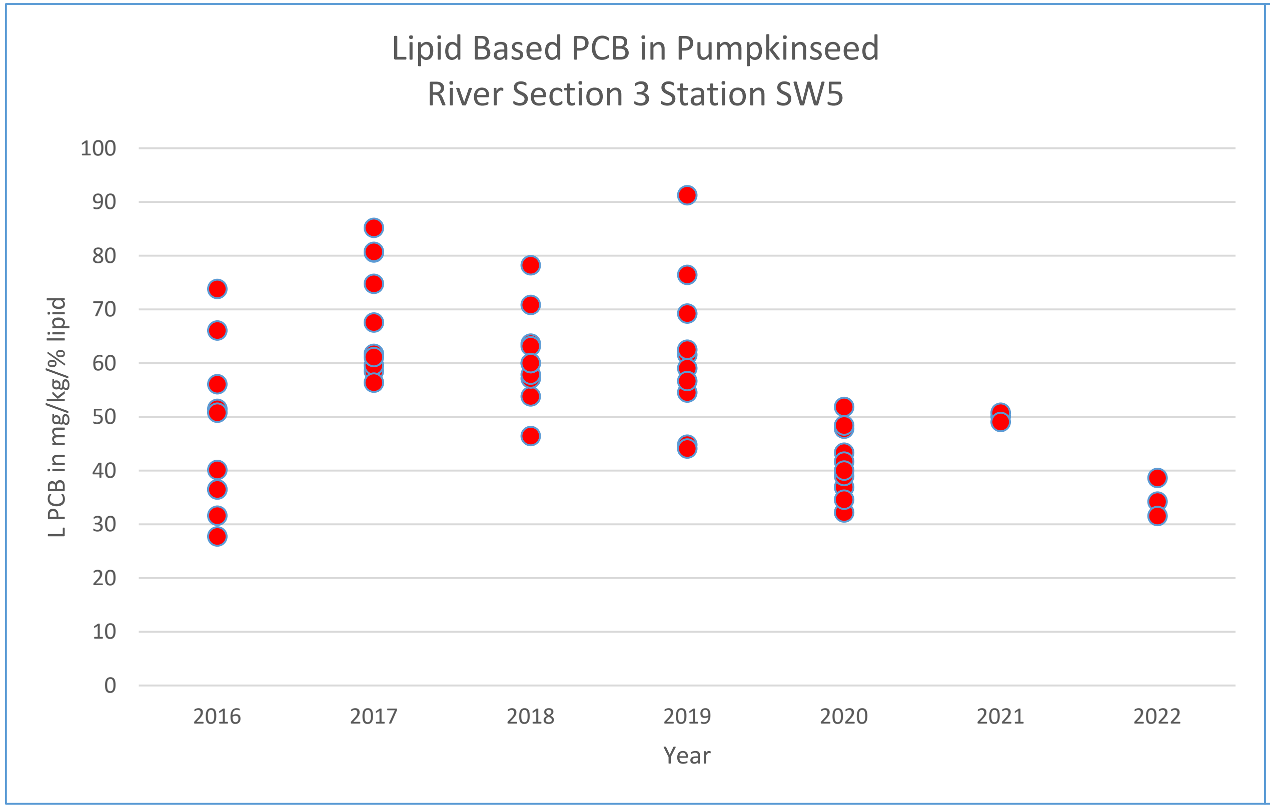
SW5 Pumpkinseed Data

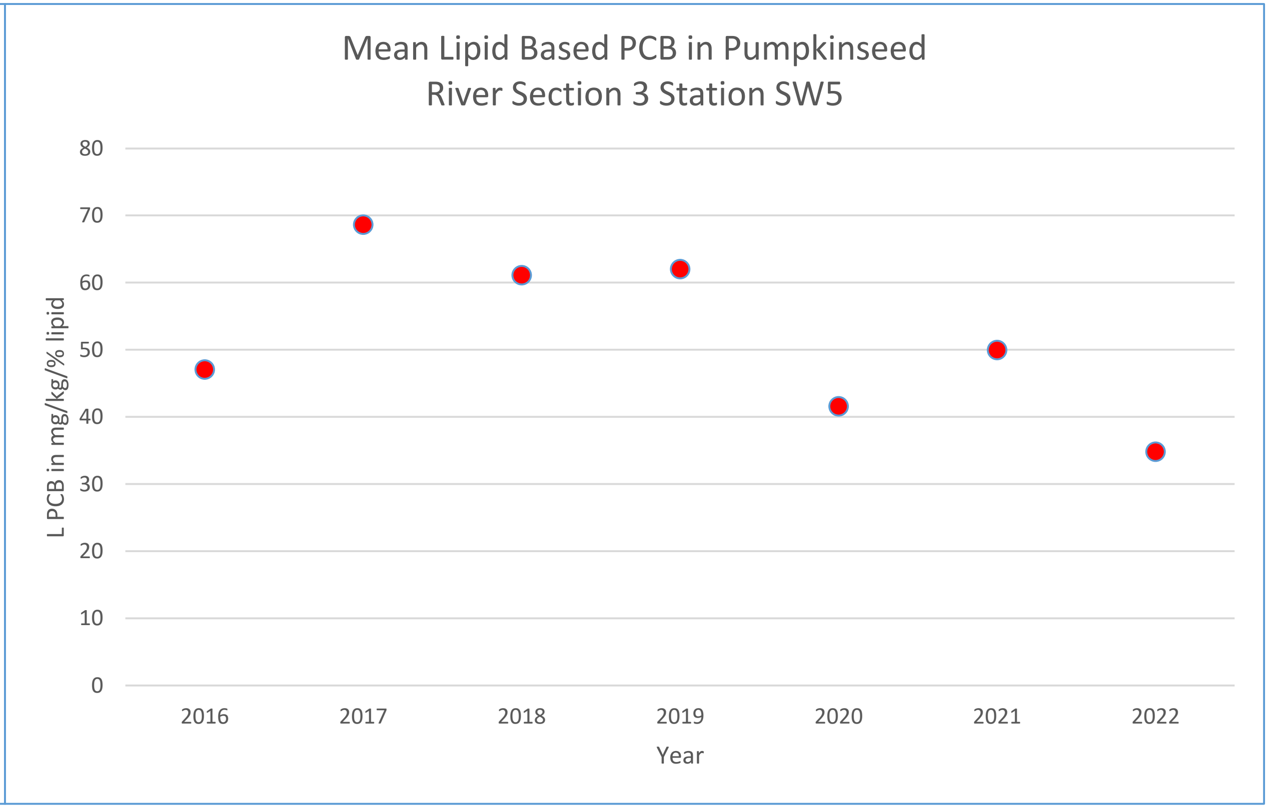
SW5 Pumpkinseed Total PCB



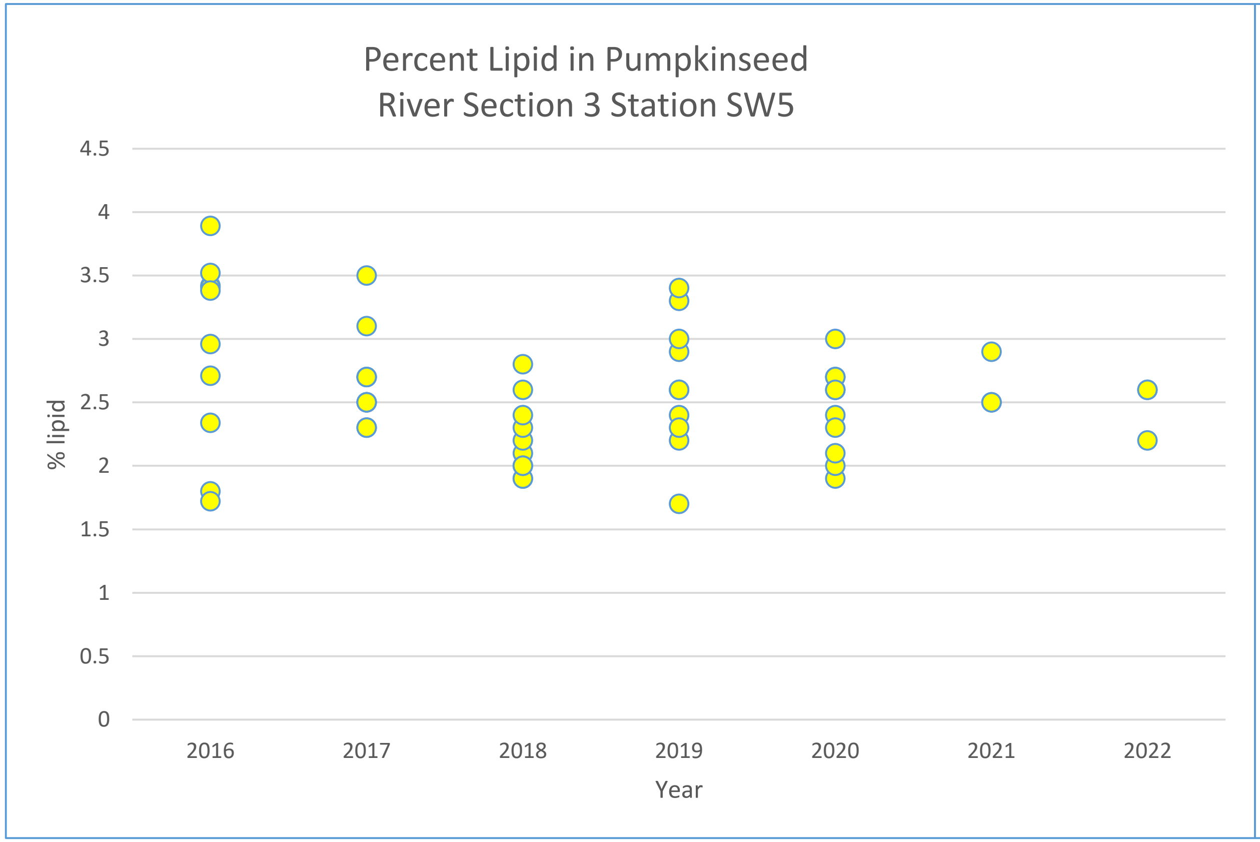


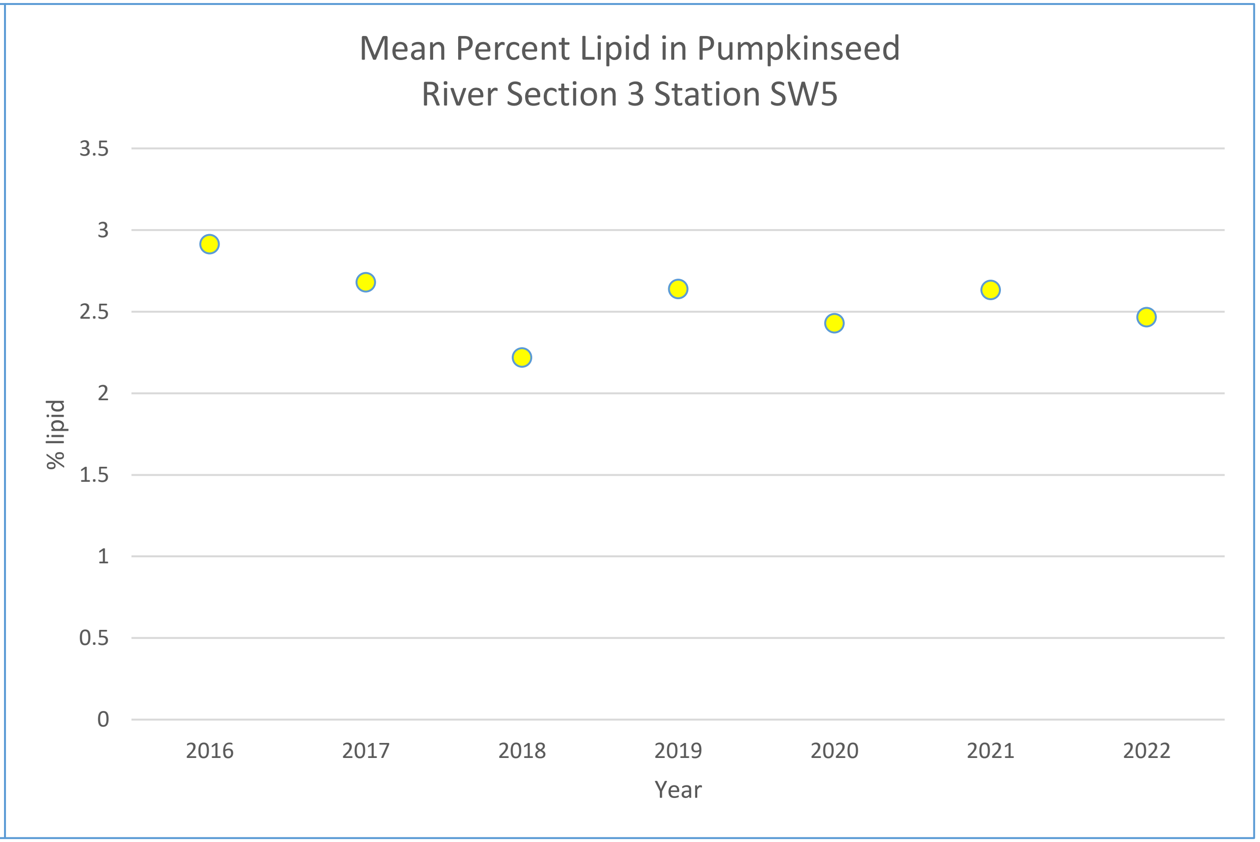
SW5 Pumpkinseed Lipid Based PCB



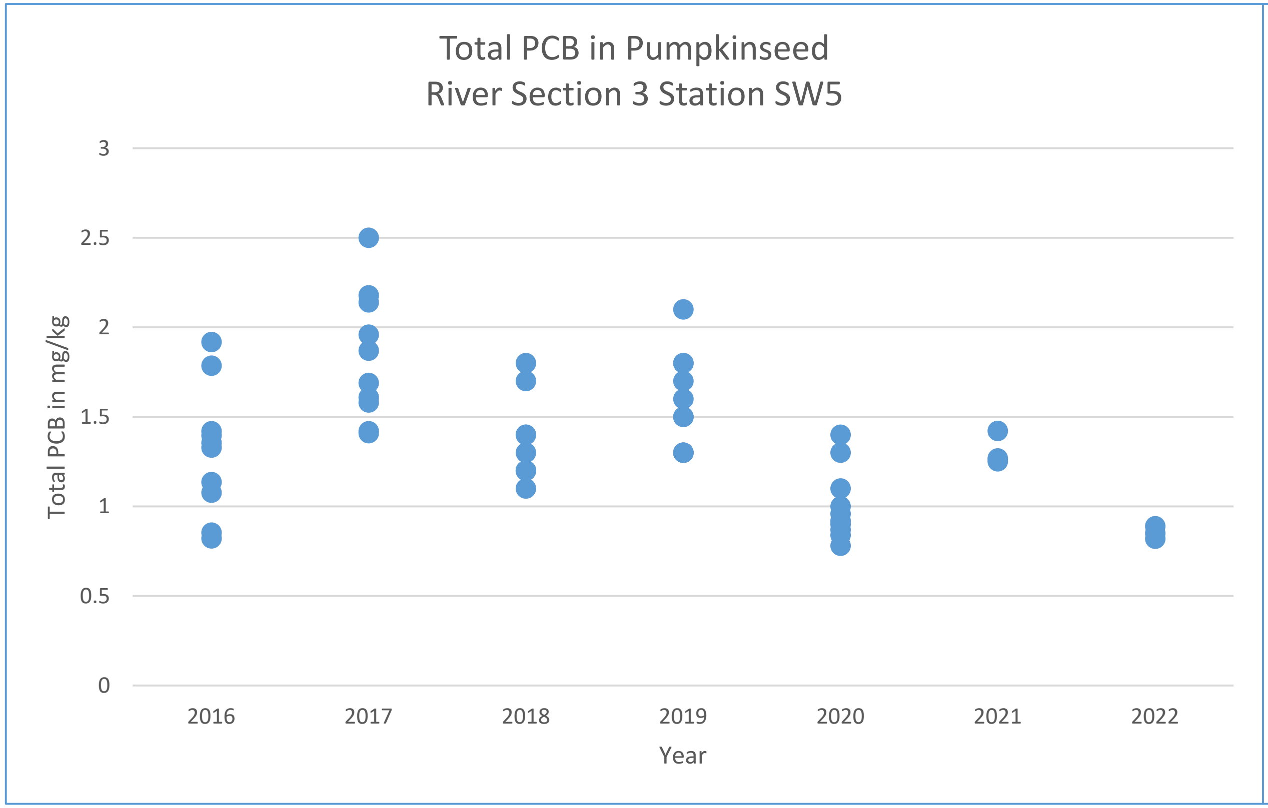


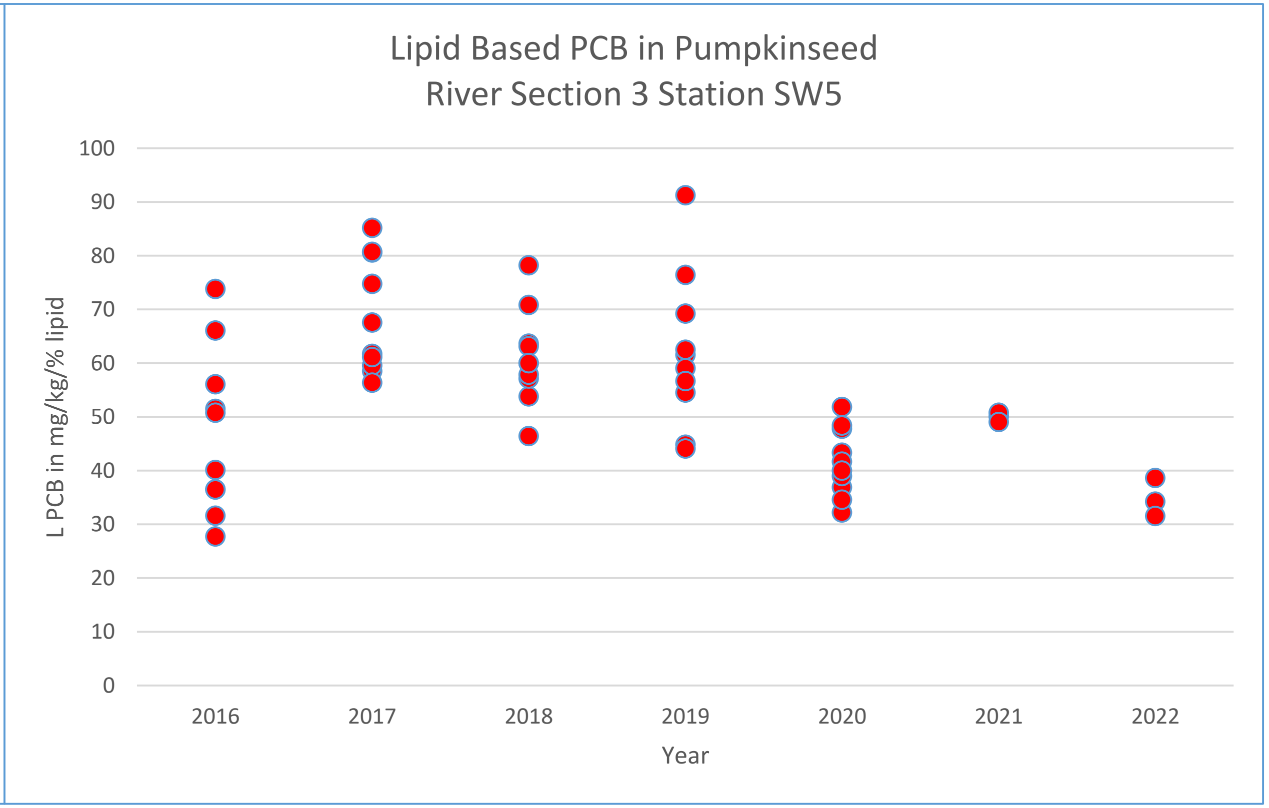
SW5 Pumpkinseed Percent Lipid



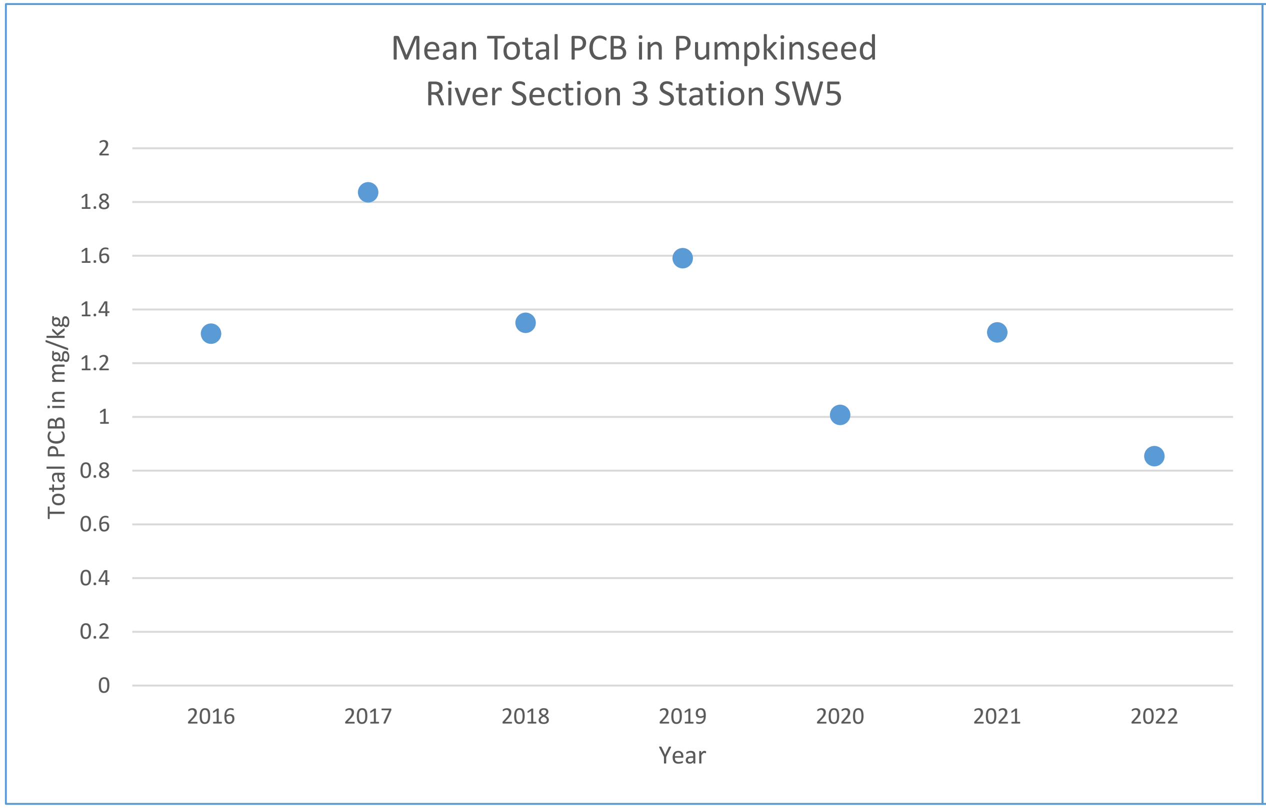


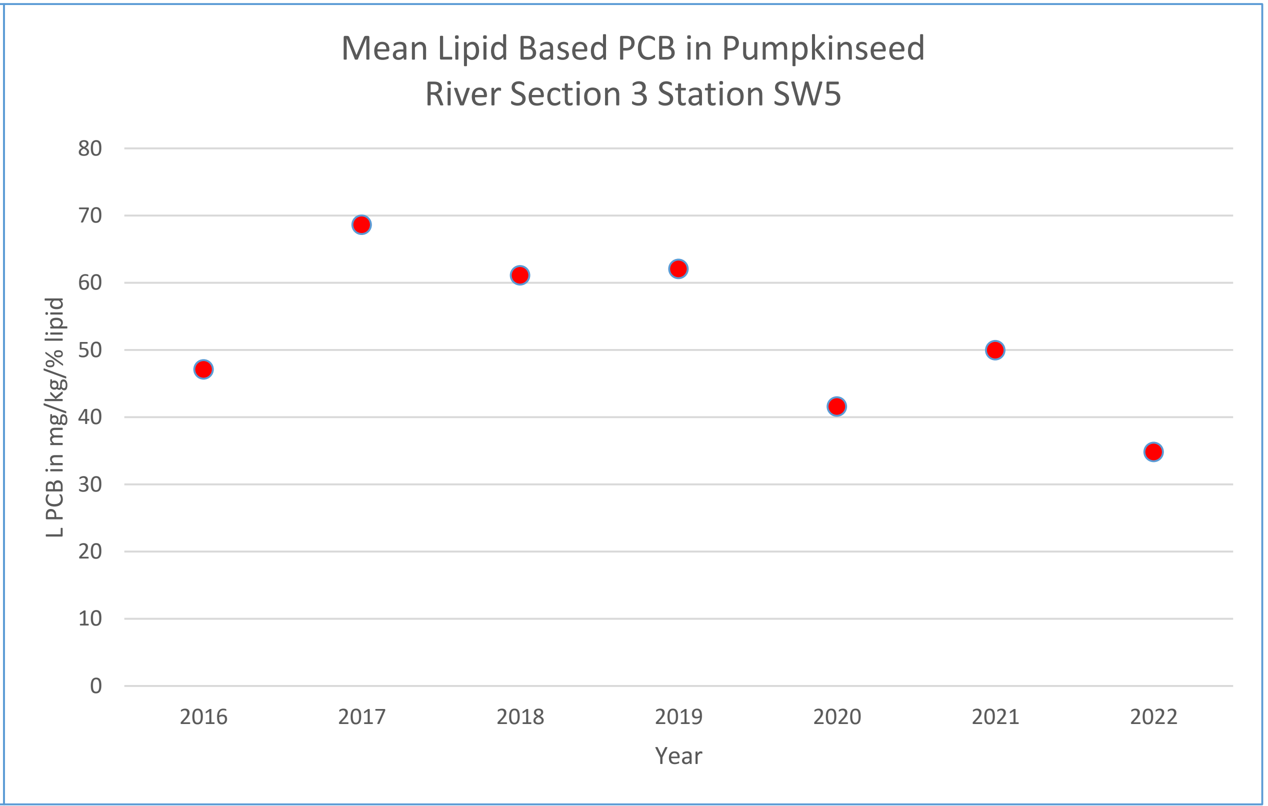
SW5 Pumpkinseed Total PCB and Lipid Based PCB





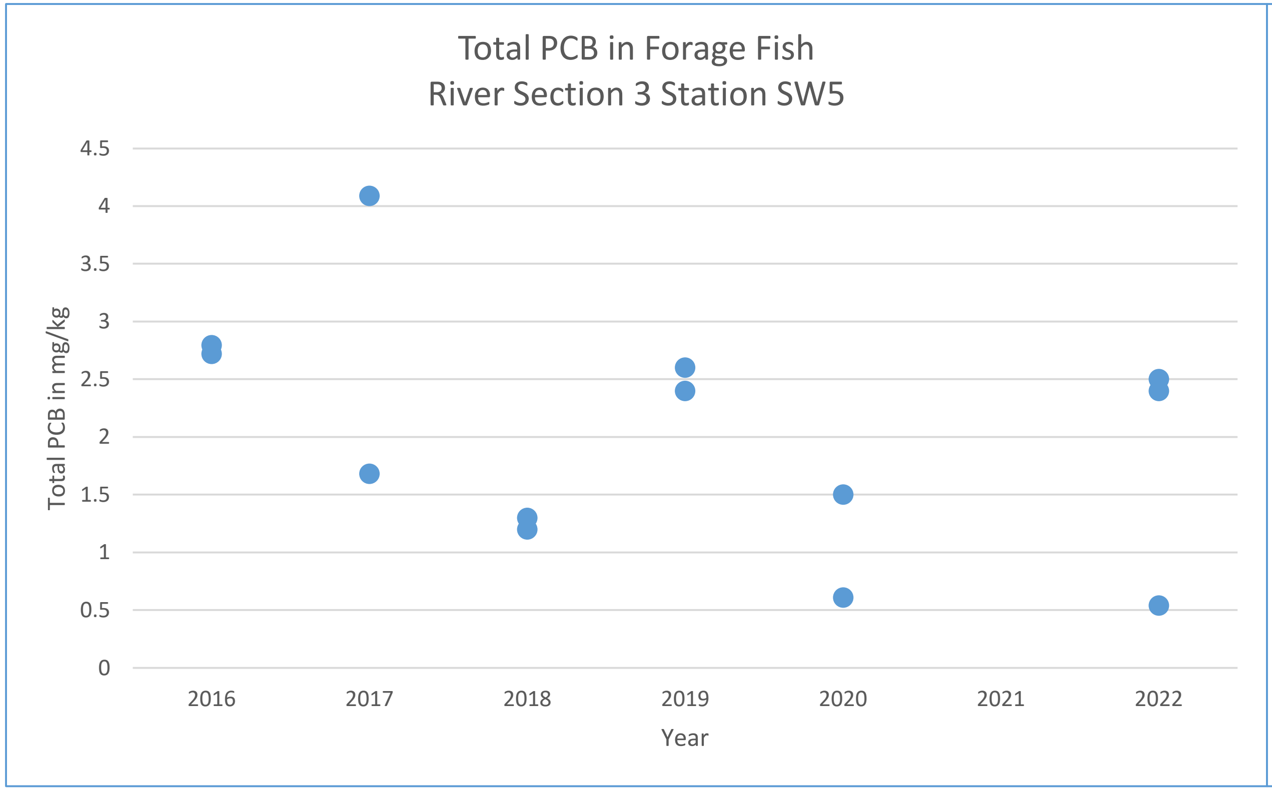
SW5 Pumpkinseed Mean Total PCB and Mean Lipid Based PCB

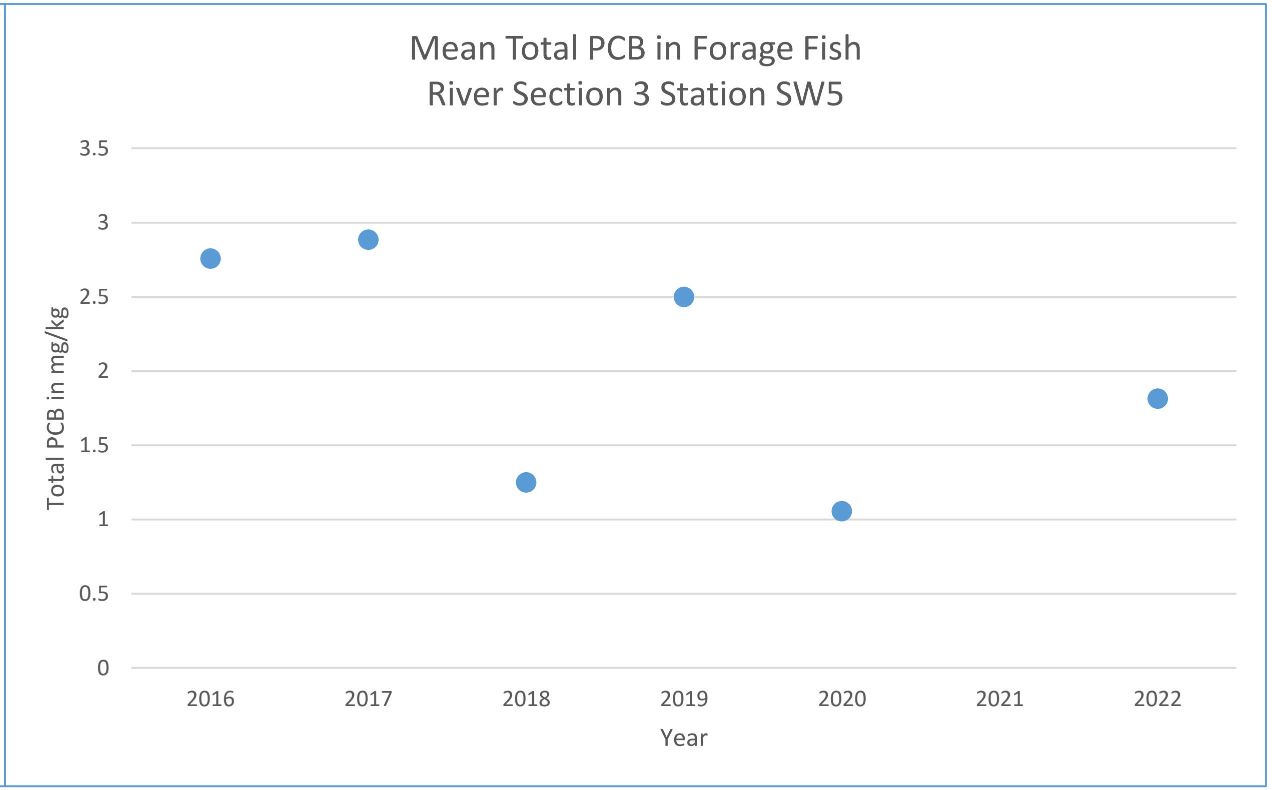




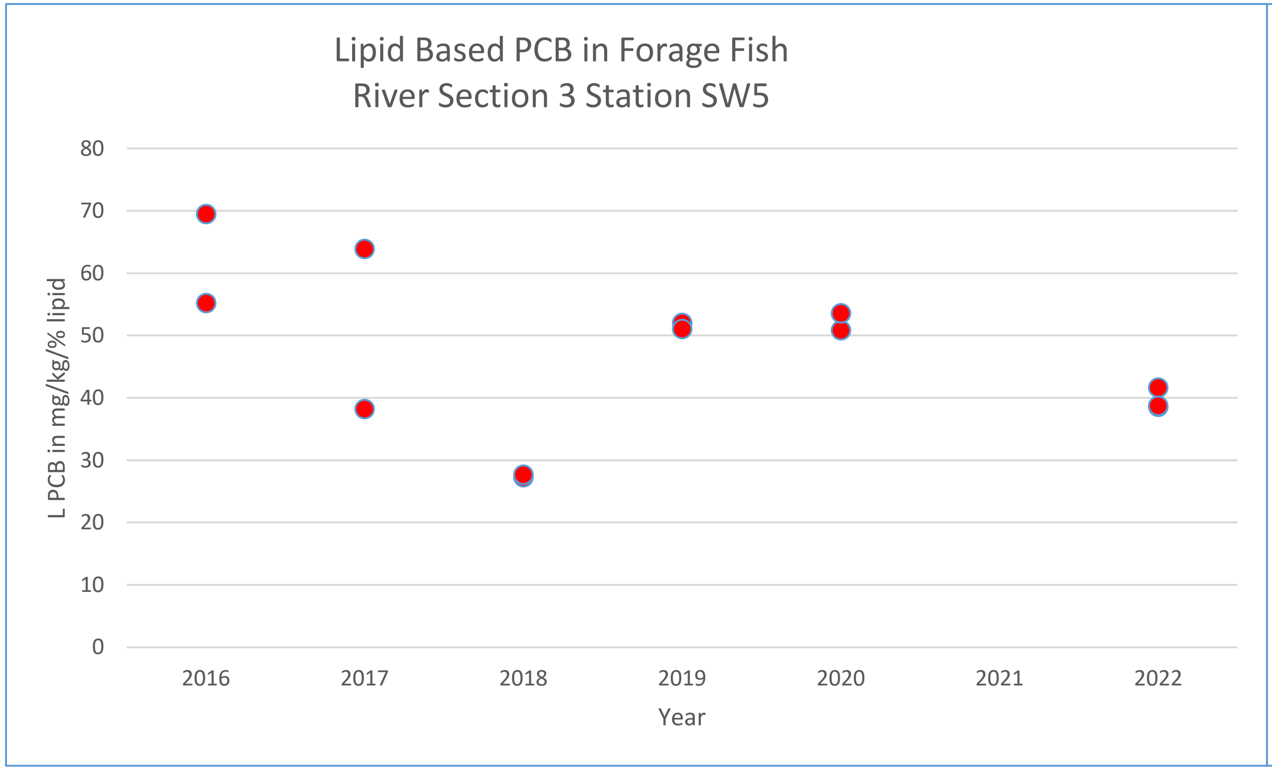
SW5 Forage Fish Data

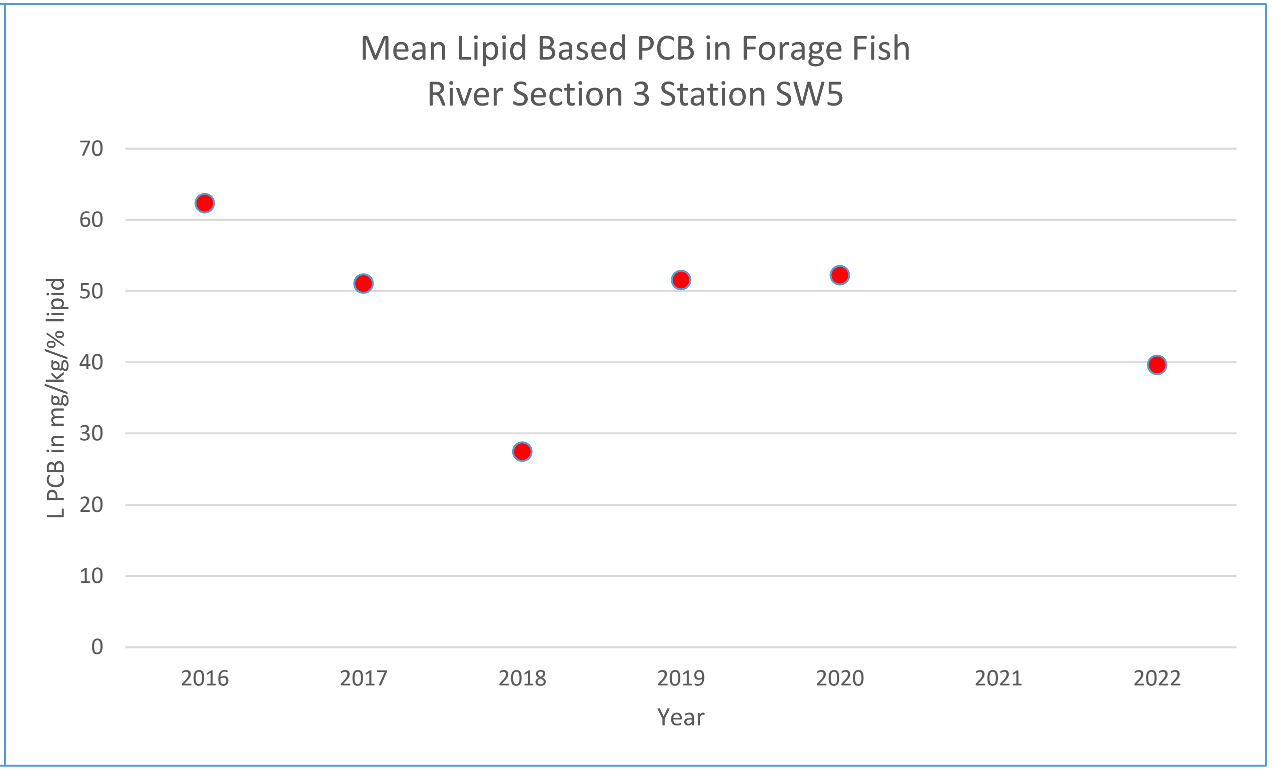
SW5 Forage Fish Total PCB



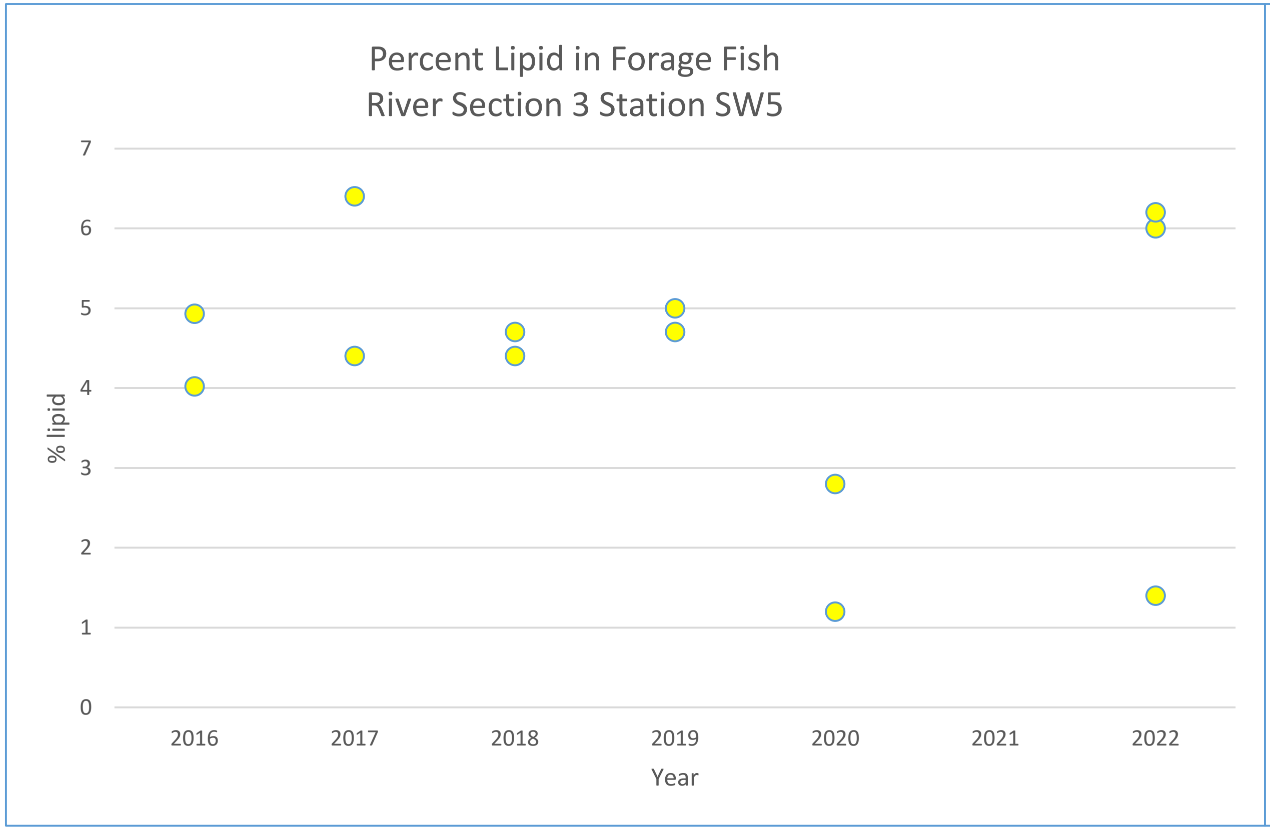


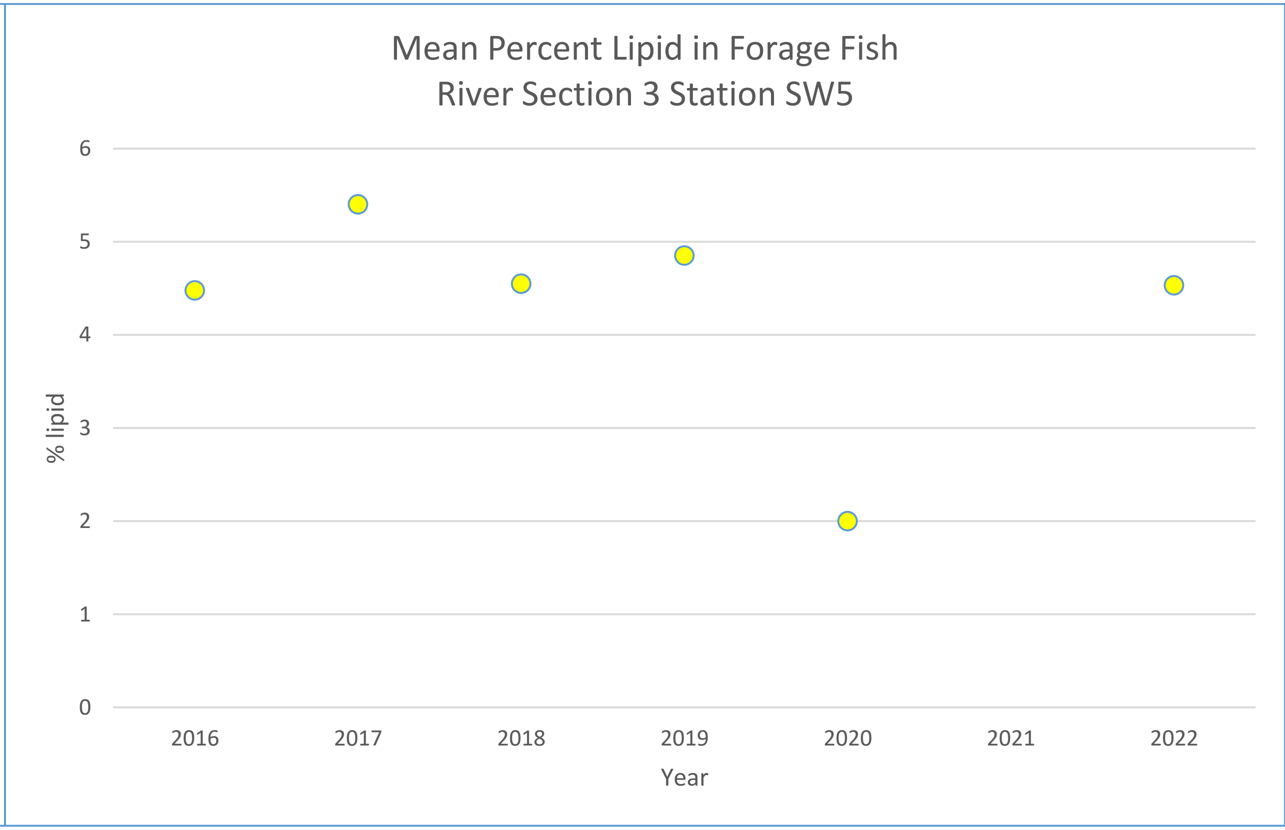
SW5 Forage Fish Lipid Based PCB



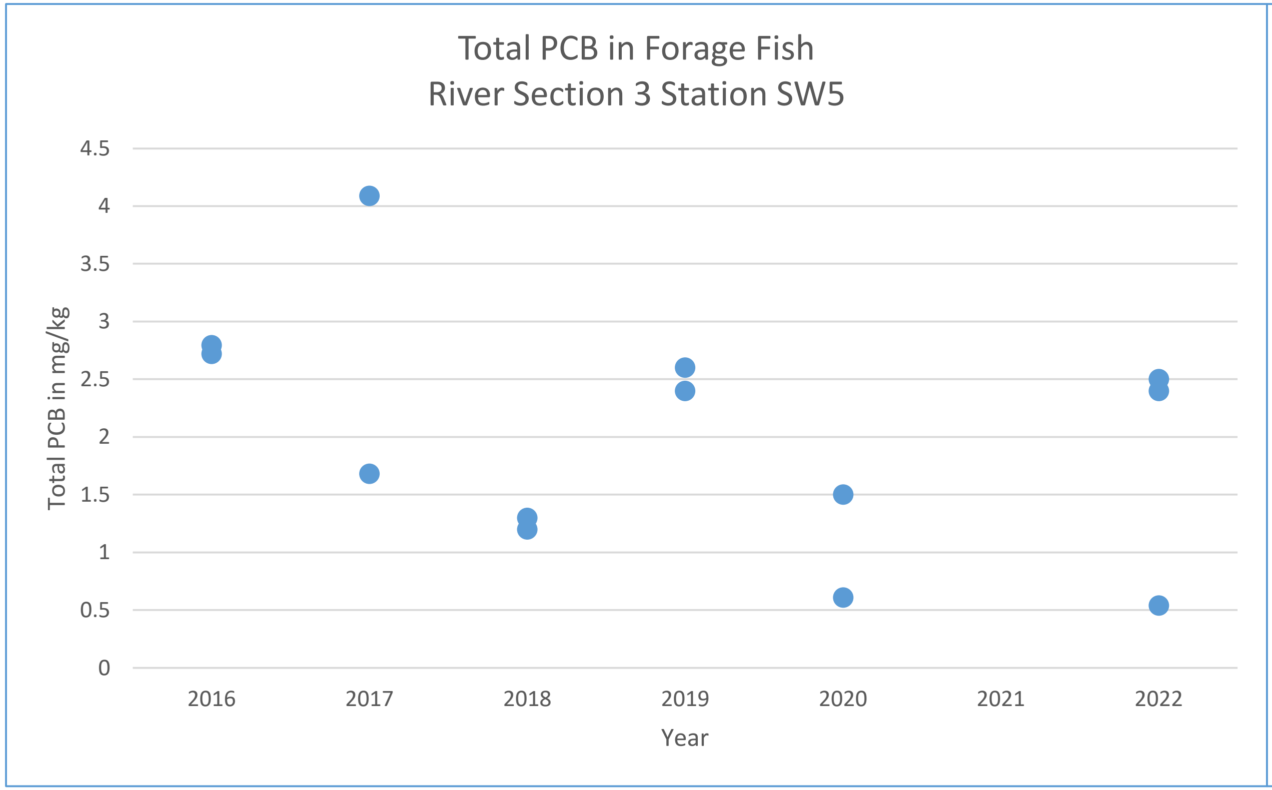


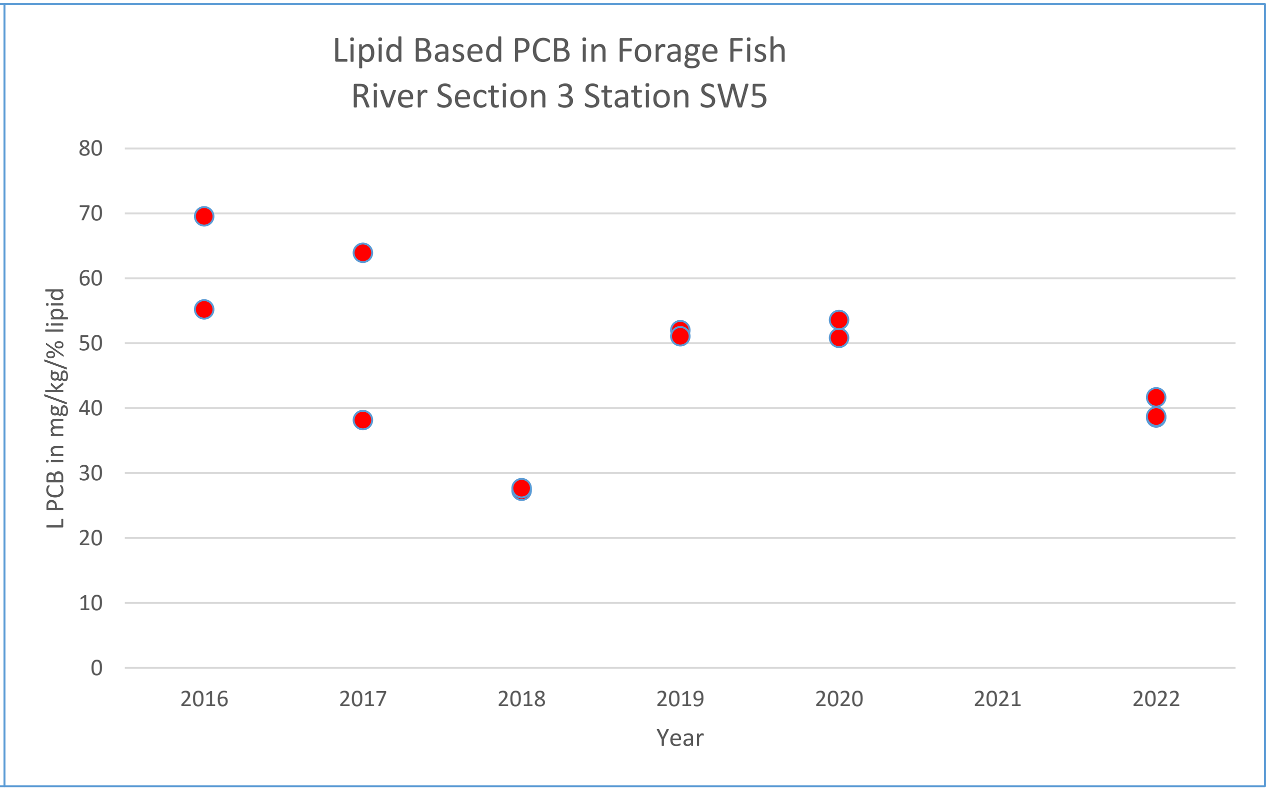
SW5 Forage Fish Percent Lipid



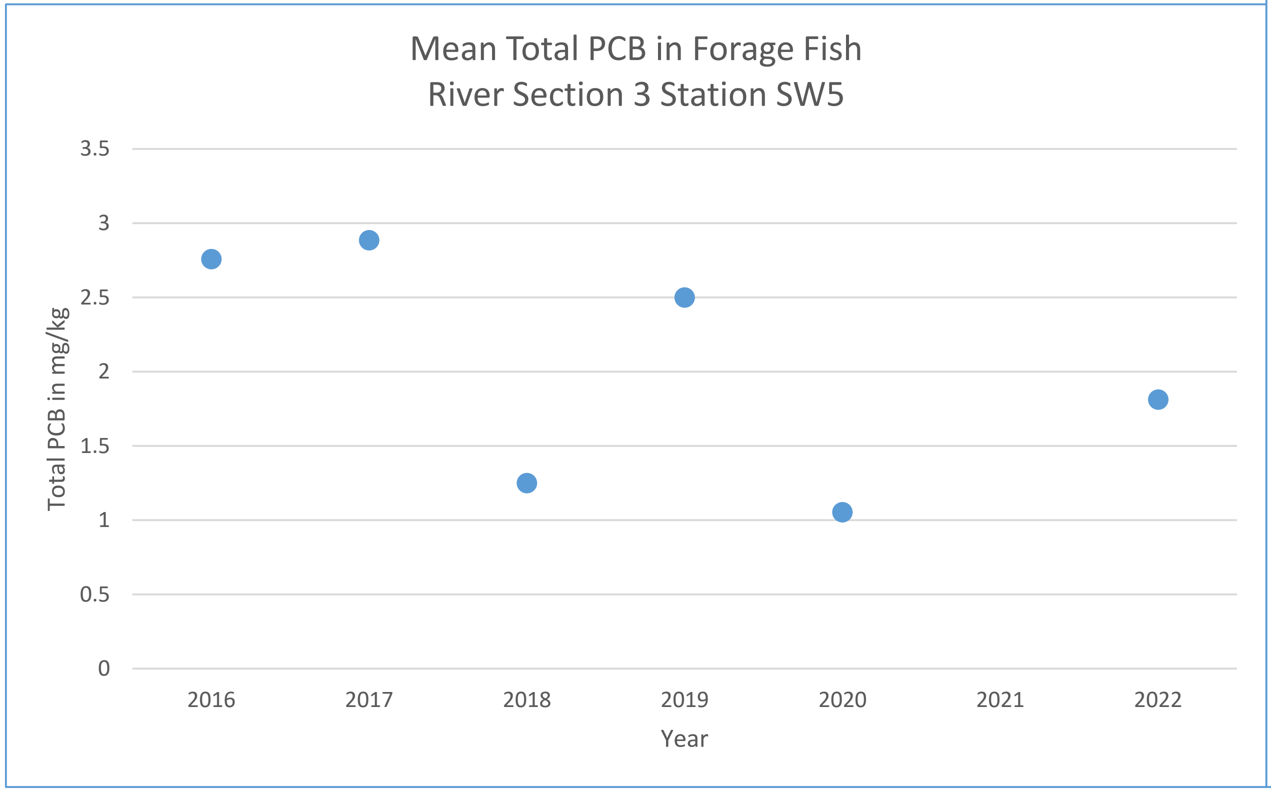


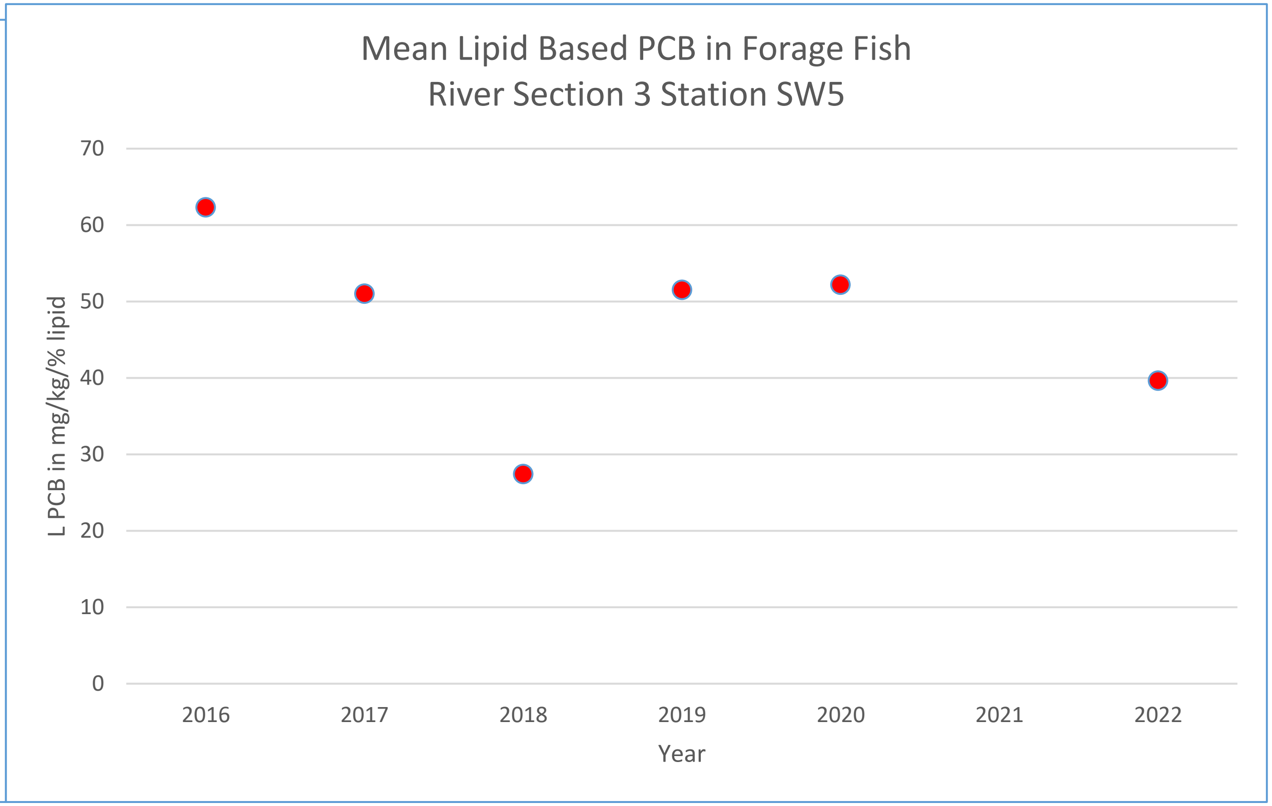
SW5 Forage Fish Total PCB and Lipid Based PCB





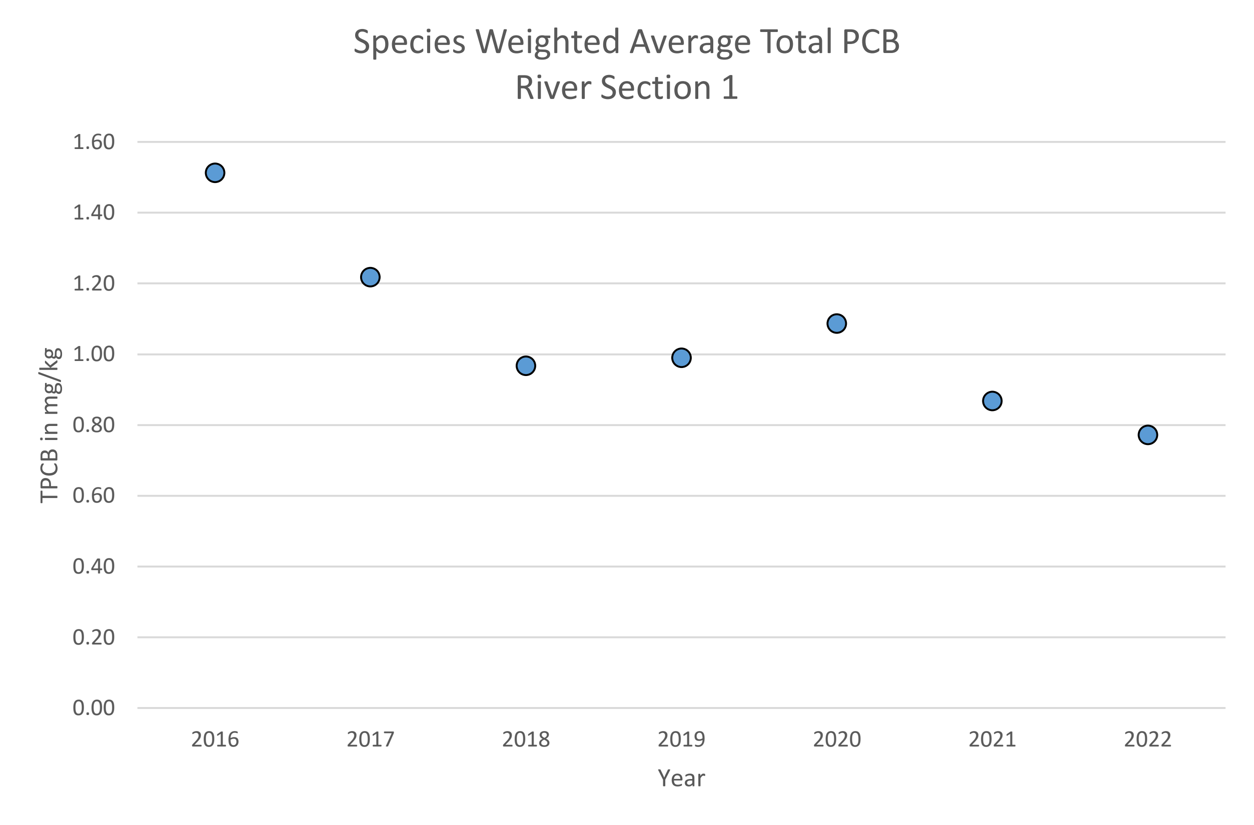
SW5 Forage Fish Mean Total PCB and Mean Lipid Based PCB

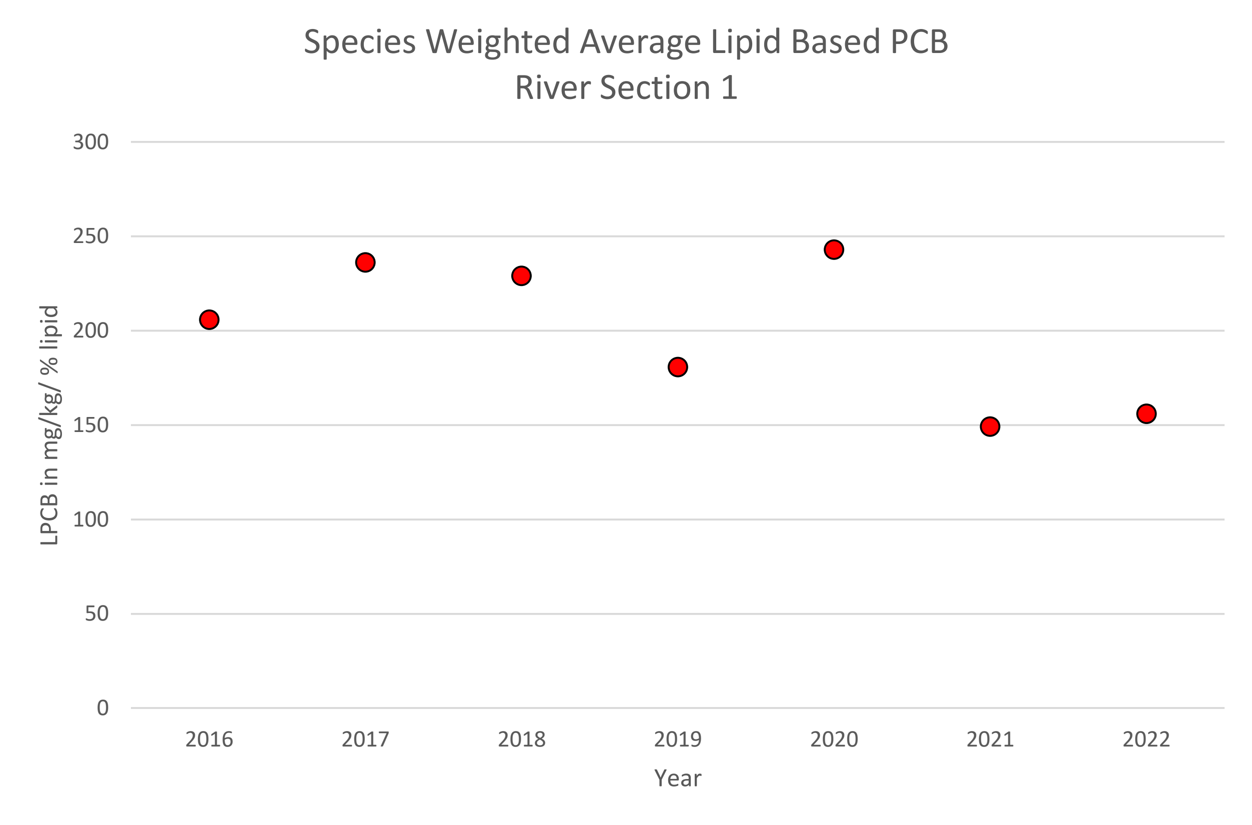




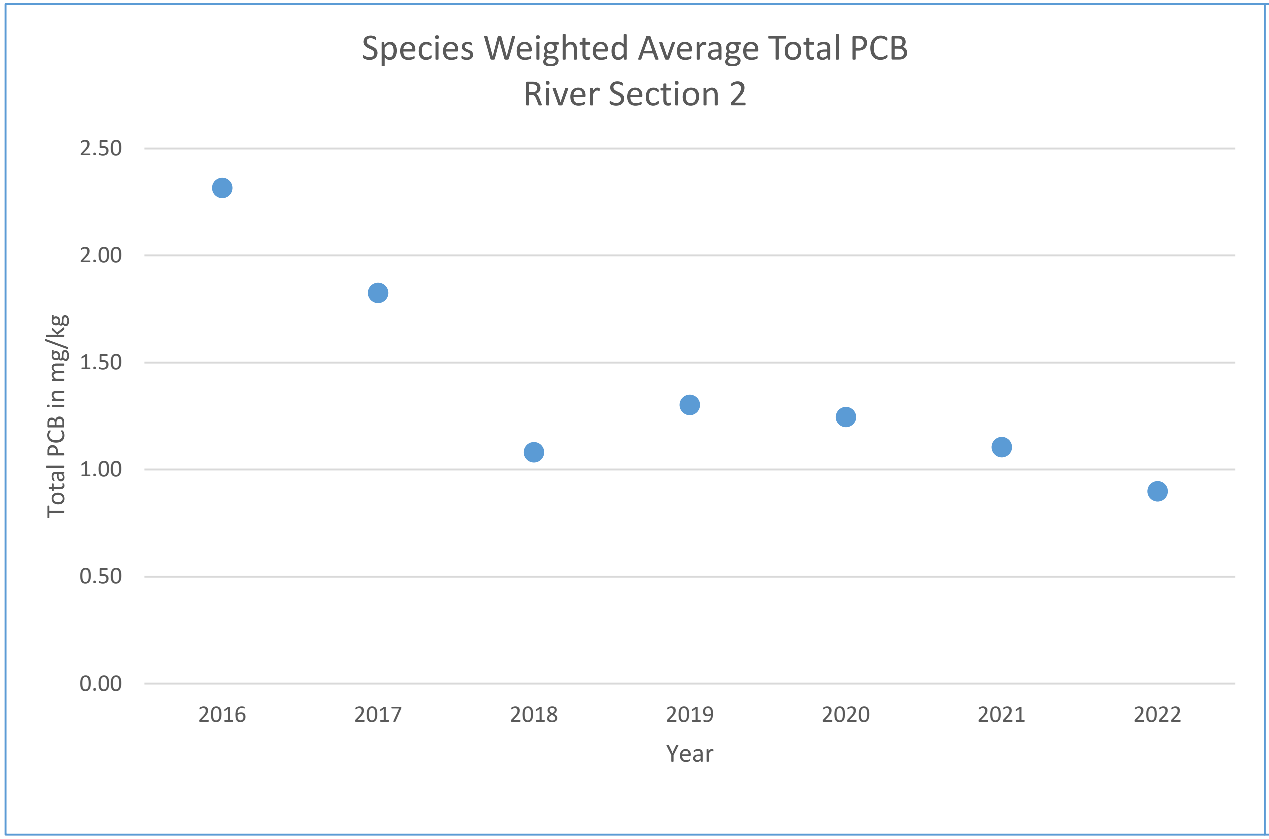
Comparison of Total PCB vs Lipid Based PCB Species Weighted Average by River Section

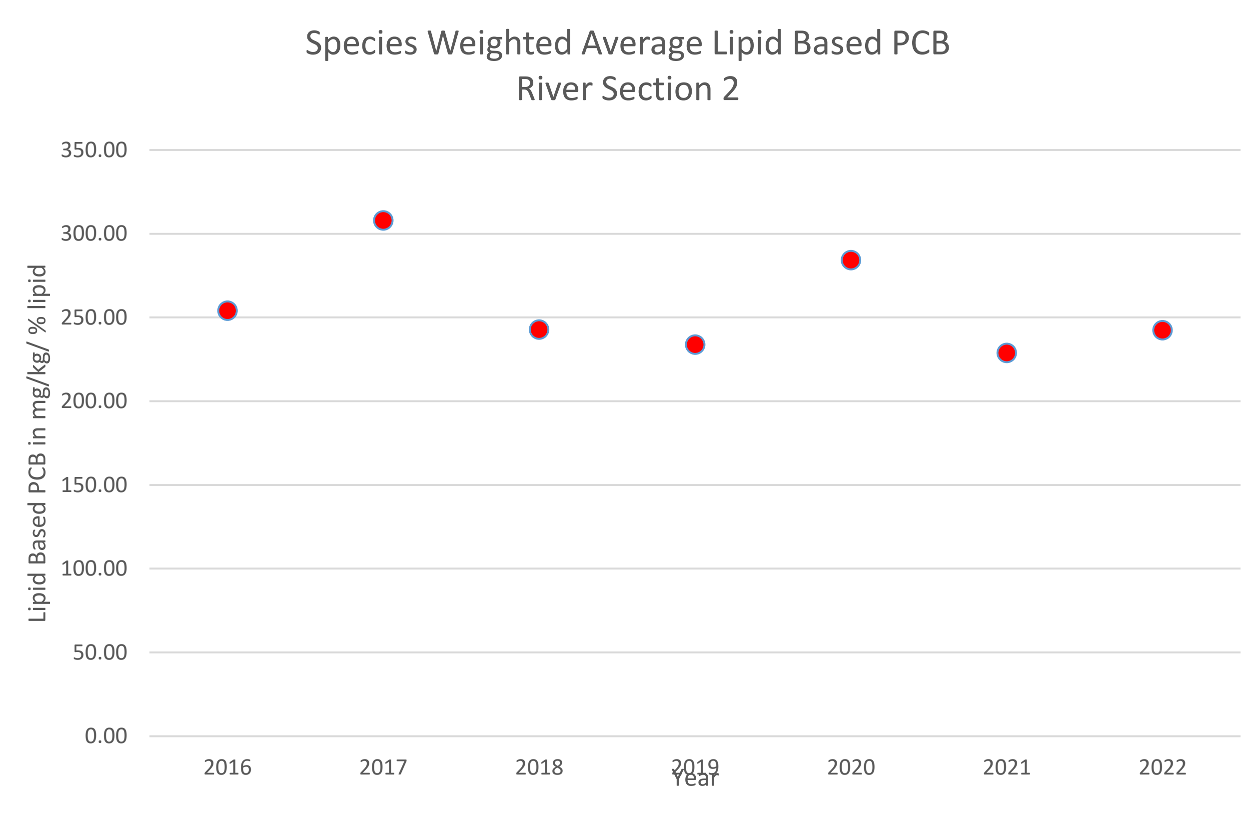
Species Weighted Total PCB and Lipid Based PCB in River Section 1



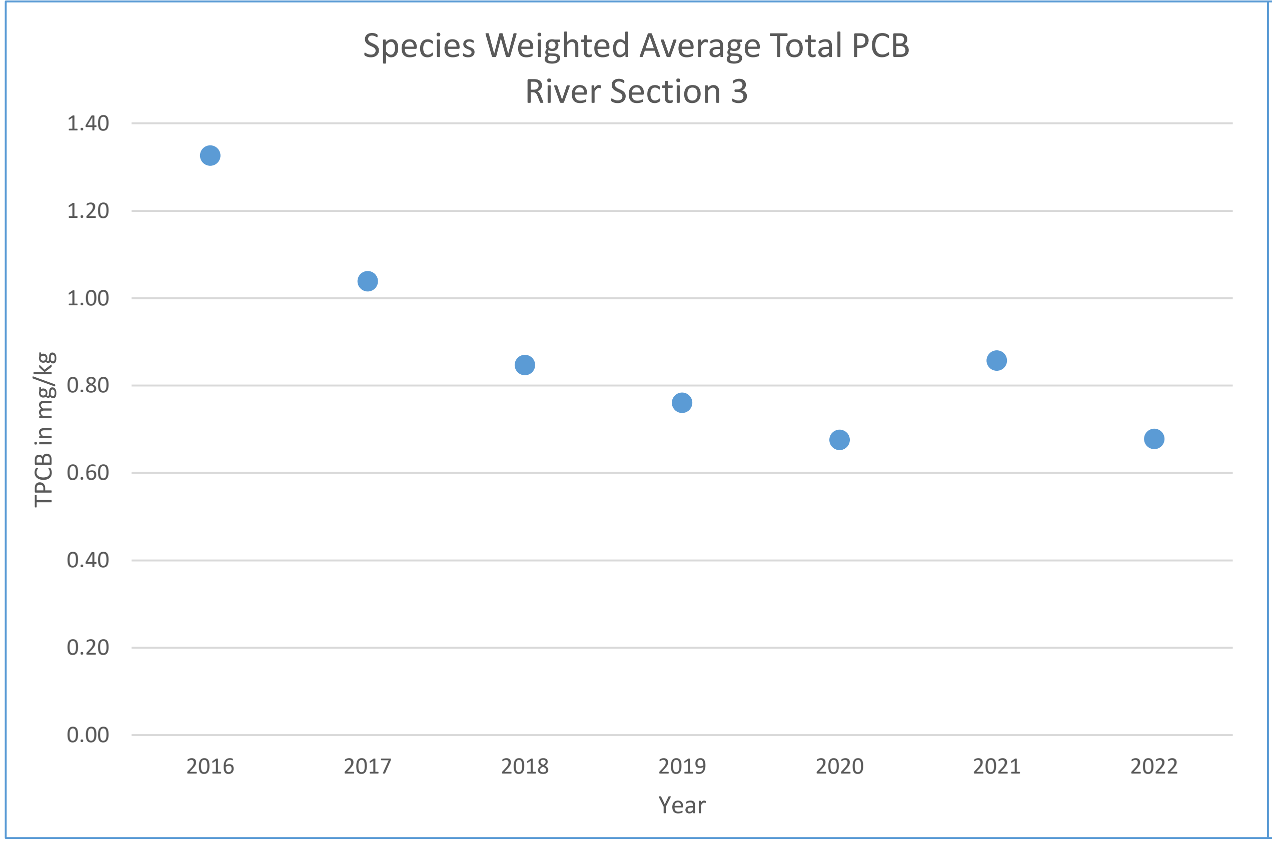


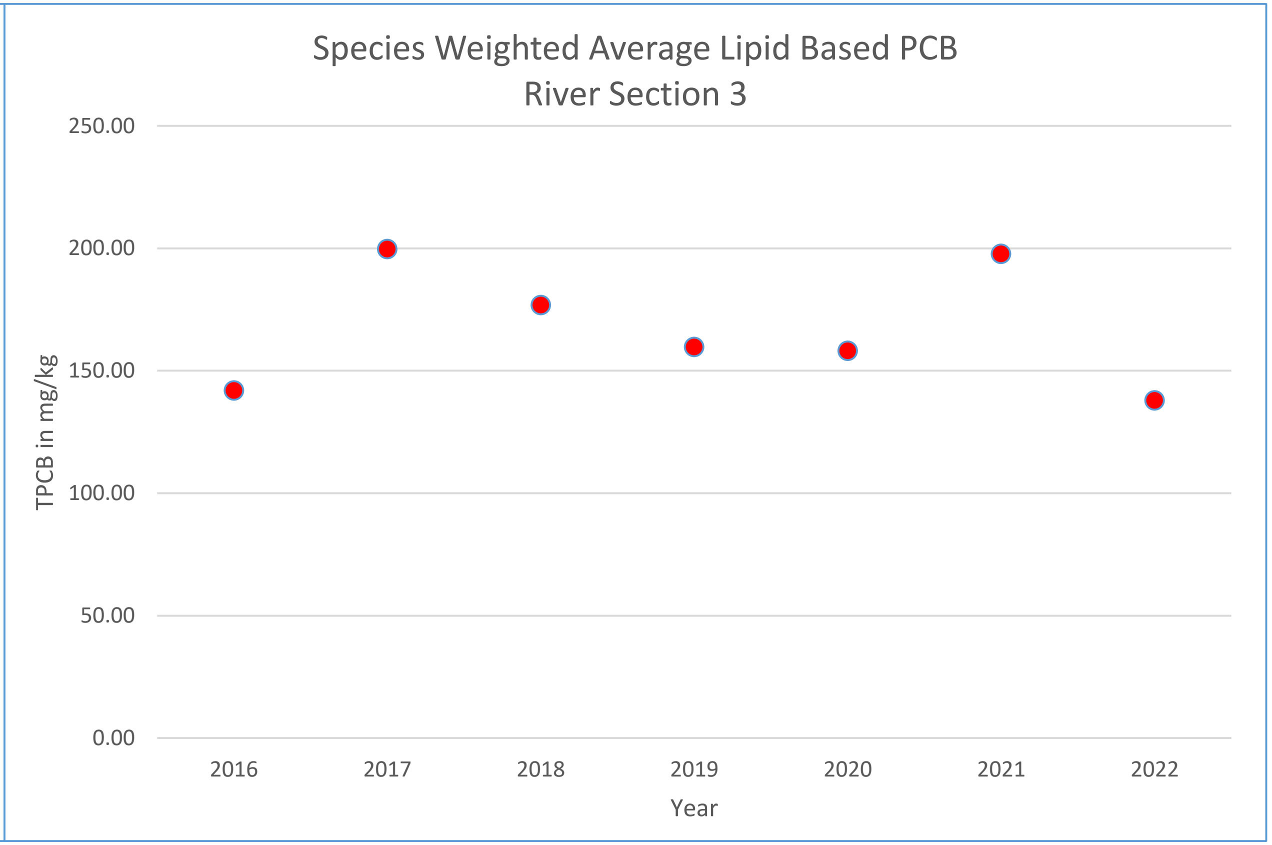
Species Weighted Total PCB and Lipid Based PCB in River Section 2



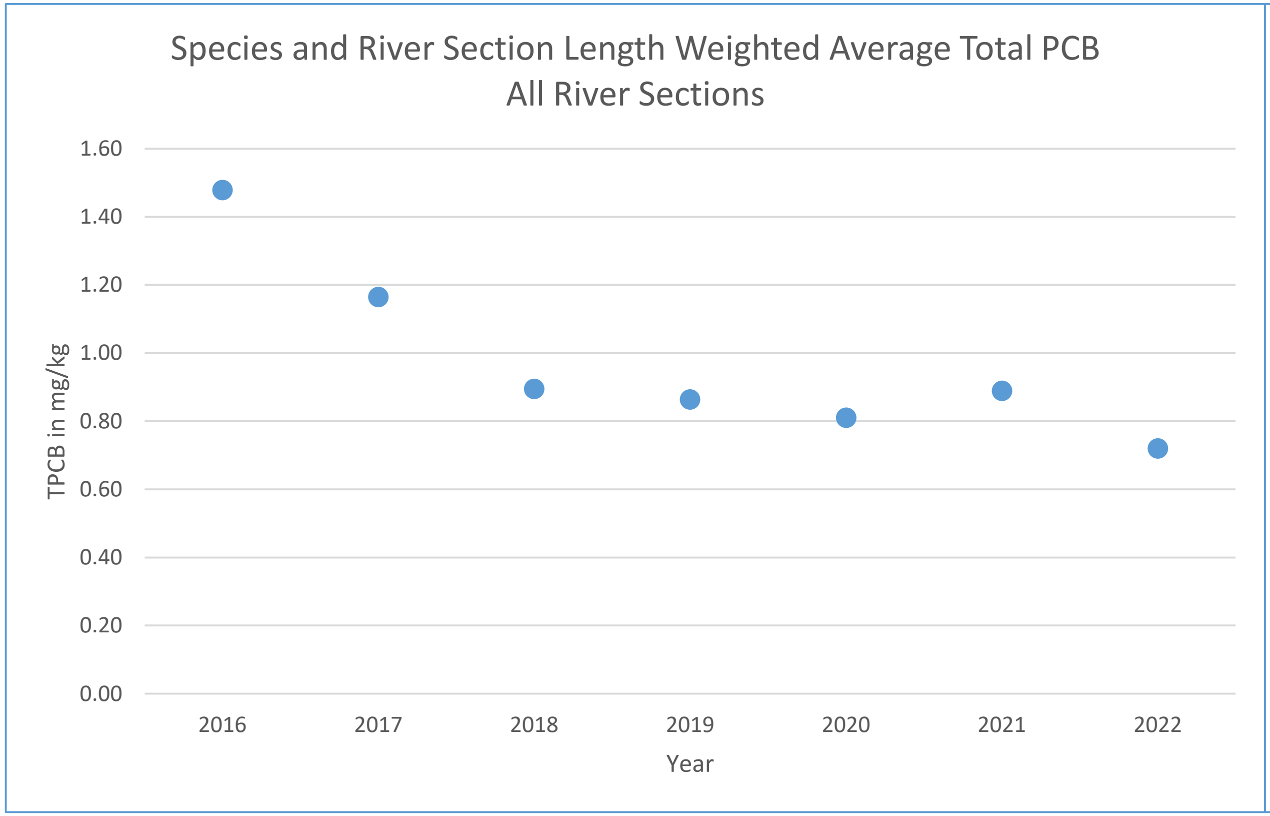


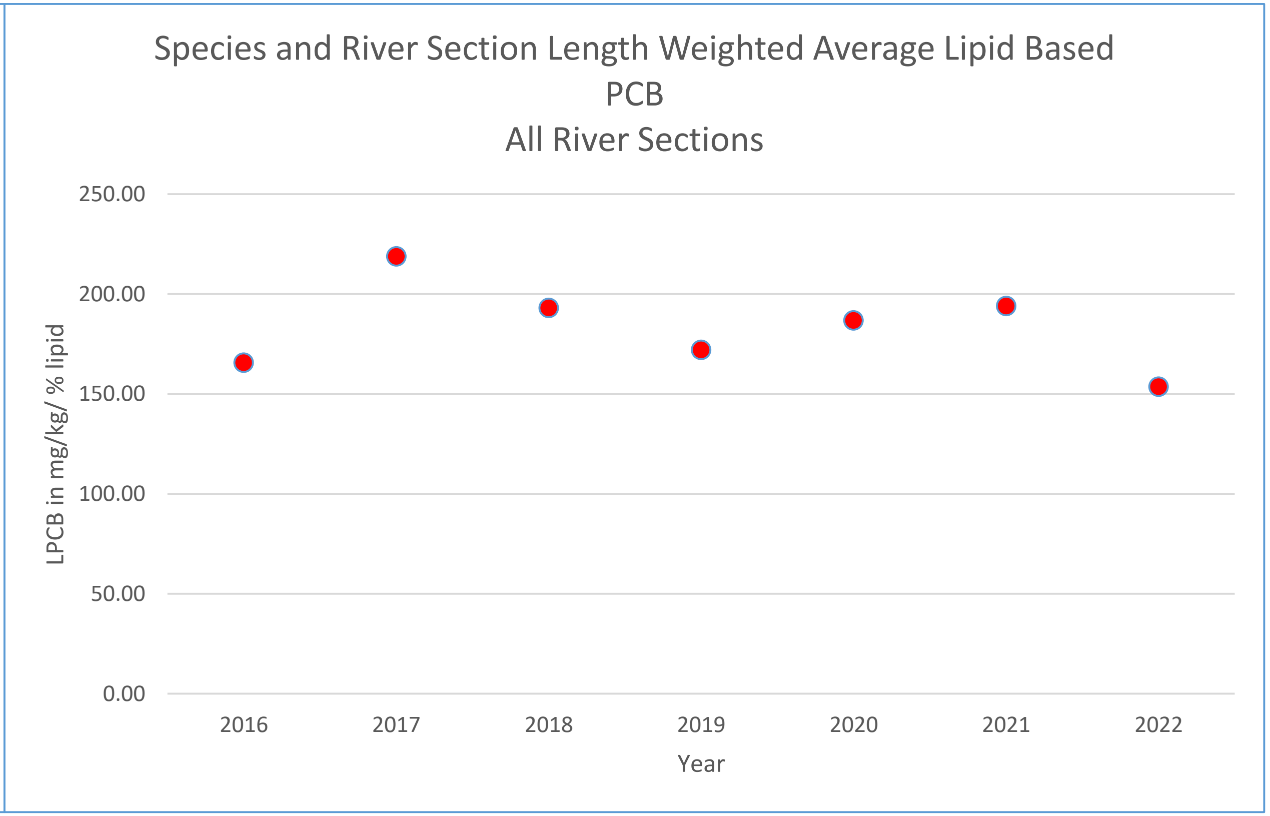
Species Weighted Total PCB and Lipid Based PCB in River Section 3





Species Weighted Total PCB and Lipid Based PCB – All River Sections





Attachment 2

FOCH Comment Spreadsheet

Comment #	Section	Page	Quote	Comment
1	Executive Summary (ES)	E-2	*There are currently two RODs for the Hudson River PCBs Superfund Site, the 1984 ROD (EPA 1984) that called for the capping of the remanent deposits (OU1)1 which was completed in 1991 and the 2002 ROD (EPA 2002) for the UHR sediments (OU2) that called for a two-part remedy: dredging followed by monitored natural recovery.*	The remnant sites were addressed as an Interim Remedial Measure consisting of a designed soil cover system. Also, the remedy selected in the OU2 ROD was one consisting of three elements - upstream source control, targeted environmental dredging, and monitored natural recovery.
2	ES	E-2	*The agency provided opportunities for project stakeholders to be involved throughout the process by establishing an active and robust FYR team, communicating with stakeholders face-to-face and via conference call and providing updates at regularly scheduled Community Advisory Group (CAG) meetings.*	Unfortunately, the communication between EPA and the "FYR team" were terminated by EPA midway through the technical discussion and were not restarted prior to EPA issuance of the draft FYR.
3	ES	E-3	*The low PCB level in the river immediately downstream of the Remnant Deposits suggests that the Remnant Deposits are not a significant source of PCBs to the river.*	While the remnant sites (based upon downstream water column concentrations measured at Rogers Island) may not represent a source of PCBs of river wide significance, EPA has not yet gathered the data necessary to determine if the remnant sites represent a locally significant PCB source to water or fish. Without this data, it is not possible to determine if fish caught and consumed from this portion of the river represent a risk to human or ecological receptors. EPA should gather the data needed to quantify these risks, and select/implement remediation as needed to address these risks.
4	ES	E-3	*The remedial action was implemented consistent with the expectations of the ROD, and while human health and ecological remedial goals have not yet been achieved, progress is being made toward Remedial Action Objectives (RAOs) presented in the ROD.*	Use of the idea that incremental small progress is made toward reaching the risk reduction goals in the OU2 ROD is acceptable is inconsistent with the risk reduction mandate in the Superfund program. The human health and ecological risks remaining from fish consumption are still well in excess of EPA's acceptable risk range used in the Superfund program for both cancer risk and non-cancer health impacts, and with the current post dredging data trends, these unacceptable risks will remain for the forseeable future. The expectation at the time of remedy selection was that the first interim target of 0.4 parts per million in fish (species and river section length weighted average) would be achieved five years after dredging. This target should have been reached in 2020, and has yet to be achieved.

Comment #	Section	Page	Quote	Comment
5	ES	E-3	*Based on analyses presented in this FYR, at least eight or more years of data (i.e., at least two or more years of data beyond the current post-dredging dataset) are needed before a meaningful time trend in PCB concentrations for water column and fish data can be determined.*	The need for "eight or more years" of post dredging fish data to evaluated the performance of the remedy is predicated on EPA's decision to use a specific statistical test which was not included in the ROD. The current test being used by EPA requires that sufficient data be obtained to show that a statisitically significant percentage annual decline in fish PCB concentrations can be shown with 95% confidence and 80% power. Unfortunately, if the performance of the remedy is such that if a lesser, or no, decline if fish PCB concentrations is observed, use of this test will NEVER result in EPA having enough data. EPA should use a "toolbox" of evaluation tools in this FYR to evaluate in this report if the remedy is protective of human health.
6	ES	E-3	*EPA anticipated at the time of the ROD that post dredging reach-averaged PCB (Tri+) concentrations in the surface sediment would decline at an annual rate of approximately seven to nine percent, consistent with long-term historical trends (EPA, 2000a), and that these rates of decline would be similar in water and fish tissue. As time progresses and concentrations decrease, it is assumed these rates will decline.*	This portion of the report clearly establishes what EPA's expectation at the time of remedy selection was for the rate of natural recovery after dredging - seven to nine percent. It also clearly establishes what EPA's expectation was as it pertains to the relationship between the three primary environmental media monitored after dredging - sediment, water and fish recovery rates should be similar.
7	ES	E-3 to E-4	*It is EPA's expectation that short-term post-dredging rates will be at least 5 percent per year in all three media and has designed the long-term monitoring program for fish, water and sediment to being able to detect a 5 percent annual rate of decline with 80 percent power and 95 percent confidence in 10 years.*	This text describes how EPA has changed their expectation of remedy performance from 7 to 9% decline per year to 5%, without modifying the ROD.
8	ES	E-4	*Water column, sediment and fish concentrations on average are less than the pre-dredging period and remain within expectations.*	A comparison of pre-dredging and post-dredging is not useful when evaluating the current phase of the remedy, monitored natural recovery. EPA has previously expressed the agency's view of the performance of the dredging phase of the remedy in the previous FYR. As to whether or not the water, sediment and fish concentrations are within expectations, the fish and sediment data are clearly not within expectations in the ROD. The first targeted fish PCB concentration, to be met in 2020, was not and has not yet been met.

Comment #	Section	Page	Quote	Comment
9	ES	E-5	*Institutional controls in the form of fish consumption restrictions and fish consumption advisories are in place for the UHR to help limit fish consumption and inform the public of the health risks associated with consuming fish contaminated with PCBs.*	While the institutional controls are in place (managed by the State), EPA does not have any data on the effectiveness of these controls on limiting fish consumption or on limiting the risks posed by fish consumption, even though the risks posed by fish consumption are well above EPA's acceptable risk range for both cancer and non-cancer health effects.
10	ES	E-5	*The fish species-weighted average TPCB concentration for the UHR as of 2021 was 0.71 milligrams per kilogram wet-weight (mg/kg-ww). The preliminary 2022 average was 0.58 mg/kg-ww. Modeling results presented in the ROD estimated that the first human health target for protection of human health (0.4 mg/kg-ww) would be reached five years after the completion of dredging. Similarly, model results presented in the ROD estimated the second target PCB tissue concentration for the UHR (0.2 mg/kg-ww) would be reached 16 years after the completion of dredging. Although the first target was not achieved within the five-year time period, overall concentrations are declining and are approaching the first target. Additional years of data collection are necessary to assess if the second target will be achieved in the timeframe estimated by the modeling. The percentage of sport fish below the 0.4 mg/kg-ww threshold has increased from 21 percent in the pre-dredging period to 37 percent in the post-dredging period.*	The situation faced by the public as it pertains to the second targeted fish PCB concentration is the same as in the last FYR for the first target. The first target was missed, and no additional action was taken by EPA. Does EPA anticipate taking action should the second target be missed as well? Also, the statistic quoted of what percentage of the fish meet or do not meet the overall species and river section length weighted average is not particularly relevant, as the distribution of concentrations within the sample population does not impact risk; rather,the average concentration is what is used in risk assessment to estimate exposure point concentration.

Comment #	Section	Page	Quote	Comment
11	ES	E-6	*RAO #3: Reduce PCB levels in sediments in order to reduce PCB concentrations in river (surface) water that are above applicable or relevant appropriate requirements (ARARs). The percentage of post-dredging water column PCB measurements meeting the most stringent water column TPCB ARAR standard of 14 ng/L was 76, 44, and 57 percent at the Thompson Island Dam, Schuylerville, and Waterford monitoring stations, respectively, an improvement compared to the pre-dredging period.*	As stated above, the comparison of pre-dredging and post-dredging concentrations, in this case sediment, is not particularly useful in evaluating the performance of the current phase of the remedy, post-dredging monitored natural recovery. Instead, EPA should perform such studies as are needed to evaluate the impact of the post-dredging water column concentrations on the recovery rate in fish. In addition, to meet this RAO, EPA should document that post-dredging water column PCB concentrations met the expected post-dredging concentrations and that the concentrations continue to decline, as expected in the ROD.
12	ES	E-6	*RAO #4: Reduce the inventory (mass) of PCBs in sediments that are or may be bioavailable.*	EPA defined bioavailable surface sediments as representing the top 12 inches. Although dredging undoubtedly reduced the mass of PCBs in bioavailable sediments within the dredged areas, EPA does not have any post-dredging data to address this RAO from bioavailable sediments outside the dredged areas, where EPA's remedy is Monitored Natural Attenuation. The remedial design data documented substantial areas with highly elevated PCBs in the top 12 inches, particularly in RS2 & RS3 where cleanup levels were 3x greater than RS1, that likely remain outside the targeted dredge areas. Inferring from data collected from the top 2 inches or from an estimated percent removal of total PCB mass can only be considered "speculation" and does not provide an evaluation of MNA for the RAO.
13	ES	E-6	*As discussed in the Second FYR, it is estimated that 76 percent of the overall PCB mass from the UHR was removed by the dredging, exceeding the 65 percent reduction assumed in the ROD.*	The presentation of this statistic from the previous FYR is misleading. EPA should also present the known remaining PCB mass in the sediments of the upper Hudson, which is greater than what was anticipated at the time of the ROD. The magnitude of the PCB mass remaining is much more important to understanding post-dredging natural recovery than the percent of mass removed. The magnitude of the PCB mass remaining is much more relevant in this FYR than evaluations of removal percentage.

Comment #	Section	Page	Quote	Comment
14	ES	E-9	*Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?"*	The lack of recovery in fish PCBs post-dredging. Two of four fish species (yellow perch and yearling pumpkinseed) with robust databases since 2004 show little to no recovery post-dredging on a wet weight or lipid-normalized basis. The other 2 species with similarly robust databases show evidence of a decline in some reaches on a wet weight basis but much lower to no decline on a lipid-normalized basis. The data for these 2 species are confounded by a temporal decline in percent lipid, making any evaluation of temporal trends unreliable according to EPA's team (Kern et al 2019)
15	ES	E-9	*OU1 Issue: The 1984 ROD does not contain requirements for institutional controls. An institutional control to ensure that future use of the Remnant Deposits does not compromise the integrity of the OU1 cap system or result in unsafe exposures should be selected and implemented. Recommendation: EPA will continue to coordinate with New York State (NYS) to determine land ownership, which would be needed for institutional controls to be properly established. Currently, fences installed at the Remnant Deposits restrict access to the sites.*	The process of developing ICs for the OU1 has apparently not progressed in the five years since release of the previous FYR. EPA should develop the ICs concurrently with the determination of land ownership. EPA should also gather the information necessary to evaluate the performance of the existing access restrictions from the land side of OU1. There are no access restrictions on the river side of OU1.

Comment #	Section	Page	Quote	Comment
16	ES	E-10	*OU2 Issue 1 of 6: There are not enough sets of annual data available since the completion of sediment dredging to establish rates of decline in fish with statistical confidence. A protectiveness determination of the OU2 remedy cannot be made until the rate of decline in fish tissue can be determined from post-dredging data. Recommendation: Once statistically relevant rates of decline in fish tissue post-dredging PCB data can be established, EPA will report the rates of recovery and determine if they are reasonably consistent with those anticipated by the ROD. Additional years of surface water and sediment data will contribute to EPA's evaluation of fish recovery.*	As stated above, the need for "eight or more years" of post dredging fish data to evaluated the performance of the remedy is predicated on EPA's decision to use a specific statistical test which was not included in the ROD. The current test being used by EPA requires that sufficient data be obtained to show that a statisitically significant percentage annual decline in fish PCB concentrations can be shown with 95% confidence and 80% power. Unfortunately, if the performance of the remedy is such that if a lesser, or no, decline if fish PCB concentrations is observed, use of this test will NEVER result in EPA having enough data. EPA should use a "toolbox" of evaluation tools in this FYR to evaluate in this report if the remedy is protective of human health. EPA is relying on establishing a significant rate of decline before making a protectiveness determination. Because the principal species (bullhead and black bass) in the species-weighted average have temporally decreasing lipid content, which EPA's team (Kern et al. 2019) consider to be a major confounding issue in determining a rate of decline, establishing a rate of decline for these species (and the species-weighted average) may not be possible in the foreseeable future. The other 2 species (yellow perch and pumpkinseed) with robust post-dredging data do not have this problem and currently show little evidence of post-dredging recovery. Relying exclusively on establishing a rate of decline in the species-weighted average (or bullhead and black bass individually) is a recipe for delaying the protectiveness determination indefinitely.

Comment #	Section	Page	Quote	Comment
17	ES	E-10	*Issue 2 of 6: Based on existing data, certain fish species and sections of the river appear to be recovering differently. Although this circumstance is not unexpected, it does require further evaluation. Recommendation: Special studies will be conducted to provide insight into why different species and certain portions of the river appear to be recovering differently. Multiple special studies are anticipated to help understand this observation, including a fish aging study.*	In order to understand EPA's proposed special studies for fish, EPA should present the purpose of each study, and identify the data quality objectives for the study so that the public can understand how these studies will help EPA understand the performance and protectiveness of the remedy. We agree that different fish species and sections of the river are recovering at different rates, especially if evaluated on a wet weight basis only. Importantly, the ROD projections of fish recovery were based on bioaccumulation models that projected the trends based on species-specific lipid distributions, so evaluating the trends on a lipid basis is most consistent with EPA's expectations of recovery. Robust data sets currently exist since 2004 when monitoring began for 4 reaches of the UHR for 4 species or species groups: Black bass (largemouth and smallmouth bass), bullhead, yellow perch, and pumpkinseed. The recovery data for black bass and, especially, bullhead, are compromised by decreasing and very low lipid concentrations, which makes it difficult to reliably determine rate of recovery for those species, as clearly recognized by EPA's team in a 2019 presentation (Kern et al 2019). Yellow perch and yearling pumpkinseed have relatively constant lipid content, which makes determining their rate of recovery much more reliable. The yellow perch and pumpkinseed data clearly show that little or no recovery is taking place for these species in 8 years post-dredging in most or all reaches included in the long-term monitoring.
18	ES	E-10	*Special studies will be conducted to provide insight into why different species and certain portions of the river appear to be recovering differently. Multiple special studies are anticipated to help understand this observation, including a fish aging study.*	To address the problems noted above with co-varying time and lipid for bullhead and black bass species, a special study to collect these species later in the summer, when lipid content is likely to be higher and more reliably measured. Another option would be to analyze whole body samples and estimate the PCB concentration in the fillet, as suggested by Kern et al 2019.

Comment #	Section	Page	Quote	Comment
19	ES	E-10	*Issue 3 of 6: Three surface sediment 'areas of interest' were identified during surface sediment sampling in 2016/2017 and are being monitored. Based on the 2021 surface sediment data, these areas have decreased in PCB concentrations.*	These “areas of interest”, which are in close proximity to dredged areas, are only sampled as part of the overall grid. To monitor these areas, the density of sampling should be increased and the depth of sampling should include the bioavailable surface zone (top 12 inches). Based on the remedial design grid-based data, numerous areas of surface of highly elevated PCBs in the surface bioavailable zone (top 12 inches) were dentified. Monitoring the natural recovery of these areas would require considerable additional sampling and analysis.
20	ES	E-11	*Issue 4 of 6: In order for NYSDOH to adjust fish consumption advisories and restrictions, additional species of fish (not currently routinely collected) will need to be collected and tested for PCBs. The Upper Hudson River long-term monitoring program has provisions for collection and analysis of supplemental and whole-body fish data. Recommendation: EPA will continue to coordinate with NYSDOH and NYSDEC regarding the scope and timing of this data collection. GE will conduct these data collection events.*	EPA should gather the data necessary to provide data to NYSDOH to inform fish advisories. A needed first step is to determine which species to monitor at which locations. To do this, EPA needs to determine who eats, or would eat, which fish from which locations. A survey is needed to gather these data.

Comment #	Section	Page	Quote	Comment
21	ES	E-11	*Issue 5 of 6: Since 2005, the State's implementation of fish consumption advisories has been supported by Health Research, Inc., of Rensselaer, New York. In 2008, NYSDOH established the Hudson River Fish Advisory Outreach Project. The goal of this initial 20-year initiative is for all people who consume Hudson River fish and crab to be aware of and follow the Hudson River fish advisories and restrictions. This work supports the NYSDOH Hudson River advisory and NYSDEC restriction ICs in various ways including encouraging anglers and other fish consumers to follow health advisories, promoting awareness of advisories by posting signs, maintaining advisory awareness through education and promotional activities, and identifying reasons that anglers or other fish consumers may not follow the fish advisories. The funding will run out in the near future. Recommendation: EPA will coordinate funding to support the program into the future. The EPA supports the important work NYSDOH is doing with the outreach program.*	This issue is not sufficiently addressed. EPA needs to make a firm commitment in this FYR to the people of New York State that EPA will provide funding for any needed efforts by NYSDOH to protect the public from the risks of the remaining PCBs in the upper Hudson.
22	ES	E-11 to E-12	*Issue 6 of 6: The 2002 ROD specifies two targets for protection of ecological resources: 1) largemouth bass based on a whole-body largemouth bass of the size range typically consumed by river otter (4 to 7 inches) and 2) spottail shiner as representative of forage fish of the size range typically consumed by mink (less than 10 cm in length). During the post-dredging period, largemouth bass samples of a size larger than typically consumed by river otter have been analyzed on a fillet basis. Additionally, during the post-dredging period, forage fish collection has focused on collection of a variety of forage fish species, including spottail shiner. EPA identified the lack of PCB data on appropriately sized whole-body largemouth bass as a data gap.*	While it is important for EPA to fill this identified data gap, EPA could also use the pumpkinseed data. These fish also are of appropriate size to use in eco risk assessments, and there is already a robust pumpkinseed data set already available. Using the robust database of yearling pumpkinseed as representative forage fish, which average about 10 cm, eliminates this challenge and would demonstrate that PCB concentrations in forage fish greatly exceed the ecological risk targets with little or no evidence of improvement in 8 years post-dredging. Major uncertainty in the post-dredging data severely compromises the evaluation of post-dredging progress in achieving the ecological risk benchmarks. EPA proposes new sampling to address uncertainty in the data used to evaluate the ecological risk targets, which only postpones any evaluation of the targets many years into the future and ignores the available pumpkinseed data that could easily be used to make this evaluation now. EPA's Revised Baseline Modeling Report noted that "Forage fish (pumpkinseed and spottail shiner) serve as primary prey base for the larger fish (that are piscivorous) and also other ecological receptors (such as mink and kingfisher, as examples)."

Comment #	Section	Page	Quote	Comment
23	ES	E-12	*Recommendation: Whole-body largemouth bass which is representative of the size targeted by river otter will begin to be collected in 2024 or 2025. This data will provide information on the current risk exposure for river otter and allow an evaluation of time trends in PCB concentrations.*	Given EPA's assessment that at least 8 years of data are required to determine trends, this means that this evaluation would be postponed until beyond 2033.
24	ES	E-12	*For forage fish, while a comparison of the existing forage fish data to the ecological risk criteria is appropriate, combining different species presents challenges when evaluating PCB concentration trends through time. For forage fish, beginning in 2021, EPA has modified the forage fish collection program to focus solely on spottail shiner. This will reduce uncertainty in time trends (e.g., avoids uncertainty introduced by combining different species) and a direct comparison to the ROD RAO can be made. The frequency of spottail shiner collection will be implemented such that time trends can be further established.*	In other words, implementing additional spottail shiner collection postpones any evaluation of ecological risk for many years. However, a robust database of forage fish (yearling whole body pumpkinseed about 10 cm in length) already exists that could be used to address these targets for protection of ecological resources.
25	ES	E-13	*Rogers Island High Flow Study: The Rogers Island water monitoring station is located upstream of where dredging was conducted and downstream of the former GE plant sites and remnant sites. Understanding PCB concentrations entering the upstream portion of the UHR is important for assessing the recovery of the river. This area is currently monitored regularly during normal river flows; however, studies of PCB load at Waterford indicate that a few high-flow events may carry the majority of the annual load. Given the importance of high-flow events in transporting PCBs within the UHR, a future special study will include water sampling at Rogers Island during high-flow conditions.*	EPA should ensure that the high flow event monitoring is performed such that the data can be used to identify which different portions of the river bottom in OU2 are sources of PCB load at differing rates. A sampling program which is designed to evaluate this loading pool by pool is needed.
26	ES	E-13	*Mohawk River Sampling Study: The Mohawk River is a tributary that flows into the Upper Hudson River at its downstream end, near Waterford, New York. It has been sampled periodically in the past, but more sampling is needed to support the EPA's evaluation of the recovery of the river.*	While it is important for EPA to fill this data gap, the data from this study is relevant only to the last downstream mile or two of OU2. This study is much more important to understanding the overall impact of the combined upper Hudson/Mohawk drainage basin on the lower Hudson.

Comment #	Section	Page	Quote	Comment
27	ES	E-13	*Lipid Normalization and Observed Recovery Trends: PCBs preferentially accumulate in fatty tissue (lipids) in fish. Long-term monitoring of fish indicates lipid content varies over time and appears to be declining overall. The EPA is evaluating variations in lipid and other constituents of fish (including non-lipid organic matter) over time to better understand the role of lipid in the recovery of the river.*	The use of lipid normalization is a critical use of the available fish data to understand the performance of monitored natural recovery. However, there is no relationship between the recovery rates in water and sediment and the lipid content of the fish. Understanding how lipid content in the fish has and may continue to change does help in understanding the actual recovery in exposure conditions, which is independent of fish lipid content. Evaluations of post-dredging fish concentrations, using lipid normalization, indicate that there has been little recovery in lipid normalized concentrations and thus little recovery in actual exposure of the fish to PCBs in water and sediment.
28	Section 1	1	*The purpose of a FYR is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment.*	EPA should include here in the report the entire section of the current FYR guidance. *"The purpose of a FYR is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. Protectiveness is generally defined in the National Contingency Plan (NCP) by the risk range and the hazard index (HI). Evaluation of the remedy and the determination of protectiveness should be based on and sufficiently supported by data and observations."*
29	Section 1.1.4	5	*The Champlain Canal is coincident with portions of the Hudson River, extending from Waterford to Fort Edward and from there, departing the river in a north-northeasterly direction, on to Whitehall, Vermont, at the southern end of Lake Champlain.*	Whitehall is in New York.
30	Section 1.1.5	5 to 6	*Currently, access to the Remnant Deposits is restricted by perimeter fencing and impeded by the relatively steep slopes in the deeper Draft 6 Third Five-Year Review for the Hudson River PCBs Superfund Site July 2024 gorge section of the UHR, as well as by similar slopes at the water's edge.*	Access to the covered portions of remnant sites 2 through 5, from the river side, is essentially uncontrolled. The fencing on the landward side, while present, does not prevent access by simply walking around the fences.

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31	Section 2.2.2	14	*In a dispute resolution proceeding that followed GE's submission of the draft Phase 1 Dredge Area Delineation Report (GE, 2004) and draft Phase 1 Target Area Identification Report (GE, 2004a), EPA resolved a dispute regarding the criteria used to delineate the spatial extent of dredging and the mass of PCB removed by dredging. The decision clarified that, unless an area is otherwise eliminated from the delineated dredge areas based on EPA-approved criteria, the conditions stated in the Feasibility Study (EPA, 2000a) and ROD hold, namely that: 1) the criteria for delineation of dredge areas in RS 3 include a MPA of 10 g/m2 Tri+ PCBs and, 2) the criteria for delineation of dredge areas include surface (0 to 12 inch) sediment Tri+ PCB concentrations of 10 mg/kg or greater in RS 1 and 30 mg/kg or greater in RS 2 and 3.*	This text highlights the basis for the surface sediment concentration used as a removal criterion. The definition of "surface" sediments was established by EPA as those sediments within 12 inches of the sediment surface.
32	Section 2.5.2	18	*The 2002 ROD remedy for OU2 includes an MNR component, which began after the completion of dredging in 2015. Regular monitoring of water, sediment, and fish has been conducted to track the recovery of the river and progress toward ROD targets and goals. Regular monitoring of post-construction habitat reconstruction is also conducted. The sampling programs for these media have been designed to detect a 5 percent or greater annual rate of decline over a 10-year period on a river section basis, with additional consideration of the individual reaches. If the actual rate of decline is less than 5 percent, it may take additional years of data to establish the specific rate with statistical confidence.*	The ROD is based upon modeling which anticipated a 7 to 9 percent annual decline in fish PCB concentrations. It is unclear in the FYR why EPA is now designing the monitoring program to detect a 5 percent annual decline, which would likely require more years of data to have sufficient statistical confidence as now required by EPA.
33	Section 2.5.2	18	*The OM&M work plan is in the process of being finalized. The scope of work requested by EPA and contained in the draft final workplan is currently being implemented.*	The OM&M work plan was, according to the legal documents governing this remedial action, due to be submitted by GE the year after dredging was completed, in 2016. Why is the OM&M work plan still not finalized?

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34	Section 2.5.2.1	19	*The high-flow program is designed to supplement the routine sampling program by specifically targeting sample collection across the range of observed high-flows within a year that the routine sampling program may not capture. The high-flow program monitors PCB concentrations at two stations (Schuylerville and Waterford, New York) during high-flow events. High-flow samples are collected during the rising, peak, and falling portions of the storm hydrograph, to the extent possible. Sampling for this program is triggered by river flows exceeding the following thresholds as monitored at the Fort Edward and Waterford, New York, United States Geological Survey (USGS) gauging stations: • 11,000 cubic feet per second (cfs) at the Fort Edward USGS Station (No. 01327750). • 15,000 cfs at the Waterford USGS Station (No. 01335754).*	Conducting high flow sampling at only two locations makes it difficult to determine the origin of high flow event driven PCB load from the remaining contaminated sediments in the upper Hudson. At a minimum, there should be monitoring immediately downstream of each of the three defined River Sections. EPA should also follow the OMM Scope document, which specifies the conditions under which GE is required to perform high flow event sampling.
35	Section 2.5.2.2	19	*Although PCBs deeper than 2 inches contribute to potential exposure, the top 2-inch interval was selected for monitoring as it provides a more sensitive indicator of how recent perturbations to the river system are impacting surface sediment PCB concentrations. The sampling program is designed to provide an unbiased estimate of the mean PCB concentration for dredged and non-dredged areas both by river section and by River Reach, as well as to yield sufficient data to monitor changes in concentration over time.*	The top 2-inch interval does not address the large PCB deposits documented in the bioavailable surface sediment (top 12 inches) in the areas surrounding the dredged areas in RS2 & RS3 during remedial design sampling. Although EPA's sampling program is designed to provide an unbiased estimate of Section and Reach averages, the design under-samples cohesive sediment areas that were recognized by EPA's dredge area delineation as likely PCB hot-spot areas and by EPA's bioaccumulation models understood as the primary source of PCBs to the food web.
36	Section 2.5.2.3	20	*Forage fish (spottail shiner) and pumpkinseed are collected in the fall.*	As acknowledged in the ROD, the yearling pumpkinseed collected in the fall are also considered to be important forage fish.
37	Section 2.6	24	*Climate-related changes at OU2 could impact some of the mechanisms associated with MNR.*	EPA should compare the frequency, magnitude, and duration of high flow events post-dredging to the framework used in the modeling to estimate the rate and magnitude of natural recovery.

Comment #	Section	Page	Quote	Comment
38	Table 3-1	26	*The remedy at OU1 currently protects human health and the environment as the in-place containment and cap system prevents human exposure, and as perimeter fencing and signage continue to be maintained. However, in order for the remedy to be protective in the long-term, an institutional control needs to be implemented to ensure that the future use of the areas with the Remnant Deposits does not compromise the integrity of the cap system or result in unsafe exposures.*	It appears that there has been no progress on this issue. ICs for the remnant sites appear to be delayed due to a lack of progress on determining who owns the remnant sites. This real estate / title issue should be relatively simple to address, as it was done previously during the State lead remediation efforts on Operable Unit 4 at the GE Fort Edward plant site immediately upstream and adjacent to the covered portion of Remnant Site 3.
39	Table 3-1	26	*There is also not sufficient data available to assess whether the interim targets identified in the ROD will be reached in the time frames estimated at the time the ROD was issued in 2002.*	This quote highlights that EPA did, in fact, have time frames anticipated in the ROD for rates of fish recovery after dredging.
40	Table 3-1	26	*Once statistically relevant rates of decline in post-dredging fish tissue PCB levels can be established, EPA will estimate the rates of recovery and determine if they are reasonably consistent with those predicted in the ROD.*	This quote highlights that EPA did, in fact, have time frames anticipated in the ROD for rates of fish recovery after dredging. Also, EPA is here stating that the criterion used to evaluate whether the remedy is performing as anticipated is "reasonable consistent" with those predicted in the ROD without establishing any quantitative measure for determining what "reasonable consistent" means.
41	Table 3-1	27	*As EPA indicated in the ROD, EPA believes it likely that improvement will occur gradually over more than five decades.*	The ROD does not describe gradual improvement over more than five decades. Instead, the ROD specifically identified two targeted fish PCB concentrations, intended to represent when the State may consider reducing fish consumption advisories.
42	Table 3-2	28	*EPA, NYS, and GE are researching ownership of the remnant sites so that an appropriate IC can be permanently established.*	It appears that there has been no progress on this issue. ICs for the remnant sites appear to be delayed due to a lack of progress on determining who owns the remnant sites. This real estate / title issue should be relatively simple to address, as it was done previously during the State lead remediation efforts on Operable Unit 4 at the GE Fort Edward plant site immediately upstream and adjacent to the covered portion of Remnant Site 3.

Comment #	Section	Page	Quote	Comment
43	Table 3-2	29	*Data collection of fish, water and sediment continues on a regular basis, and data evaluation is ongoing. Data collected through 2021 and evaluated as part of this FYR are not sufficient to establish statically relevant trends. More years of data are necessary to establish these trends. Data will continue to be evaluated as they are collected to determine if an appropriate amount of data exists to establish a relevant rate of decline.*	EPA is requiring a specific degree of statistical certainty in order to make a protectiveness determination. However, this degree of certainty is much more stringent than was deemed needed at the time of remedy selection, when much less data was available. If EPA was able to make a very momentous decision at the time of remedy selection with much less certainty, why is this much higher degree of certainty needed now?j Protectiveness determinations are, as described in EPA documents describing how to perform an FYR, primarily based on the remaining human health and ecological risks.
44	Table 3-2	29	*Once statistically relevant rates of decline in post-dredging fish tissue PCB levels can be established, EPA will estimate the rates of recovery and determine if they are reasonably consistent with those predicted in the ROD.*	EPA must define “reasonably consistent” in terms of the rate of recovery and the length of time to achieve the thresholds identified in the ROD. To achieve the predicted recovery in the ROD, the rate of recovery and the PCB concentration need to be taken into account. Given that the post-dredging PCB concentrations in fish were/are higher than the ROD predicted, will the rate of decline have to be greater than predicted?
45	Table 3-2	30	*As discussed in more detail below, EPA has entered into an order with GE to conduct supplemental studies of the Lower Hudson River. Additional fish water and sediment data was collected in 2023 and additional work is planned for 2024.*	EPA should issue an Order to GE to implement an RI/FS without any further delay. This site has been on the National Priorities List for forty years; the human health and ecological risks are well in excess of EPA's acceptable risk range, and literally millions of people live within a short distance of the lower Hudson who could be exposed to GE's PCBs. There is no basis for continued delays in issuing GE an RI/FS Order.
46	Table 3-2	31	*EPA continues to collect fish water and sediment data as part of the long-term monitoring program. Although the first target was not achieved within the five-year time period predicted in the ROD, concentrations are approaching the first target and additional years of data collection are necessary to assess if the second target will be achieved in the anticipated timeframe.*	This text appears at the top of page 31 in Table 3-2, in the portion of the table discussing the lower Hudson. It appears that this text is an editorial error, and likely should be removed.
47	Table 3-2	31	*EPA has optimized the long-term monitoring program such that a 5 percent annual rate of decline can be detected in a 10-year time frame. EPA routinely evaluates the data to see if any adjustments to the program are necessary.*	As stated above, the ROD is based upon modeling which anticipated a 7 to 9 percent annual decline in fish PCB concentrations. It is unclear in the FYR why EPA is now designing the monitoring program to detect a 5 percent annual decline, which would likely require more years of data to have sufficient statistial confidence as now required by EPA.

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48	Section 4.1.1	32	*This third FYR was supported by a FYR team representing diverse perspectives. Upon initiation of the third FYR, EPA identified potential members and alternates and established a team (24 members plus alternates) which included representatives of state and federal agencies, CAG members, and EPA subject-matter experts. Between December 2022 and September 2023, a series of seven team meetings were held (Appendix 7) to discuss various topics and answer questions. During these meetings, members of the team, including EPA technical experts, consultants, and representatives of other agencies, led technical discussions on topics ranging from interpretation of EPA's guidance documents on the performance of FYRs to detailed analyses of the data being considered. At each meeting, members of the team were given the opportunity to provide input on the technical presentations, ask questions, request additional analysis be done or provide additional information. Meetings were held virtually, and a teleconference phone line was available to allow those without a computer to participate in the discussions. EPA incorporated feedback from these discussions into the FYR report as appropriate.*	Unfortunately, these FYR team meetings were terminated by EPA before all of the questions raised by the FYR team were discussed and answered in advance of the release of the draft report.
49	Section 5.1	35	*Monitoring of PCBs in the UHR began in the early 1970s, however, the data presented in this FYR represent three time periods with consistent data collection for water, sediment and fish. The three time periods are: the pre-dredging baseline period (2002 to 2008); the dredging period (2009 to 2015); and the post-dredging period (2016 to 2021). The evaluations in this report focus on the six years of post-dredging data. Preliminary post-dredging fish data from 2022 are also presented in this report. Pre-dredging baseline period and dredging period data were collected for different objectives and are used in this report when necessary and appropriate.*	This discussion highlights that the focus of this FYR should be on the post-dredging period of monitored natural recovery. Improvements related to the dredging itself, while critically important to understand the effectiveness of the dredging program in meeting the removal goals, have been evaluated in the previous FYR report. It is critical, however, that this FYR focus on the performance of the ongoing improvement associated with the current phase of the remedy, monitored natural recovery.

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50	Section 5.1	36	*Progress is being made toward RAOs presented in the 2002 ROD (see Section 5.1.6). - The fish species-weighted average TPCB concentration for the UHR as of 2021 was 0.71 mg/kg. The preliminary 2022 average was 0.58 mg/kg. Modeling results presented in the ROD estimated that the first human health target for protection of human health (0.4 mg/kg) would be reached five years after the completion of dredging. Similarly, model results presented in the ROD estimated the second target PCB tissue concentration for the UHR (0.2 mg/kg) would be reached 16 years after the completion of dredging. Although the first target was not achieved within the five-year time period, concentrations are approaching the first target and additional years of data collection are necessary to assess if the second target will be achieved in the timeframe estimated by the modeling (see Section 5.1.6.1). The percentage of sport fish below the 0.4 milligrams per kilogram wet-weight (mg/kg-ww) threshold has increased from 21 percent in the pre-dredging period to 37 percent in the post-dredging period.*	Several points need to be raised here. (1) Progress toward meeting the human health targets included in the ROD associated with the dredging, while critically important to understand the effectiveness of the dredging program in meeting the removal goals, are not helpful in understanding the performance of the current phase of the remedy (MNR). (2) EPA compares the two most recent years of fish data to argue "progress toward", highlighting a reduction between 2021 and 2022, while continuing to state that many years of data are needed to reliable quantify trends in fish PCB concentrations. Which use of the data is appropriate - year to year comparisons, or a much more robust statistical evaluation? (3) The percentage of fish meeting or not meeting any particular criterion, while interesting, is not a metric which helps understand whether or not the goals of the ROD are being met, which EPA has based upon a river section length and species weighted average. It is critical to recognize that the modeling results in the ROD relied on species-specific lipid distributions to estimate wet weight PCB concentrations, which means a direct comparison of wet weight values without considering lipid content is misleading. Using species-specific lipid values (equivalent to lipid-normalized results), the preliminary average is much higher and the rate of decline post-dredging is about ½ the rate from using wet weight values only.
51	Section 5.1	37	*ROD ecological targets for spottail shiner (whole-body) range from 0.7 to 0.07 mg/kg-ww. As part of the ecological risk assessment, spottail shiner was used as an indicator species to represent forage fish less than 10 cm in length (EPA, 2000a). Between 2016 and 2020, the fish collection program collected a variety of forage fish species, including spottail shiner. Since the forage fish collection in the post-dredging period include other forage fish, in addition to the spottail shiner, a comparison to the ecological targets is made for the forage fish. During the post-dredging period, approximately 20 percent of the forage fish collected are below the 0.7 mg/kg-ww criterion and no results are below the 0.07 mg/kg-ww criterion. While a comparison of the forage fish data as a whole to the ecological risk criteria is appropriate, in 2021 EPA modified the fish collection program to focus solely on spottail shiner. This will reduce uncertainty in time trends (e.g., avoids uncertainty introduced by combining different species) and a direct comparison to the ROD RAO can be made.*	As stated above, the percentage of fish which are meeting or not meeting any particular criterion, while interesting, is not a metric which helps understand whether or not the goals of the ROD are being met. FOCH recommends that pumpkinseed be used in evaluating ecological risks to pisciverous wildlife in this FYR, as the data are available and represent forage base for these receptors.By focusing solely on spottail shiner, EPA has significantly extended the time period for making a comparison to the RAO. Using yearling pumpkinseed, which are also considered forage fish, the comparison could be made now and it would demonstrate that PCB concentrations are much higher than the ROD risk threshold and that concentrations have shown no evidence of decline post-dredging.

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52	Section 5.1	37	*EPA anticipated at the time of the ROD that reach-averaged PCB (Tri+) concentrations in the surface sediment would decline post dredging at annual rate of approximately seven to nine percent, consistent with long-term historical trends (EPA, 2000a), and that these rates of decline would be similar in water and fish tissue. As time progresses and concentrations decrease it is assumed these rates will decline. It is EPA's expectation that short-term post-dredging rates will be at least 5 percent per year in all three media and has designed the long term monitoring program for fish, water and sediment is designed to detect a 5 percent annual rate of decline with 80 percent power and 95 percent confidence in about 10 years. Therefore, it is likely that about 10 years of data will be necessary before there are sufficient data to establish whether, and at what rate, PCBs are declining in all three media.*	EPA here describes the anticipated 7 to 9 percent annual decline in PCB concentrations anticipated at the time of remedy selection. EPA is now designing the monitoring programs to identify a 5 percent annual decline, requiring ten years of post dredging data. It is also why EPA states that the rate of decline will decrease as time progresses; is EPA stating that the percentage rate of annual decline will decrease, or that the change in absolute magnitude of the decline from year to year will decrease, or both? This should be made clear in the report.
53	Section 5.1	37	*Additionally, relative to the pre-dredging period, the Tri+ PCB loads to the LHR have decreased.*	The FYR should compare the cumulative magnitude of Tri+ PCB loads post-dredging to expected MNR values: Are Tri+ PCB loads 6 years after dredging consistent with predicted recovery in the ROD?
54	Section 5.1.2	40	*There is a need to sustain the ongoing outreach efforts as NYSDOH continues to work to increase public knowledge of and compliance with fish consumption advisories and fishing restrictions. Human health risk reduction and the protectiveness of the selected remedy rely on the effective implementation of these ICs through ongoing public outreach efforts.*	FOCH recommends that, in order to effectively manage the ICs and to determine their effectiveness, data needs to be gathered to determine who is eating which fish at which locations. This applies not only to the upper Hudson, but to the entire site as well including the entire lower Hudson from the Troy Dam to the Battery in New York City.

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55	Section 5.1.5	42	*The reduction of PCB concentrations in water and fish (and a reduction in PCB mass in sediment) is a key item of the RAOs presented in the 2002 ROD. Reductions in PCB concentration in water, sediment, and fish reduce risks to humans and ecological receptors and minimize the transport of PCBs to the LHR. In this section, a brief overview of the water, sediment, and fish sampling program is presented. This overview is followed by a comparison of pre- and post-dredging PCB levels in each medium, demonstrating that water, sediment, and fish PCB concentrations in the post-dredging period to date are below pre-dredging levels and within expectations of the 2002 ROD.*	As described in comment above, the reductions in fish PCB concentrations associated with the dredging project do not impact the reductions associated with monitored natural recovery. When assissing currrent progress toward remedial goals, EPA should focus on the reductions associated with the current phase of the remedy, monitored natural recovery. The assessments of rates of natural recovery should not be conflated with the recovery associated with removals.
56	Section 5.1.5.1	43	*Figure 3 presents a comparison of geometric mean Tri+ PCB and TPCB concentrations for routine samples collected between May and November during the pre- and post-dredging periods, plotted against long-term monitoring stations ordered from upstream to downstream.*	Can EPA explain why geometric mean was the measure of central tendency chosed for use in this analysis of surface water PCB data? Does this choice impact the analysis? It's nice to know that water column PCB concentrations decreased after dredging. However, the primary question that should be addressed is how those concentrations compared to what was expected in the ROD and whether they appear to be declining at the expected rate. Water column PCB concentrations for 2016 to 2021(2) (Years 1-6 post-dredging) should be compared directly to expected water column PCB concentrations for Years 1-6 post-dredging in the ROD Responsiveness Summary.
57	Section 5.1.5.1	43	*Therefore, a regression model was developed that controls for these factors when comparing pre- and post-dredging geometric means (Appendix 1, Section 4.1.3). This analysis indicates the three stations within the project area exhibited a statistically significant reduction in Tri+ PCB and TPCB concentrations compared to the pre-dredging period.*	Reductions in water column PCB concentrations associated with the dredging project do not impact the reductions associated with monitored natural recovery. When assissing currrent progress toward remedial goals, EPA should focus on the reductions associated with the current phase of the remedy, monitored natural recovery. The assessments of rates of natural recovery should not be conflated with the recovery associated with removals.
58	Section 5.1.5.2	43	*Approximately 99 percent of the samples had Tri+ PCB levels below the most stringent ROD-specified surface sediment dredging criterion of 10 mg/kg.*	This is a totally inappropriate and misleading comparison, since the ROD-specified surface sediment dredging criterion of 10 mg/kg was based on the surface sediment as defined by EPA in the ROD as the top 12 inches. An evaluation of remedial design data from River Section 2 identified more than 200 samples within 100 ft of dredge prisms that had Tri+ PCB levels in the surface exceeding 10 mg/kg.

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59	Section 5.1.5.2	43	*Although there is no cleanup level in the ROD for PCBs in surface sediments, a comparison to the post-dredging residual concentration goal of 1 mg/kg was also conducted to facilitate a comparison to a lower threshold.*	EPA should revise this statement to include the sediment cleanup levels in the ROD. There were clear concentration based cleanup levels set for delineating sediment removal by river section (see the dispute resolution document generated by EPA during design).
60	Section 5.1.5.2	44	*In contrast, in RS 2 and RS 3, the sampling grids focused on areas of suspected contamination with sampling effort decreasing where contamination fell below the removal thresholds. As a result, the pre-dredging measurements in RS 2 and RS 3 are generally representative of contaminated areas in RS 2 and RS 3, and not the entire river section. As discussed in the Second FYR, to partially account for this biased sampling approach, an area-weighted average Tri+ PCB concentration was developed for each river section through segregating results by grain size (cohesive versus non-cohesive) (Second FYR, see Appendix 4 Table A4-5 of that document). However, this approach is not expected to completely resolve the biased high measurements in RS 2 and RS 3.*	The “biased” sampling conducted during remedial design in RS2 and RS3 focused on depositional sediment areas, which were understood by EPA’s (and GE’s) bioaccumulation models as the principal source of exposure to the food web and the areas where major PCB deposits were located outside of the dredged areas. These “biased” sampling grids should be re-sampled to assess the post-dredging concentrations of bioavailable surface (top 12 inches) PCBs and to evaluate the success of the remedy in reducing the mass of bioavailable PCBs (RAO #4).
61	Section 5.1.5.2	44	*…the pre-dredging measurements in RS 2 and RS 3 are generally representative of contaminated areas in RS 2 and RS 3, and not the entire river section. As discussed in the Second FYR, to partially account for this biased sampling approach, an area-weighted average Tri+ PCB concentration was developed for each river section through segregating results by grain size (cohesive versus non-cohesive) (Second FYR, see Appendix 4 Table A4-5 of that document). However, this approach is not expected to completely resolve the biased high measurements in RS 2 and RS 3.*	If EPA designed a sampling program to address the high concentrations of PCBs remaining in the surface in RS2 and RS3, as documented by the remedial design Sediment Sampling and Analysis Program (SSAP), then a program that re-visited the spatial grid used to address remaining contaminated sediment surface (top 12 inches) would provide an assessment of MNR. EPA should make it clear in this FYR that any discussion of “surface” sediment only addresses the top 2 inches, which does not include the bioavailable zone (top 12 inches) as defined by EPA and used to define the surface sediment dredging criteria. The current sampling program used to define RSA and RWA average PCB concentrations in the top 2 inches does not directly address remaining bioavailable surface sediment PCBs, particularly in the contaminated areas documented in the SSAP.

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62	Section 5.1.5.2	44	*To facilitate the comparison to pre-dredging levels in this section and consistency with the water and fish comparisons, the RSA-weighted averages in 2016/2017 and 2022 were combined to derive an overall average for each river section for the post-dredging period.*	Reductions in 0-2 inch surface sediment PCB concentrations associated with the dredging project do not impact the reductions associated with monitored natural recovery. When assessing currrent progress toward remedial goals, EPA should focus on the reductions associated with the current phase of the remedy, monitored natural recovery. The assessments of rates of natural recovery should not be conflated with the recovery associated with removals.
63	Section 5.1.5.2	44 - 45	*Figure 3 compares the pre- and post-dredging RSA-weighted average Tri+ PCB concentrations in the surface sediments. Prior to dredging, the RSA-weighted average Tri+ PCB concentrations were 14 mg/kg, 12 mg/kg, and 4 mg/kg in RS 1, RS 2 and RS 3, respectively. These averages decreased to 1.1 mg/kg, 2.0 mg/kg, and 0.73 mg/kg during the post-dredging period in the respective river sections. These results demonstrate the significant reduction in surface sediment concentrations achieved between the pre- and post-dredging period as a result of both natural recovery and dredging activities.*	Please provide the analysis of the pre and post dredging sediment data which show that the decline in surface sediment PCBs is attributable to monitored natural recovery. Comparisons of the two post dredging surface sediment data sets (2016/17, and 2022) does not appear to document any significant declines in 0 - 2 inch surface sediments. Also, as stated in comments above, EPA should focus on the reductions associated with the current phase of the remedy, monitored natural recovery. The assessments of rates of natural recovery should not be conflated with the recovery associated with removals. The FYR should evaluate recovery compared to expected post-dredging recovery of the surface top 2 inches by including a figure that compares the expected post-dredging and measured concentrations for 6 years post-dredging.
64	Section 5.1.5.3	45	*Wet-weight TPCB concentrations provide one basis for evaluating changes in concentration through time and are the basis for estimating risk via ingestion to human health and the environment in the 2002 ROD.*	Although the ROD used wet weight values for estimating risk and recovery of fish PCBs, the wet weight values were derived from bioaccumulation models that were based on species-specific lipid distributions.

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65	Section 5.1.5.3	45	*Figure 3 compares the geometric mean of the wet-weight and lipid-normalized TPCB data in the pre- and post-dredging period for fish in the UHR. The geometric mean provides a better representation of the central tendency of log-normally distributed data.*	Can EPA explain why geometric mean was the measure of central tendency chosen for use in this analysis of surface water PCB data? Does this choice impact the analysis? The metric chosen by EPA to assess fish PCB concentrations during the current phase of the remedy (monitored natural recovery) is average (ie. arithmetic mean) and not geometric mean. The geometric mean may provide the best statistical representation of the data, but the arithmetic mean is more relevant for evaluation risk.
66	Section 5.1.5.3	46	*Brown bullhead and pumpkinseed show statistically significant declines in the geometric mean of the wet-weight and lipid-normalized TPCB concentrations relative to the pre-dredging period. Brown bullhead show the largest decline in both wet-weight and lipid-normalized geometric mean TPCB concentrations. Yellow perch show consistent declines in the lipid-normalized geometric means. The difference between the wet-weight and lipid-normalized plots for yellow perch indicate the influence of lipid on the TPCB concentration. In the post-dredging period, lipid content has increased in yellow perch. When the wet-weight TPCB concentration is normalized to account for the increase in lipid, the change (decrease) in TPCB concentration becomes evident.*	Can EPA explain why geometric mean was the measure of central tendency chosen for use in this analysis of surface water PCB data? Does this choice impact the analysis? The metric chosen by EPA to assess fish PCB concentrations during the current phase of the remedy (monitored natural recovery) is average (ie. arithmetic mean) and not geometric mean.
67	Section 5.1.5.3	46	*Another metric used to quantify how PCB concentrations in fish tissue change over time is the species-weighted average. The species-weighted average represents the average TPCB fish tissue concentrations for species expected to be commonly caught throughout the UHR for consumption. It is calculated using bass, bullhead and perch concentrations from all three river sections and accounts for how frequently these fish are expected to be caught and the length of each river section. The basis for ROD targets and goals is the species-weighted average.*	A few thoughts on this passage: (1) is EPA using geometric mean or arithmetic mean for the referenced calculation? (2) EPA is referencing ROD targets and goals which are being downplayed elsewhere in the FYR (3) When viewed on a lipid-normalized basis, there appears to much less recovery in fish PCB concentrations after dredging than EPA is claiming. (4) As stated in multiple comments above, EPA should be assessing the current phase of the remedy, and not citing any improvements associated with the dredging with the performance of the current phase of the remedy, monitored natural recovery.

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68	Section 5.1.5.3	46	*The species-weighted average has been calculated annually from 2004 through 2021. Similar to the results shown in Figure 3, the species-weighted average has decreased relative to the pre-dredging period (Appendix 3, Figure A3-19).*	The ROD included a table of the expected species-weighted averages resulting from the implementation of the elected remedy (ROD Table 11-2). The FYR should compare the annual species-weighted average concentrations with the expected concentrations.
69	Section 5.1.6	46	*The 2002 ROD did not anticipate that RAOs would be achieved within six years (2016 to 2021) following completion of the dredging, however, the post-dredging data collected to date indicates that positive progress is being made towards meeting those goals.*	EPA should clarify here when the progress referred to was made; between predredging and immediately post dredging monitoring results, or during the current phase of the remedy, monitored natural recovery after dredging. It is important to understand how the current phase of the remedy is performing when trying to understand when the remedial targets will be met, and when the human health and ecological risk will reduce to a point where the risks are within EPA's acceptable risk range.
70	Section 5.1.6.1	46	*The First Human Health Target Level of 0.4 mg/kg-ww Has Not Yet Been Achieved.*	A major assumption of the evaluation of this Human Health Target Level is that the fish collected in spring are representative of concentrations throughout the summer. Given the extremely low and decreasing lipid content of the primary species (black bass and bullhead) used to calculate the species-weighted averages, this assumption may not be true, as these species are likely to accumulate lipid (and PCBs) over the summer. This assumption has never been tested.
71	Section 5.1.6.1	47	*Model results presented in Table 11-2 of the 2002 ROD projected that for the UHR as a whole, a target level of 0.4 mg/kg-ww may be achieved about five years after completion of dredging, and the second target of 0.2 mg/kg may be achieved about 16 years after dredging. In 2020, five years after dredging, the species-weighted average TPCB concentration was 0.63 mg/kg-ww. Although the first target was not achieved in the time frame estimated by the modeling, concentrations appear to be declining.*	The apparent decline in species-weighted average fish PCB concentrations can be explained by the reductions in fish lipid concentrations in bass and bullhead. These two species make up 91% of the species weighted average metric developed by EPA. Bass and bullhead PCB data, when lipid normalized, show much lesser declines than when looked at on a total PCB basis alone. The apparent decline cited by EPA can not continue much further, as there are currently very low lipid concentrations in bass and bullhead and there is little room for further declines in lipid. As a result, basing assumptions on the recent trends in bass and bullhead total PCB concentrations ignores the relationship between PCB and lipid in these animals.

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72	Section 5.1.6.1	47	*Additionally, as noted in the response to comments for the Second FYR, any comparison of fish data to ROD model projections needs to consider that assumptions used in the ROD model projections were not expected to (and did not) exactly reflect actual implementation of the remedy (EPA, 2019c)*	This should not preclude comparing the fish data to model projections, since the model projections were instrumental to the ROD. If the fish data do not meet model projections, then the assumptions of the modeling should be re-evaluated.
73	Section 5.1.6.2	47	*The Ecological Targets for Protection of Ecological Resources Have Not Yet Been Achieved. The 2002 ROD specifies two targets for protection of ecological resources, one for largemouth bass and one for spottail shiner."*	EPA proposes new sampling to address uncertainty in the data used to evaluate the ecological risk targets, which only postpones any evaluation of the targets many years into the future and ignores the available pumpkinseed data that could easily be used to make this evaluation now. EPA's Revised Baseline Modeling Report noted that "Forage fish (pumpkinseed and spottail shiner) serve as primary prey base for the larger fish (that are piscivorous) and also other ecological receptors (such as mink and kingfisher, as examples)."
74	Section 5.1.6.3	49	*The substantial increase in the number of samples with detected TPCB concentrations below 14 ng/L from the pre-dredging to the post-dredging period, whether using all data or only routine data, indicates that positive progress is being made toward achieving the most protective water column PCB concentration ARAR.*	This analysis only demonstrates that dredging resulted in lower TPCB concentrations in the water column, but does not provide any information on "progress." To demonstrate progress, EPA would need to show that concentrations are continuing to decline and that they are approaching the post-dredging predictions in the ROD.
75	Section 5.1.6.4	49	*An additional RAO in the 2002 ROD was to reduce the inventory (mass) of PCBs in sediments that are or may be bioavailable. It is estimated that 76 percent of the overall PCB mass from the UHR was removed by the dredging, which exceeds the 65 percent reduction assumed in the ROD. Total sediment volume and TPCB and Tri+ PCB mass removed were greater than planned in the remedial design, in part due to underestimates of the depth of contamination (primarily caused by wood debris that interfered with sediment sampling) during the original remedial design.*	While the total mass of PCBs removed during dredging was greater than estimated at the time of the ROD, the total mass of PCB in the upper Hudson was also underestimated at the time of the ROD, resulting in the remedy actually leaving behind more PCB than was anticipated to be left behind at the time of the ROD.

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76	Section 5.1.7	51	*During the first year or more of the post-dredging period, the concentrations of PCBs in water, sediment and fish were likely subject to lingering effects from the dredging activities. It is anticipated that as the system re-equilibrates, concentrations will more closely reflect ongoing recovery as a collective result of the remedy and MNR*	Does EPA believe that the system has re-established equilibrium after dredging? If so, when was equilibrium achieved? This is an important point given the discussion in this section of the draft FYR on starting and ending points for trend analyses. As drafted, this suggests that PCB concentrations are likely to be higher during equilibration period from the lingering effects from the dredging activities, although an evaluation of the data does not suggest that. A comparison to the predictions for the post-remediation recovery in fish, sediment, and water in the ROD can take this into account. [“The overall protectiveness of the selected alternative, REM-3/10/Select, is based on modeling of a six-year implementation schedule, 0.13% PCB loss due to resuspension, and a one-year equilibration period, such that risks were calculated with a start year of 2010.” EPA ROD, p.69]
77	Section 5.1.7	51	*Therefore, before a time trend can be estimated, it is important to determine whether the dataset spans a sufficiently long period of time so that the time trend accurately reflects the true, long-term time trend and is not affected by short-term natural variability in the dataset.*	EPA is using this uncertainty in the time trend as an excuse to not evaluate (or present) the current trends. Sufficient data are now available to show that, without a highly unlikely miraculous recovery, two of the 4 fish species with robust datasets are either not recovering or recovering much slower than EPA expected. Additionally, the PCB concentrations can be directly compared to the post-remediation PCB concentrations predictions in the ROD. With the addition of the now available 2022 and 2023 data, EPA currently has 8 years of post-dredging fish data for estimating trends and comparison to predicted concentrations.

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78	Section 5.1.8	53	*In aquatic systems, hydrophobic chemicals such as PCBs are mostly associated with sediments, and in the absence of significant external sources, the transport and fate of the legacy PCBs in the sediments of the UHR control the surface water concentrations and the bioaccumulation of PCBs in fish. Sediment concentrations influence PCB exposure through resuspension under high-flow conditions. Under lower flow conditions, transfer of dissolved phase PCBs from sediment to the overlying water becomes an important control on water column PCB concentrations. Bioturbation is another mechanism that can influence water column PCB concentrations. Fish and other aquatic organisms are exposed to PCBs through direct contact with water and sediment (bioconcentration), as well as through dietary sources (bioaccumulation). Because of the dynamic link between the three media, there is an expectation of a system-wide spatial correlation between PCB exposure and fish concentration. Therefore, long-term monitoring of all three media is important for understanding the recovery of the system.*	This passage highlights the relationship between sediment, fish, and water PCB concentrations. When looking at the available sediment and fish data, it appears that there are similarities in the surface sediment and most of the fish data. There is no meaningful decline in surface sediment PCB concentrations in much of the upper Hudson, as is the case with the perch and pumpkinseed PCB concentrations. The outliers in these comparisons are the bass and bullhead PCB concentrations, which on a total PCB basis show more decline than in either surface sediments or the other monitored fish (pumpkinseed/perch). The apparent declines in total PCB in bass and bullhead are explained by reductions in fish lipid concentrations, and likely not due to changes in exposure conditions. When looking at fish and sediment data holistically, it appears that the overall trend is one of relative stablility in PCB concentrations, not significant declines.
79	Section 5.2	54-55	*The risk-based remediation goal for the protection of human health is 0.05 mg/kg PCBs in fish fillet based on the non-cancer hazard index for the RME adult fish Draft 55 Hudson River PCBs Superfund Site Third Five-Year Review July 2024 consumption rate of one half-pound meal per week (this level is protective of cancer risks as well). This risk-based remediation goal remains protective of human health since there have been no significant changes to the toxicity and exposure assumptions used in the original risk assessment, as described further below.*	FOCH recommends that EPA update the IRIS database to include more recent information on PCB toxicity available since the last update to the PCB toxicity values in IRIS, made decades ago. (This comment also applies to the text in Section 5.3.2.1.)
80	Section 5.2.3.2	57	*The recalculated risk-based concentration range for spottail shiner consumed by the mink is 0.34 to 0.11 mg/kg PCBs in fish compared with 0.7 to 0.07 mg/kg PCBs in fish in the Revised BERA.*	Using yearling pumpkinseed as representative forage fish rather relying exclusively on spottail shiner is appropriate because yearling pumpkinseed, which average 10 cm in length (approximately 4 inches) can be considered equivalent forage fish for the ecorisk evaluation. Also, the limitations of the database for spottail shiner make a strong case for using pumpkinseed data, which has a robust pre- and post-dredging database. Using pumpkinseed data, the 0.34 threshold is exceeded by an average factor of 4-18 for reaches 5-8 since 2016, with no clear evidence of declining concentrations.

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81	Section 5.2.6	58	*Risks to subsistence anglers, which would include subsistence anglers in environmental justice communities (specifically minority and low-income communities, with disproportionate adverse environmental impacts), were evaluated as part of the risk assessment performed for the 2002 ROD. EPA's evaluation of available literature regarding subsistence consumption led EPA to conclude that cancer risks and non-cancer health hazards to subsistence anglers were adequately evaluated in the Revised HHRA. Review of the limited literature available on subsistence or highly exposed angler populations supports the assumption that these subpopulations are likely to be adequately represented in the total distribution of fish ingestion rates developed for UHR anglers.*	EPA should provide more detail in the section. Does EPA believe that the "Reasonably Maximum Exposed" or RME exposure assumptions are representative of subsistence anglers? If so, then the report should state this. If not, then EPA should provide the rationale for the conclusion that the risks to subsistence anglers are "adequately represented" in EPA's risk assessments for this site.
82	Section 6.1	59	*Recommendation: EPA will continue to coordinate with NYS to determine land ownership, which would be needed for institutional controls to be properly established. Currently, fences installed at the Remnant Deposits restrict access to the sites.*	Determination of ownership should be a relatively straightforward process, consulting with NYSDEC and the New York Office of General Services. This was done fairly quickly when NYSDEC implemented the GE Fort Edward plant site OU4 remedy, immediately adjacent to and upstream of Remnant Site 3. Also, the fences on the landward side of the remnant sites do not prevent access by walking around the fences, or by accessing the remnant sites directly from the river shoreline.
83	Section 6.1	60	*Issue: There are not enough sets of annual data available since the completion of sediment dredging to establish rates of decline in fish with statistical confidence. A protectiveness determination of the OU2 remedy cannot be made until the rate of decline in fish tissue can be determined from post-dredging data.*	EPA needs to set, in this FYR document, quantitative criteria to evaluate whether or not enough data is available to reach conclusions on rates of decline and on whether or not further work needs to be undertaken to understand the performance of the monitored natural attenuation phase of the remedy. Simply waiting for more years of data will not help understand the performance of the remedy if EPA can not achieve the agency goal of documenting an acceptable rate of decline. This is particularly true if the actual rate of decline in fish PCB concentrations is significantly lower than anticipated by EPA.

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84	Section 6.1	60	*Recommendation: Once statistically relevant rates of decline in fish tissue post□dredging PCB data can be established, EPA will report the rates of recovery and determine if they are reasonably consistent with those anticipated by the ROD. Additional years of surface water and sediment data will contribute to EPA's evaluation of fish recovery.*	EPA should clearly state here what "reasonably consistent" means in this statement. The ROD anticipated a 7 to 9 percent annual decline in fish PCB concentrations, but is now designing the monitoring program to be able to detect a 5 percent annual decline. Does this mean that, if EPA can document a 5 percent annual decline, that this 5 percent decline is "reasonable consistent" with the anticipated 7 to 9 percent decline? If not 5 percent, what rates of decline would EPA determine to be "reasonable consistent"? This issue is critical for evaluating whether or not EPA would need to issue a ROD amendment or a new ROD should the decline in fish PCB concentrations not be found by EPA to by "reasonably consistent" with the ROD.
85	Section 6.1	60	*Issue: Based on existing data, certain fish species and sections of the river appear to be recovering differently. Although this circumstance is not unexpected, it does require further evaluation. Recommendation: Special studies will be conducted to provide insight into why different species and certain portions of the river appear to be recovering differently. Multiple special studies are anticipated to help understand this observation, including a fish aging study.*	EPA should, in this FYR document, detail the specifics of the proposed "special studies" so that the public can be informed on what the objectives for the work would be, and how EPA plans to meet these objectives. EPA should at least include the Data Quality Objectives for these studies, along with the scope of the proposed work to meet the objectives.

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86	Section 6.1	61	*Three surface sediment "areas of interest" were identified during surface sediment sampling in 2016/2017 and are being monitored. Based on the 2021 surface sediment data, these areas have decreased in PCB concentrations. The caps and these select sediment areas are being monitored and maintained as required by the Consent Decree. See Appendix 4 for additional details. As approved by EPA, several considerations resulted in engineering offsets (for example near bridge piers and retaining walls), cultural resource offsets and safety offsets (primarily immediately above dams) that prevented sediment from being dredged in those areas. Additionally, sampling has indicated that there are elevated PCB levels in soil within certain limited areas of the floodplain that are underwater during high flow portions of the year. There is potential that areas with elevated PCBs, including the examples described above, could contribute to localized delays in recovery. Recommendation: These limited and localized areas of elevated PCBs concentrations in sediment/soil should be evaluated for their potential impact on water and/or fish recovery.*	EPA should, when evaluating the identified "areas of interest", also investigate the other undredged areas in the upper Hudson in order to understand the impacts of the remaining PCB mass left behind to be managed by the monitored natural recovery element of the remedy. A goal of such studies would be to quantify the relationship between the remaining contaminated sediments and the trends in fish PCB concentrations. Any evaluation should include the entire bioavailable sediment zone (top 12 inches), not just the top 2 inches.
87	Section 6.1	62	*Issue: In order for NYSDOH to adjust fish consumption advisories, additional species of fish (not currently routinely collected) will need to be collected and tested for PCBs. The Upper Hudson River long-term monitoring program has provisions for collection and analysis of supplemental and whole-body fish data. However, the scope of this work has not been defined yet. Recommendation: EPA will continue to coordinate with NYSDOH and NYSDEC regarding the scope and timing of this data collection, but it is expected to occur in the next year. These supplemental data collection events will be needed at various times over the anticipated decades-long recovery of the Upper Hudson River to support the fish advisories. GE will conduct these data collection events.*	EPA should, in this FYR document, detail the specifics of the proposed additional fish collections to support the NYSDOH advisory program, so that the public can be informed on what the objectives for the work would be, and how EPA plans to meet these objectives. EPA should at least include the Data Quality Objectives for these studies, along with the scope of the proposed work to meet the objectives.
88	Section 6.1	63	*Recommendation: EPA supports these education and outreach efforts, including the need for continued funding of the outreach program beyond its current funding limit of 2027. The additional funding will need to be in place in advance of 2027 so that a smooth transition can occur and to avoid disruptions to the program. EPA will continue to coordinate with NYSDOH and engage in discussions with GE regarding continued funding.*	If the funding for the fish advisory programs will run out after two years, then EPA must commit to fund the work needed to support and implement the NYSDOH advisory program. The advisory program is the only control on risks for this site during the MNR phase of the remedy. As the remaining human health risks are still well in excess of the EPA acceptable risk range, it is critical that the NYSDOH outreach and education efforts are sufficiently supported by EPA without delay or gaps in funding.

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89	Section 6.1	64	*Issue: The 2002 ROD specifies two targets for protection of ecological resources: 1) largemouth bass based on a whole-body largemouth bass of the size range typically consumed by river otter (4 to 7 inches) and 2) spottail shiner as representative of forage fish of the size range typically consumed by mink (less than 10 cm in length). During the post-dredging period, largemouth bass samples of a size larger than typically consumed by river otter have been analyzed on a fillet basis. Additionally, during the post-dredging period, forage fish collection has focused on collection of a variety of forage fish species, including spottail shiner. EPA identified the lack of PCB data on appropriately sized whole-body largemouth bass as a data gap. For forage fish, while a comparison of the existing forage fish data to the ecological risk criteria is appropriate, combining different species presents challenges when evaluating PCB concentration trends through time.*	While obtaining the data specified in the monitoring plan is appropriate, EPA already has data on other species (pumpkinseed) which can be used for assessing the progress of monitored natural attenuation in meeting the risk targets for protection of ecological resources in this FYR.
90	Section 6.2.3	65	*OM&M of water, sediment, fish, caps, and habitat is an important component of the remedy. It is necessary that OM&M plans reflect the current understanding of the system being monitored and that monitoring plans have the flexibility to be adjusted as necessary during the ongoing MNR phase of the remedy. EPA is overseeing GE's development and implementation of the OM&M program in consultation with NYS. The program may need to be adjusted periodically to allow for further evaluation of the river system and to account for changes in data variability. These adjustments could require changes to ongoing sampling and investigation scopes of work.*	In this FYR, EPA should assess the current monitoring program to evaluate if the data quality objectives for the monitoring are being met, and direct GE to perform any additional needed monitoring to support a determination of remedy protectiveness.

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91	Section 6.2.4	65-66	*The Rogers Island water column monitoring station is located upstream of the areas dredged during Phase 1 and Phase 2 of the remedial action. Understanding PCB concentrations entering the upstream portion of the UHR is important for assessing the recovery of the river. As discussed in Section 5.1.3, high-flow samples have not been collected at Rogers Island and, therefore, the concentration of PCBs entering the upstream portion of the UHR during high-flow events is not well known. The PCB load estimated at Waterford (Appendix 1, Attachment A) shows that a few high-flow events may carry the majority of the annual load. Given the importance of high-flow events in transporting PCBs within the UHR, high-flow samples are needed at Rogers Island*	While it is important to quantify the PCB concentrations and mass load at Rogers Island to help understand the movement of PCB during high flow events, it is likely more important to gather high flow event water column data at or immediately downstream of the Thompson Island Dam (the downstream end or River Section 1) in order to understand the source(s) of PCB loading from the remaining contaminated sediments. Only gathering data from the downstream end of River Sections 2 and 3 will not allow EPA to assess the source of high flow event driven PCB loading from River Sections 1 and 2. If elevated high flow event loading is found during monitoring at the downstream end of River Section 2 with no data to differentiate which River Section upstream of that location, then even more years of data would be required to understand the source of the loading.
92	Section 7	68	*A protectiveness determination for the OU2 remedy cannot be made at this time until further information is obtained. In the last FYR, EPA indicated that as many as eight or more years of post dredging data are needed to establish rates of decline for fish with an appropriate level of statistical confidence. Since sediment dredging activities were completed in 2015, EPA has gathered and evaluated fish data up to 2022. EPA does not yet have sufficient sets of annual fish data to make a protectiveness determination and, therefore, is deferring such determination*	It is unclear why EPA believes that one or two more years will provide sufficient data to achieve EPA's desired statistical confidence. Taking into account that (1) the apparent declines in some species (bullhead and black bass) is primarily driven by declining lipid concentrations in these species and (2) there is little room for further lipid declines (the recent lipid concentrations are already very low for these species), there is little reason to believe that concentrations will decline sufficiently in the next year or two to allow for a statistically representative trend to become apparent. EPA has enough data now. The amount of data available now is much, much greater than was available to EPA when the agency did remedy selection over 20 years ago.

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93	Section 7	68	*Based on the analysis conducted during this FYR and consistent with the last FYR, once statistically relevant rates of decline in post-dredging fish tissue PCB levels can be established, EPA will estimate the rates of fish recovery and determine if they are reasonably consistent with those anticipated by the ROD and make a protectiveness determination. EPA will issue a protectiveness determination through an addendum to this FYR report. It is anticipated that the results of the annual 2024 fish data could provide the information that results in determining statistically relevant rates, allowing EPA to make a protectiveness determination, and issuing an addendum in 2025. If not, EPA will report out its analysis and continue to actively monitor the river and evaluate data until sufficient data is available to determine statistically confident rates of decline in fish. At that point, but no later than 2027, EPA will issue the addendum with a protectiveness determination.*	EPA should establish, in this FYR, what quantitative decision criteria will be used by EPA in determining protectiveness over the next few years. These criteria should be based on the ROD, and the expectations of remedy performance at the time of remedy selection.
94	Figure 3			Figure 3 shows that, as expected, PCB concentrations in all media decreased after dredging, but fails to show that the decrease was much less than expected. Higher than expected concentrations post-dredging means that natural recovery would take longer that the ROD projected. Additionally, the figure does not demonstrate recovery after the initial post-dredging reductions.
95	Figure 3			Comparing aggregated pre-dredging to post-dredging fish PCBs is nice, but the important question for the third five-year review is an evaluation of the annual post-dredging arithmetic mean PCBs to the post-dredging PCBs expected in the Responsiveness Summary of the ROD.
96	Figure 3			Comparing grouped sediment, water and fish data pre and post dredging is not useful in understanding the performance of the current phase of the remedy - monitored natural recovery. The appropriate data analysis at this point in the project is to look at the magnitude and temporal trends in the three media in the several years since dredging was completed.

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97	Figure 3			Figure 3 should also present the water column data on the basis of PCB load as the river moves downstream. A drop in concentration does not mean that the water column is not continuing to pick up PCB from the sediments; rather, it may only mean that the increase in PCB mass carried by the river is diluted by tributary flow inputs. EPA should evaluate the changes in load as the river passes downstream over the remaining contaminated sediments in order to understand which reaches of river maj be important sources of sediment PCB flux to the water column.
98	Figure 3			EPA should present the water and fish data in Figure 3 on an arithmetic mean (average) basis.
99	Figure 3			EPA should present the total PCB concentrations in sediment, on an arithmetic mean (average) basis in this figure.
100	Figure 3			Figure 3 should also present the black bass PCB data, as these data make up nearly 47% of the species and river weighted average metric used by EPA in evaluating trends in fish PCB concentrations over time since the end of dredging.
101	Appendix 1 Section 4.1.1	17	*This non-linear relationship between concentration and flow is likely reflective of a dilution-dominated flow regime at relatively low flows and a resuspension-dominated flow regime at higher flows.*	Please define "dilution-dominated" in this context.
102	Appendix 2 Executive Summary	E-1	*Technical Assessment Characterize post-dredging surface sediment PCB concentrations by river section and reach Overall concentration level: Data collected during the post-dredging period show that about 99 percent of sediment samples contained Tri+ PCB concentrations (the sum of all measured PCB congeners with three or more chlorine atoms per molecule) that were lower than the most stringent ROD-specified surface sediment remediation criterion of 10 milligrams per kilogram (mg/kg), and 70 percent of samples contained less than 1 mg/kg Tri+ PCB.*	The comparison of post dredging surface PCB concentrations to the criteria used for delineating dredge areas, while informative, provides little insight on the performance of the monitored natural recovery phase of the remedy. It would be expected that the remedy should meet the design goals for removal, as there was stringent application of the criteria during dredging. This is extremely misleading and a totally inappropriate comparison. EPA established the surface criterion for dredging based on the Tri+ PCB concentration in the surface top 12 inches (considered the bioavailable layer) and the “surface” data collected post-dredging only represent the top 2 inches.

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103	Appendix 2 Executive Summary	E-1	*The median Tri+ PCB concentration was around 0.5 mg/kg in both the 2016/2017 and 2021 datasets.*	This passage highlights the rate of monitored natural recovery during the current phase of the remedy after dredging. There appears to be little improvement in surface (0 to 2 inch) sediment PCB concentrations in the upper Hudson since the end of dredging. EPA should explain in this FYR how there would be declines in fish PCB concentrations if there has been little recovery in surface sediment PCB concentrations.
104	Appendix 2, Executive Summary	E-2	*Changes in PCB concentrations in these three reaches over time will be carefully examined in the next Five-Year-Review (FYR).*	Which is another way of saying that EPA will not evaluate changes or the lack of change in the current two sediment datasets or compare to the predictions of post-dredging concentrations.
105	Appendix 2, Executive Summary	E-2	*Evaluating the recovery rate of PCB concentrations in surface sediment was not performed, as the sediment OM&M program requires 10 years of data (year 0, year 5, and year 10) to detect a 5-percent annual rate of decline with 80-percent power and 95-percent confidence. Rather, temporal change in surface sediment PCB concentrations was explored by comparing the geometric mean concentrations in recoverable sediments sampled in 2016/2017 and 2021, as well as the RWA-weighted average concentrations.*	Any evaluation of surface sediment recovery should compare arithmetic mean concentrations, since the arithmetic mean is the standard representation of biological exposure.
106	Appendix 2, Executive Summary	E-2-3	*The increased concentrations in dredged areas over time are expected likely due to the resuspension of sediment from the non-dredged areas, followed by deposition of these sediment in the dredged areas. This redistribution is expected as dredged areas are typically located within depositional areas of the river and the majority of the areas were not backfilled to the pre- dredged elevations. Therefore, creating an ideal environment for sediment deposition. Since the PCB concentrations in the dredged areas that were backfilled are low right after the completion of dredging, concentrations in these areas will increase over time and go toward the concentrations in non-dredged areas as they continue to accumulate depositing solids.*	The modeling used in the ROD expected the post-dredging concentrations in the dredged areas to be 0.25 ppm Tri+ PCBs.
107	Appendix 2 Executive Summary	E-3	*RWA-weighted average concentrations: In RS 1 and RS 2, the RWA-weighted average PCB concentrations measured in 2021 remained unchanged from those measured in 2016/2017. In RS 3, the RWA-weighted average Tri+ PCB concentration decreased from 0.57 mg/kg in 2016/2017 to 0.44 mg/kg in 2021; and the RWA-weighted average TPCBHE concentration decreased from 1.2 mg/kg in 2016/2017 to 0.96 mg/kg in 2021.*	This passage again highlights the rate of monitored natural recovery during the current phase of the remedy after dredging. There appears to be little improvement in surface (0 to 2 inch) sediment PCB concentrations in the upper Hudson since the end of dredging in River Sections 1 and 2, with an approximate 20 percent decline in River Section 3. EPA should explain in this FYR how there would be declines in fish PCB concentrations if there has been little recovery in surface sediment PCB concentrations.

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108	Appendix 2 Executive Summary	E-3	*In the United States Environmental Protection Agency's (EPA's) Technical Memorandum Evaluation of 2016 EPA/GE and 2017 NYSDEC Surface Sediment Data (EPA, 2019b), three areas of interest were identified as zones of comparatively elevated surface sediment Tri+ PCB concentrations, based on sample data collected during 2016 and 2017: (1) Near Galusha Island between River Mile (RM) 188 and 187 in RS 2/Reach 7 (2) Near the Upper Mechanicville Dam, north of RM 166 near Certification Unit (CU) 92 in RS 3/Reach 4 (3) Near the Lower Mechanicville Dam, between RM 164 and 163, near CU-96 in RS 3/Reach 3*	EPA is focusing this portion of the data analysis on three areas of interest. It would likely be more useful it this analysis was expanded to include the entire project area to quantify the relationship between fish and sediment PCB concentrations and understand how the remaining PCBs in upper Hudson River sediment are impacting the fish PCB concentrations over time.
109	Appendix 2 Section 2.2	5	*The NYSDEC program targeted 1,678 locations. The program was designed around the eight reaches (or pools) that are found in the UHR project area instead of the three river sections used in EPA/GE's 2016 program. The number of samples was determined with the goal of achieving: (1) the ability to detect an 8 percent annual decline in PCB concentrations within a given reach between two consecutive five-year monitoring periods with a statistical power of 80 percent at the 95 percent confidence level, and (2) the ability to determine the mean PCB concentration for each reach with a relative error no greater than 20 percent (NYSDEC, 2018)*	The 2017 sampling program was designed to allow for a comparison of data from a similar sampling program in five years (ie, in 2022) which would meet the statistical criteria which EPA had identified. EPA should explain, in this section of the FYR, why this was not done and instead a more limited sampling program was performed in 2022, necessitating an additional 5 years delay in gathering the data needed to achieve the statistical power EPA is seeking.
110	Appendix 2, Section 3.2.1	10, FN 12	*The ROD indicated the 0 to 12-inch depth as surface sediment. The 0 to 2-inch depth was selected for long-term monitoring since it will respond more rapidly to changes in PCB conditions in the river. A larger sample (box apparatus) could be collected from the 0 to 2-inch depth, providing a more consistent and representative sample collection at the same locations in each event compared to a 12-inch-deep core.*	We agree that the 0 to 2- inch depth is most useful for long-term monitoring of each river reach or section, but that does not preclude the need to sample the bioavailable surface zone, particularly in areas of RS 2 and RS 3 where known significant deposits of PCBs in the surface top 12 inches were left undredged. Additionally, PCB concentrations in the 0 to 2- inch samples collected from areas surrounding the dredged areas were likely diluted by the broadcast backfill. For example, in River Section 2, over 200 samples collected during Remedial Design (2002-2005) within 100 ft of dredge certification units had surface TRI+ PCB concentrations greater than 10 ppm, 80% of which were collected from the top 2 inches.

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111	Appendix 2 Section 4.2.1	21	*The observation that the increases in PCB concentrations in dredged areas occurred mainly in the upstream reaches aligns with the fact that these reaches also exhibited elevated PCB concentrations in non-dredged areas, as discussed in Section 4.1.3. This suggests that the increasing concentrations of PCBs in dredged areas over time may be due to the resuspension of sediments from non-dredged areas and their subsequent deposition in the dredged areas.*	This passage highlights the ongoing impacts of the remaining PCB contaminated sediments in the upper Hudson. EPA should take this observation into account in designing the sediment monitoring program needed to quantify the impacts of the remaining PCB contaminated sediments in the upper Hudson on the relatively uncontaminated dredged areas, and on the fish in the upper Hudson.
112	Appendix 2 Section 4.2.2	22	*The lack of a statistically significant reduction in sediment concentrations in RS 1 and RS 2 is expected, given that the number of samples was not designed to detect the small changes in concentrations over the five-year period.*	This passage is better phrased "The lack of the ability to discern a statistically significant reduction in sediment concentrations is due to the relatively small number of samples collected in 2021."
113	Appendix 3	Figures A3-24A and A3-24	*(Two figures displaying the average total PCB and lipid normalized average PCB concentration for the entire upper Hudson area)*	These figures present the data on first a total PCB basis, and then on a lipid normalized PCB basis. It is clear from these figures that the rate of decline to date in total PCB is not sufficient to meet project goals, and that if one takes into account the impact of decreasing lipid content on total PCB concentrations, there has been little to no decline during the MNR period after dredging.
114	Appendix 2 Section 4.2.2	22	At RS 3, because the expected change of 22 percent over the five-year period is larger than the smallest change that can be detected with the current data (18 percent), the sample size in RS 3 is adequate as of five years.	EPA states here that there are sufficient data in River Section 3 to quantify the rate of decline over five years. This rate of 18 percent over five years, or 3.6 percent per year, is half of the anticipated 7 to 9 percent per year in the ROD. EPA should include this comparison of recovery rates (observed vs. anticipated at the time of remedy selection) in this FYR.
115	Appendix 2 Section 4.2.3	23	*Overall, the largest reduction in sediment PCB concentrations from 2016/2017 to 2021 was measured in non-dredged areas in RS 3, particularly in Reach 5. As dredged areas only represent approximately 3 percent of the total area in RS 3 and 4 percent in Reach 5, the reduction in non-dredged areas led to an overall decrease in terms of RWA-weighted average concentration in RS 3 and Reach 5.*	This observation that the non-dredged areas (ie. areas of remaining PCB contaminated sediments) showed a decline in PCB concentrations should be followed up by comparsisons to fish PCB concentration in River Section 3. Is there a quantifiable relationship between fish and sediment PCB concentrations, and trends in concentrations, in River Section 3?

Comment #	Section	Page	Quote	Comment
116	Appendix 2 Section 5	27	*In non-dredged areas, sediment PCB concentrations appear to remain unchanged in RS 1 and RS 2, but decreased from 2016/2017 to 2021 in RS 3, mainly due to the decrease in Reach 5.*	There appears to be little improvement in surface (0 to 2 inch) sediment PCB concentrations in the upper Hudson since the end of dredging in River Sections 1 and 2, with an approximate 20 percent decline in River Section 3. EPA should explain in this FYR how there would be declines in fish PCB concentrations if there has been little recovery in surface sediment PCB concentrations.
117	Appendix 3, Executive Summary	ES-2	*It is important to note that the ecological targets themselves are based on the dietary intake of river otters, which typically consume fish between 4 and 7 inches in size (Erlinge 1968), rather than the larger fish collected for fillet analysis. Therefore, the 6 percent estimate has some uncertainty due to the potential differences in PCB levels between smaller and larger fish, as well as the lack of site-specific fillet to whole-body conversion factor. Recognizing this data gap, the EPA plans to collect whole-body data from smaller largemouth bass in future monitoring events.*	Alternatively, EPA could use existing yearling pumpkinseed data, which are approximately 4 inches in length, and evaluate the RAO now. Using the pumpkinseed data would not require an additional data collection and postpone the eco risk evaluation for an indefinite period.
118	Appendix 3, Executive Summary	ES-2-3	*While a comparison of the forage fish data as a whole to the ecological risk criteria is appropriate, in 2021 EPA modified the fish collection program to focus solely on spottail shiner. This will reduce uncertainty in time trends (e.g., avoids uncertainty introduced by combining different species) and a direct comparison to the ROD RAO can be made.*	Alternatively, EPA could use existing yearling pumpkinseed data and evaluate the RAO now. As EPA stated in the Revised Baseline Modeling Report "*Forage fish (pumpkinseed and spottail shiner) serve as primary prey base for the larger fish (that are piscivorous) and also other ecological receptors (such as mink and kingfisher, as examples)* ."
119	Appendix 3, Executive Summary	ES-3	*The geometric mean of lipid-normalized TPCBHE concentrations between the pre-dredging baseline (2004 to 2008) and post-dredging (2016 to 2021) periods has also decreased across all river section-species pairs, except for largemouth in RS 3.*	It is not surprising that PCB concentrations have decrased following remediation. However, this FYR should address the comparison of annual post-dredging concentrations to the post-dredging preducted values in the ROD and the evaluation of trends.

Comment #	Section	Page	Quote	Comment
120	Appendix 3, Executive Summary	ES-3	*The current six years of fish tissue data post-dredging are not sufficient to establish a trend in the post-dredging period. An evaluation of the pre-dredging data from RS 1 shows that at least eight or more years of data are needed to establish a trend with confidence. When using only six years of data (the current number of years of post-dredging data), time trend estimates exhibit substantial variability (as measured by deviation from the long-term time trend), with trend estimates falling well outside the 95-percent confidence limits of the long-term time trend.*	As EPA stated in the Revised Baseline Modeling Report: "PCBs accumulate primarily in fish lipid tissue, and it is appropriate to normalize fish body burdens to concentration on a lipd basis. This helps remove variability in concentrations due to variability in individual lipid content."
121	Appendix 3 Section 3.2.1	9	*Fish tissue TPCBHE concentrations are a function of exposure to sediment and water integrated through diet. Wet-weight concentrations provide one basis for evaluating changes in concentration through time and are the basis for estimating risk to human health and the environment as presented in the ROD. When evaluating changes in PCB in tissue, it is also important to compare changes in percent lipid over time. Wet-weight TPCB concentrations are often correlated with lipid content, therefore, declines in lipid content can confound the decline in wet-weight-based concentrations. That is, declines in wet-weight concentrations may be associated with declines in lipid, in addition to declines in exposure.*	It would be more accurate to complete this passage with "…independent of declines in exposure." rather than "…in addition to declines in exposure." This analysis should not presuppose declines in exposure. Evaluation of changes in concentration through time in the ROD were based on bioaccumulation models that used species-specific lipid concentration to estimate wet weight values. Focusing on the wet weight concentrations rather than the lipid-normalized or lipid-standardized values is likely to provide misleading results. From the Revised Baseline Modeling Report: "As described in Chapter 3, PCBs accumulate primarily in fish lipid tissue, and it is appropriate to normalize fish body burdens to concentration on a lipid basis. This helps remove variability in concentrations due to variability in individual lipid content."
122	Appendix 3 Section 3.2.1	10	*Pumpkinseed (collected as yearling fish),spottail shiner (collected when they are one to three years old), and other forage fish represent rapid integration of exposure to PCBs.*	Although the original intent of the sampling program was to sample yearling (age 1+) fish, pumpkinseed have been collected based on size (and not aged) .The monitoring typically does not age the pumpkinseed collected, but rather the samples are collected based on size, not age. However, EPA is correct in identifying pumpkinseed as forage fish which can be used in assessments of changes in the PCB content in the diet of pisciverous wildlife.

Comment #	Section	Page	Quote	Comment
123	Appendix 3 Section 4.1	18	*The TPCBHE wet-weight concentrations in smallmouth bass appear to have slight decline in the concentrations in RS 2 and less change in RS 1 since 2016*	EPA here describes the change in smallmouth bass PCB concentrations over time as "slight". This description is repeated in this section to also apply to the rates of decline in PCB concentrations in largemouth bass. For yellow perch, this section of the report states that there be little change in PCB concentrations during the period of monitored natural recovery after dredging. This corresponds well with the descriptions in Appendix 2 of the rates of decline in surface sediment concentrations. As EPA believes that there should be a corresponding relationship between sediment and fish PCB concentrations, these observations support a conclusion that the rates of decline in both media do not meet the expectations at the time of remedy selection of decline rates of approximately 7 to 9 percent.
124	Appendix 3 Section 4.1	19	*Pumpkinseed are used as rapid integrators in the UHR monitoring program. These fish are collected as yearling fish represent a single year of exposure, unlike the other species samples, which are primarily comprised of adult sportfish several years in age—therefore, they are anticipated to reflect current conditions in the river. The short exposure period of the pumpkinseed also makes them more susceptible to annual environmental changes such as impacts associated with high flow events, which may cause unexplained variations in PCB body burdens. Consistent with this, TPCBHE wet-weight and TPCBHE lipid-normalized data in the post-dredging period show more year-to-year fluctuation than the other species (Figure A3-8). In contrast, the lipid content show much less variation than the sport fish and little change through all three period of data. Because of high year-to-year variability in PCB concentration, it is difficult to observe any changes in with the data with a short-term dataset (Figure A3-8).*	The lack of declines in pumpkinseed concentrations during the current phase of the remedy corresponds well with the lack of recovery in other fish species, and with the lack of recovery noted by EPA in surface sediment concentrations. This observation further supports a conclusion that the rates of decline in both media do not meet the expectations at the time of remedy selection of decline rates of approximately 7 to 9 percent.
125	Appendix 3 Section 4.4	23	*In summary, a one-way ANOVA analysis was able to identify changes in TPCBHE between the pre-dredging and post-dredging periods independent of lipid variations. This analysis identified substantial (22 to 68 percent), statistically significant reductions across all river section-species pairs, except for largemouth bass at RS 3, compared to the pre-dredging baseline period.*	Here EPA is describing the reductions in fish PCB concentrations before and immediately after dredging. While informative concerning the immediate changes in fish PCB concentrations due to the dredging, this analysis does not provide any insight on the performance of the current phase of the remedy, monitored natural recovery. The rate of declines in fish PCB concentration during this phase of the remedy are likely not impacted by the magnitude of the changes due to the dredging. The rate of declines in fish PCB concentrations after dredging are likely controlled not by how much PCB was removed, but rather by how much PCB has been left behind after dredging.

Comment #	Section	Page	Quote	Comment
126	Appendix 3 Section 4.5	24	*Figures A3-16A to A3-19A show declining wet-weight species-weighted average TPCBHE concentrations within each river section since the end of the dredging period. From 2016 to 2021, the species-weighted average in RS 1 decreased from 1.3 mg/kg-ww to 0.71 mg/kg-ww. In RS 2, the species-weighted average decreased from 1.9 mg/kg-ww to 0.76 mg/kg□ww and in RS 3, the average decreased from 0.99 mg/kg-ww to 0.69 mg/kg-ww. The species□weighted average for the UHR has decreased from 1.1 mg/kg-ww in 2016 to 0.71 mg/kg-ww in 2021. Like the results obtained by the ANOVA analysis described previously, RS 1 and RS 2 show the largest declines since dredging*	The report here, in describing the PCB concentrations in fish after dredging, should contain here a comparison to the PCB concentrations after dredging anticipated at the time of remedy selection. The apparent declines in wet weight PCB concentration are much less than anticipated in the ROD. This section also highlights that the health based interim target of 0.4 parts per million, five years after the end of dredging, was not met and has not, as of the most recently available data, been met.
127	Appendix 3 Section 4.5	24	*Figures A3-16B to A3-19B show that declines in wet-weight TPCBHE are less apparent when normalized to lipid content, suggesting that variability in lipid is important in determining concentration changes over time.*	This passage highlights the importance of understanding trends in PCB concentration on a lipid normalized basis. There has been only modest declines in fish PCB concentration when changes in fish lipid content are taken into account, and due to the very low lipid concentrations in bass and bullhead in recent years, there is little reason to believe that the modest declines in fish PCB concentration, driven by decreases in fish lipid content, will continue as there is little room for further declines in lipid content.
128	Appendix 3 Section 4.6	25	*As discussed in Section 3.2.3, the data from the pre-dredging period was used to examine the ability to accurately estimate long-term rates of change when relatively limited periods of data (six years or less) are available. Figure A3-20 presents the results of the moving window analysis described in Section 3.2.3. For brown bullhead, largemouth bass, yellow perch, and pumpkinseed in RS 1, for a given consecutive six-year grouping of pre-dredging data (six years is the current number of years of post-dredging data), the estimated time trend can vary approximately ± 50 percent of the long-term time trend (based on the years 1998 to 2008).*	Estimating long-term rates of change in fish PCB concentrations due to monitored natural recovery during the period 1998 to 2008 using the available data is problematic, as there were significant ongoing remedial measures ongoing at the two GE plant sites upstream of the project area. Changes in fish PCB concentrations over time during this period should not be attributed to natural recovery, but rather to multiple factors including changes in exposure conditions.

Comment #	Section	Page	Quote	Comment
129	Appendix 3, Section 5	27	*The species-weighted average characterizes an "average fish" consumed by an "average angler" for risk characterization.*	Do fish collected in spring, when lipid content is likely to be at a low point in the annual cycle, represent an "average" fish? Do anglers catch fish from multiple reaches? It would be most appropriate to estimate risk to anglers on a reach-specific basis before combining into the upper Hudson species-weighted average.
130	Appendix 3, Section 5	28	*Statistical analysis indicates the current six years of fish tissue data are insufficient to establish the long-term trends in the data. Using 11 consecutive years of pre-dredging data from RS 1 it was determined that reliable estimates of the long-term trends in PCB concentration can be obtained when at least eight or more years of data are available. When using only six years of data (the current number of years of post-dredging data), time trend estimates exhibit substantial variability (as measured by deviation from the long-term time trend), with trend estimates falling well outside the 95-percent confidence limits of the long-term time trend. This analysis indicates that to determine a meaningful time trend in fish tissue PCB concentrations, at least eight or more years of fish tissue data are needed. The results of this analysis are consistent with results from the Second Five-Year Review Comment Response (EPA 2019b) using pre-dredging fish tissue data.*	The pre-dredging fish tissue data (and the data used in the bioaccumulation modeling to project fish concentrations post-remedy implementation) had higher lipid concentrations.
131	Appendix 3 Section 5	28	*The preliminary fish data from 2022 have been included in Figures A3-21 through A3-24. This data does not change the conclusions of this report and indicates a continued decline in fish concentrations. The 2022 fish data will be finalized as part of the project data treatment approach (Attachment A), once the 2023 congener matched pairs are evaluated and incorporated.*	EPA should not here make conclusions that preliminary 2022 fish data indicate a "continued decline" in concentrations, while at the same time stating in this FYR that there is not sufficient data to quantify trends.

Comment #	Section	Page	Quote	Comment
132	Appendix 3	Figures A2-21B, A2-22B and A2-23B	*(Three figures displaying the lipid-normalized species weighted average by River Section)*	These three figures summarize the current performance of the monitored natural recovery phase of the remedy. In each River Section, there is very low recovery; the graphs display little recovery in the species weighted average metric used by EPA in the entire upper Hudson, even when the 2022 data are added to the graphs.
133	Appendix 5 Section 2.1	2	*When the Remnant Deposit remedy was selected in 1984, guidance on risk assessment was in its early development at EPA. As a result, a risk assessment was not conducted, and a total polychlorinated biphenyl (PCB) concentration of 5 milligrams per kilogram (mg/kg) was used to determine areas to be addressed and cleaned up. The remediation of the Remnant Deposits involved capping concentrations greater than 5 mg/kg with a buffer zone extending at least 5 feet beyond the 5 mg/kg concentration boundary. The cap system consists of a soil cover, a geosynthetic clay liner, and a topsoil and vegetative layer. Ongoing inspections and maintenance are necessary/required into perpetuity.*	In this Appendix, the health risks associated with the site are evaluated. For OU1, this section of Appendix 5 describes how no risk assessment was done for the Remnant Sites. EPA should perform a risk assessment, including gathering any needed data to perform the assessment, in order to determine if the OU1 remedial work is protective of human health and the environment.
134	Appendix 5 Section 2.2	3	*Fish ingestion is the primary route of exposure to PCBs in the UHR. Key assessment inputs are the fish ingestion rate and the duration of exposure. The 1991 New York Angler survey (Connelly et al., 1992) was selected as the primary source of information for the deterministic and Monte Carlo assessments for analysis of the fish ingestion pathways.*	The risk assessments performed by EPA for the OU2 remedy selection was based, in part, on an angler survey conducted 33 years ago. EPA should direct that an updated angler survey be performed to support evaluations of remaining human health risk at this site. This updated angler survey would also provide information to help inform the only remaining control on risks at this site, the fish consumption advisories managed by NYSDOH. In order to optimize the advisory program, an updated understanding of who is eating which species of fish from what locations at the site is needed.

Comment #	Section	Page	Quote	Comment
135	Appendix 5 Section 2.2	3	*The exposure point concentration (EPC) for fish was based on an average concentration of what a typical angler is expected to commonly catch and consume throughout the UHR over the exposure period. To calculate this value, a species-weighted average concentration was developed based on modeling results for bass, bullhead, and perch across all three river sections, accounting for how frequently these fish are expected to be caught and the length of each river section.*	In order to understand the risks posed by fish consumption, an element of understanding the protectiveness of the remedy, the assumptions related to consumption used in the risk assessment during remedy selection should be verified through an updated angler survey, to determine if these assumptions on which fish are being eaten, from which portion of the site, are still valid. The risk assessment used survey data from 1991; the consumption rates, and which portions of the site are being fished for consumption may have changed, as the perception of the health of the river may have changed after completion of the dredging work in 2015.
136	Appendix 5 Section 2.2	4	*The Revised HHRA used toxicological information from two sources: EPA's Integrated Risk Information System (IRIS) for PCB mixtures (EPA, 1999b) and values published by the World Health Organization (WHO) for the dioxin-like PCBs available in 1998. The 1998 WHO/International Program on Chemical Safety (IPCS) Toxicity Equivalency Factors (TEFs) were used to calculate cancer risks for dioxin-like PCBs and results were discussed in the risk characterization (Van den Berg et al., 1998). Additional details related to TEFs are provided below.*	EPA should complete the process for updating the IRIS database. The protectiveness determination in this FYR should not solely rely on 25 year old toxicological information, when there has been substantial progress on the understanding of PCB toxicity over that time.
137	Appendix 5 Section 2.2	5	*The RME is defined as the highest exposure that could reasonably be expected to occur for a given exposure pathway at a Site and is intended to account for both uncertainties in the contaminant concentration and variability in exposure parameters (e.g., exposure frequency and exposure duration). The estimate of increased risk to the RME individual developing cancer averaged over a lifetime (childhood through adulthood over 40 years), based on the exposure assumptions in the Revised HHRA, was 1 x 10-3, or one in 1,000. The total cancer risk of 1 x 10-3 is composed of risks to the adult (6 x 10-4 or six in 10,000), to the adolescent (4 x 10-4 or four in 10,000), and to the young child (4 x 10-4 or four in 10,000). The cancer risks to the RME individual exceed the risk range established under the National Contingency Plan (NCP) of 1 x 10-6 to 1 x 10-4 (one in 1,000,000 to one in 10,000; EPA, 1991).*	Appendix 5 states here that, at the time of remedy selection, the cancer risk associated with the site for reasonably maximum exposed individuals is one in ten thousand, an order of magnitude over the acceptable risk range. EPA should state in the FYR what the current health risks are for this site, as remaining risks are a key element to be evaluated in determining remedy performance in an FYR.

Comment #	Section	Page	Quote	Comment
138	Appendix 5 Section 2.2	6	*EPA's evaluation of non-cancer health effects in the Revised HHRA (EPA, 2000b) involved comparing the average daily exposure levels (dose) to determine whether the estimated exposures exceed the RfD used to evaluate non-cancer health effects. The ratio of the Site-specific calculated dose to the RfD for each exposure pathway and receptor age group was summed to calculate the Hazard Index (HI) for the exposed individual. HI of 1 is the reference level established by EPA above which concerns relating to non-cancer health effects are further evaluated. Ingestion of fish resulted in the highest HI values. The RME HI was 104, 71, and 65, for the young child, adolescent, and adult, respectively.*	Appendix 5 states here that, at the time of remedy selection, the non-cancer health effects associated with the site were between 65 and 104 times the reference level established by EPA. EPA should state in the FYR what the current health risks are for this site, as remaining risks are a key element to be evaluated in determining remedy performance in an FYR.
139	Appendix 5 Section 2.3.1	8	*There have been no changes in the physical condition of the Site since the second FYR that would change exposure or toxicity assumptions for the Site. The cleanup goal for the Hudson River of 0.05 mg/kg in edible fish tissue that was developed as the RAO for the Site (as described in the prior section) remains protective of human health since there have been no significant changes to the toxicity and exposure assumptions used in the original risk assessment, as described further below. Monitoring of PCB concentrations in fish continues and catch and release fishing restrictions are in place for the UHR to reduce human exposure to fish tissue until the cleanup goal for fish tissue is achieved. It is illegal to possess a fish from the UHR area.*	This section of Appendix 5, (Ongoing Validity of the RAOs and Cleanup Levels for OU1 and OU2) describes how there has been no physical changes that would change exposure or toxicity assumptions, and no changes to the assumptions in the risk assessment, to conclude that the cleanup levels are still valid. However, the cleanup numbers were developed on the basis of how much PCB would be removed, and how much was to be left behind, would be needed to achieve the anticipated reductions in fish PCB concentrations. If the assumptions built into the model used to make these estimates are incorrrect, then the actual performance of the remedy would vary from anticipated. This may be the case for this site; assumptions in the model on the performance of the remedy during monitored natural recovery may have been incorrect. Given the current disparity between the anticipated performance of monitored natural recovery (an average of 7 to 9 percent annual recovery in fish PCB concentrations) and the observed recovery to date lagging well behind that rate, the assumptions made during remedy selection resulting in the ROD cleanup levels need to be re-evaluated. EPA should gather such data as are needed to determine if the assumptions made between the remaining contaminated sediments and recovery in fish PCB concentrations are still valid and if not evaluate what additional remedial measures, if any, may be appropriate.

Comment #	Section	Page	Quote	Comment
140	Appendix 8 Section 1	4	*(Table in center of page)*	This table displays the current guidelines reportedly used by DOH in setting fish consumption advisories for fish containing PCBs. The information in this table appears to contradict the actual fish consumption advisories depicted later in Appendix 8. EPA should remove reference to this guidance from the FYR, as the public may misinterpret the information and conclude that consumption of fish from the upper Hudson is safe. This is particularly important for sensitive populations, including women of child bearing age and children. Until any disparities between this table and the fish consumption advisories can be resolved, there is no reason for this table to be included in the report and the actual advisories should be highlighted.
141	Appendix 8 Section 1	4	*A quantitative health risk assessment, based on toxicity values (e.g., from the EPA Integrated Risk Information System [IRIS] toxicity database) and representative fish consumption rates, is used to evaluate risks.*	This passage, describing how NYSDOH relies on the IRIS database for evaluating risks and setting fish consumption advisories, highlights the pressing need for EPA to update the IRIS database to take into account updated toxicity information which became available since the last IRIS update many years ago.
142	Appendix 8 Section 1	5	*In terms of fish consumption, EPA has established two fish targets in the ROD to guide its consideration of fish consumption. The target concentrations are 0.2 mg/kg – ppm PCBs in fish fillet, which is protective at a fish consumption rate of one half-pound meal per month, and 0.4 mg/kg - ppm PCBs in fish fillet, which is protective of the average angler, who consumes one half□pound meal every two months. EPA noted in the ROD that attaining such levels might facilitate the relaxation of the fish consumption advisories by NYSDOH and fishing restrictions by NYSDEC (EPA, 2002).*	This passage clearly depicts the fish targets in the ROD (0.4 parts per million five years after dredging, and 0.2 parts per million sixteen years after dredging) are health based targets. EPA should include in this section a description of how the first target has not yet been met, to make the point to the public that no one should not consume fish from the upper Hudson.
143	Appendix 9	1	*General Electric Company's (GE's) Hudson Falls and Fort Edward facilities discharge an estimated 1.3 million pounds of polychlorinated biphenyls (PCBs) into the Hudson River*	EPA should cite the original reference for the stated estimate of the PCB mass discharged to the Hudson by GE from the plant sites in Hudson Falls and Fort Edward. This often cited number of 1.3 million pounds appears without reference; the actual mass of PCB released to the Hudson by GE may be much larger.

Comment #	Section	Page	Quote	Comment
144	Appendix 9	2	*Tunnel Drain Collection System (TDCS) at plant sites completed under NYSDEC oversight*	This statement is only partially correct; the TDCS was constructed at the GE Hudson Falls plant site, and not at the GE Fort Edward Plant Site. EPA should coordinate with NYSDEC to include in this appendix the list of significant Interim Remedial Measures, and final remedial actions, implemented at the two GE plant sites. This inclusion would give the public a fuller sense of how exposure conditions in the river changed over time as a result of the remedial work done to control sources at the plant sites starting in the late 1980s.

Attachment 3

The Friends of a Clean Hudson: An Independent Review of EPA's Upper Hudson River PCB Dredging Remedy

November 2023

THE FRIENDS OF A CLEAN HUDSON:

AN INDEPENDENT REVIEW OF EPA'S UPPER HUDSON RIVER PCB DREDGING REMEDY

Hudson River PCBs Superfund Site
Operable Unit 2 (Upper Hudson)

Prepared By:
The Friends of a Clean Hudson
Hudson Fishermen's Association, Hudson River Sloop Clearwater,
Hudson Riverkeeper, Scenic Hudson,
Sierra Club-Atlantic Chapter

November 2023

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EXECUTIVE SUMMARY

Beginning in 1947 and continuing for decades, General Electric ("GE") dumped its toxic PCB waste into the Hudson River. PCBs are known carcinogens that have also been linked to neurological damage, asthma, and diabetes. **One of the original "forever chemicals" (persistent organic pollutants), PCBs do not readily break down once in the environment and are able to easily cycle between air, water, and soil.**

GE's waste turned the Hudson – home to diverse fish and other wildlife species, world-class views, treasured parks, and fertile farmland – into the largest Superfund site in the nation. Today, eight years after GE completed a targeted cleanup of hotspots in a 40-mile stretch of the Upper Hudson, and 40 years after the Hudson River was identified as a Superfund site, the risk-reduction dredging remedy chosen by the U.S. Environmental Protection Agency ("EPA") to protect human health and the environment is not achieving the goals set by the agency in its 2002 Record of Decision ("ROD"), the legal agreement between the EPA and GE governing the cleanup action. **This will, in effect, continue an environmental injustice legacy on the most vulnerable populations living along the shores of the river – subsistence fishermen from communities of color and impoverished families who rely on the river for food**.

As part of its upcoming third Five-Year Review ("FYR") of the cleanup action, EPA must determine whether the dredging remedy is proving to be protective of human health and the environment. In anticipation of this decision, the Friends of a Clean Hudson ("FOCH") worked with technical experts to conduct an independent analysis of the remedy's protectiveness. The conclusion: The dredging remedy has missed key targets deemed necessary to protect human and ecological health, as such **EPA must acknowledge the cleanup is "Not Protective of Human Health and the Environment."**

This analysis of publicly available project data shows that PCB concentrations in Upper Hudson sediment and fish **are much higher than EPA predicted in the selection of remedial alternatives in the 2002 ROD. Neither fish nor sediment are recovering at the rates needed to achieve key goals laid out in the 2002 ROD.**

Specifically:

- Human health and ecological risk are still well above EPA's "acceptable risk range" and will remain so for the foreseeable future;
- Fish consumption advisories are not effective at protecting human health and place the burden on the public to avoid contaminated fish. In addition, such advisories do nothing for the ecological receptors that depend on the Hudson's ecosystem;
- Fish data show minimal reduction of PCB contamination in most species at most locations;
- The first preliminary remediation target, to achieve average concentrations of 0.4 mg/kg of PCB in fish within five years after the completion of dredging (i.e., by 2020), was not met;

- Sediment data show little recovery in the uppermost layer of sediment; and
- Post-dredging sediment recovery rates to date are likely not sufficient to allow the ongoing slow natural recovery in fish to reach the second preliminary remediation target of 0.2 mg/kg of PCB in fish within 16 years after the completion of dredging (i.e., by 2031).

Under the Superfund law, EPA is charged with protecting people and the natural environment from toxic pollution at our country's most contaminated sites. At Superfund sites like the Hudson River, where EPA identifies pollution that "may present an imminent and substantial danger to the public health and welfare," **the agency must select an appropriate remedy that will "attain a degree of cleanup [that] . . . at a minimum assures protection of human health and the environment." 42 U.S.C. § 9621(d)(1**).

To date, EPA has performed two FYRs to determine whether the remedy is "protective of human health and the environment." In both reviews, EPA essentially ignored the warning signs the data trends were showing. Even as GE was completing its six-year dredging project in 2015, analysis of project data warned that a significant amount of contaminated sediment would remain in the Hudson River at levels that likely would not allow for "unlimited use and unrestricted exposure after cleanup." **At this point, the data are clear: The remedy is "not protective of human health and the environment."**

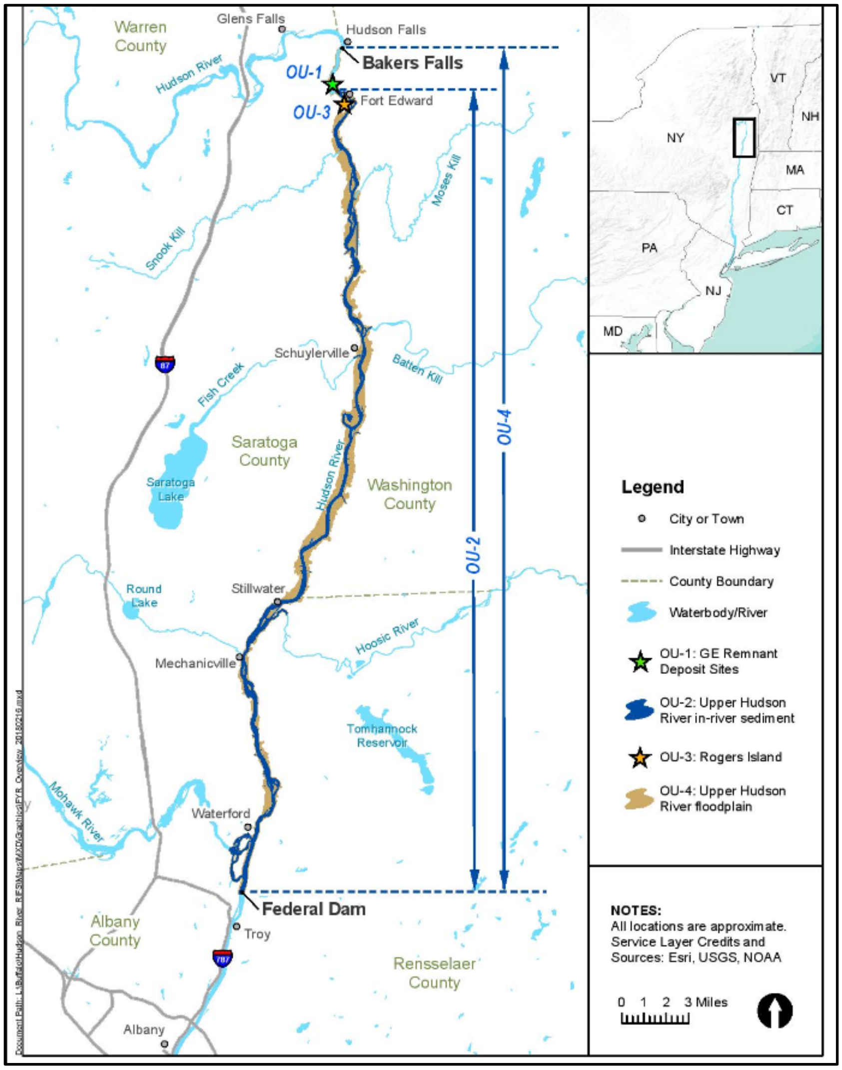
The FiveYear Review process allows and encourages EPA to address potential problems with remedies as they become apparent, but unless and until EPA acknowledges the failure of the remedy to meet the goals and objectives in the expected timeframes, the opportunities to "fix" the remedy and take additional steps to address PCB contamination in the Hudson River will be lost. For low-income families and disadvantaged communities who subsist on the river's tainted fish, **the continued delay by EPA has essentially placed the burden of "protection of human health" squarely on the people themselves – essentially turning the Hudson Superfund Site into a "risk-avoidance" remedy that is neither acceptable nor just.**

The complex nature of PCBs ensures GE's toxic waste will continue to travel throughout the Hudson River ecosystem, resisting degradation, biomagnifying in food chains, and bioaccumulating in human and animal tissue. Stalled waterfront economic development planning, warnings against fish consumption, and ongoing damage to the unique ecosystem of the Hudson River are just a few of the limitations PCB pollution has forced on people living along the river for decades. Without additional actions, **the health risks and generational impacts of living, working, and playing within a heavily polluted Superfund site along a nearly 200-mile stretch of the Hudson River will exist for the foreseeable future.**

Hudson River PCBs Superfund Site Maps

Map 1

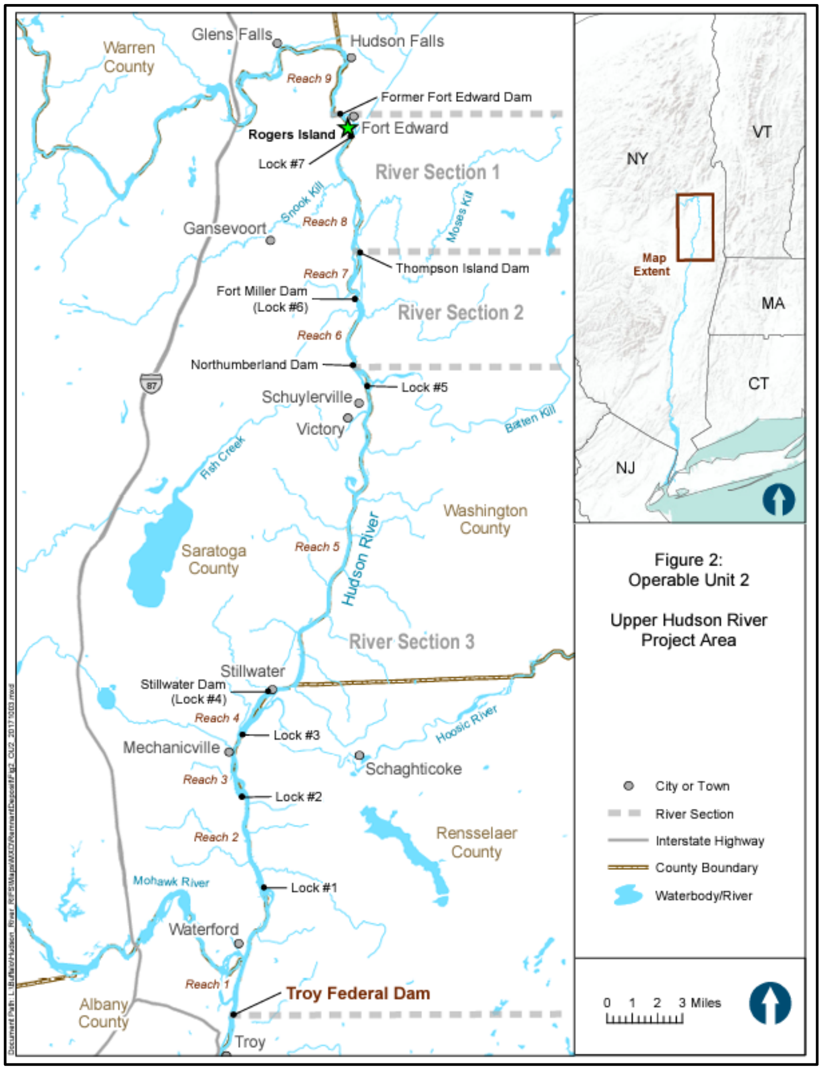
Operable Units of the Hudson River PCBs Superfund Site



Note: The U.S. Environmental Protection Agency is addressing the Site in discrete phases or components known as operable units (OUs). The 1984 Record of Decision for the first OU (OU1) addresses areas, known as the Remnant Deposits, and in addition called for a treatability study of the Waterford Water Works to determine whether upgrades or alterations of that facility were needed. The 2002 ROD for the second OU (OU2) selected dredging to address PCB-contaminated sediments of the Upper Hudson River, as well as monitored natural attenuation (MNA) of PCB contamination that remains in the river after dredging. OU3 is a removal action taken on Rogers Island by EPA in 1999 to address soil contamination with PCBs and metals. OU4 pertains to the Upper Hudson River floodplain areas, currently the subject of an ongoing remedial investigation. In 2022, the Lower Hudson River, including the portion of the Hudson River from the Federal Dam at Troy to the Battery in New York City, was designated as OU5. **This report focuses only on OU2.**

Map 2

River Sections of the Upper Hudson River PCBs Superfund Site



Note: EPA divided the Upper Hudson River area into three main sections known as River Section 1, River Section 2, and River Section 3. River Section 1 consists of the Thompson Island (TI) Pool. This river section extends about 6.3 miles from the former Fort Edward Dam to the TI Dam. The area between the former Fort Edward Dam and the northern end of Rogers Island, a distance of about 0.2 miles, contains minimal PCB contamination and was not considered for remediation under this decision document. River Section 2 extends from the TI Dam to the Northumberland Dam near Schuylerville, an extent of 5.1 river miles. River Section 3 extends from below the Northumberland Dam to the Federal Dam at Troy, an extent of 29.5 river miles.

The Friends of a Clean Hudson:

An Independent Review of EPA's Upper Hudson River PCB Dredging Remedy

November 2023

SECTION 1

Abstract

The Hudson River PCBs Superfund Site (the "Site") includes a nearly 200-mile stretch of the Hudson River from the Village of Hudson Falls, NY, to the Battery in New York City. In 2002, the U.S. Environmental Protection Agency ("EPA") issued a Record of Decision ("ROD") to address the ongoing environmental and human health risks posed by the discharge of millions of pounds of polychlorinated biphenyls ("PCBs") by General Electric ("GE") from its capacitor production facilities in Hudson Falls and Fort Edward, NY (referred to herein as the "2002 ROD"). The remedy selected in the 2002 ROD called for dredging to remove PCB-contaminated in-place sediments of the Upper Hudson River[1] and Monitored Natural Attenuation ("MNA")[2] of PCB contamination remaining in the river after dredging. The selected remedy was designed to reduce the dangerous health risks to humans and ecological receptors[3] living in and near the Upper and Lower Hudson River.[4] Dredging was conducted in two phases[5] and completed in 2015. GE was given a certificate of completion for the active portion of the remedial action in 2019. However, significantly more PCBs remain in the river sediment post-dredging than were originally estimated and EPA is now relying solely on monitored natural recovery to achieve the remedial goals set forth in the ROD and institutional controls, i.e., fish consumption advisories to protect human health.

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[1] The Upper Hudson River is an approximately 40-mile stretch of the Hudson River between Fort Edward and the Federal Dam at Troy.
[2] Monitored Natural Attenuation is a risk-reduction strategy that relies solely on naturally occurring processes to contain, destroy, or reduce the availability or toxicity of contaminants in the environment to living organisms. EPA now describes Monitored Natural Attenuation as "Monitored Natural Recovery."
[3] The term "ecological receptors" refers to river-dependent wildlife (including endangered and threatened species).
[4] The Lower Hudson River is an approximately 150-mile stretch of the Hudson River between the Federal Dam at Troy and the Battery in New York City.
[5] Phase 1 dredging occurred in 2009 and Phase 2 dredging took place from 2011-2015.

SECTION 2

Introduction

In April 2022, EPA announced it would begin its third Five-Year Review ("FYR")[6] of the Hudson River PCB Superfund Site. As required by the federal Superfund law, EPA must conduct these periodic studies at hazardous waste sites where cleanups do not remove all contaminants from the site. The purpose of the study is to ***determine whether the remedy selected in the 2002 Record of Decision ("ROD") is achieving the agency's goals for the cleanup,*** specifically whether the remedial action ***is protective*** of human health and the environment. This decision made by the EPA will deeply impact the health – as well as the economic and environmental future – of hundreds of communities and millions of people who live, work, and play along the banks of this long-contaminated river for generations to come.

As members of the Hudson River PCBs Superfund Site Community Advisory Group[7] and the Friends of a Clean Hudson ("FOCH") coalition, we appreciate that EPA has long-recognized the value offered by stakeholder groups understanding and participating in Superfund processes, and how significant public involvement contributes to the overall success of the Superfund program. Utilizing the most recent, publicly available project data and best available scientific methods, we offer the following critical observations and recommendations to EPA Region 2 Project Staff in advance of EPA's release of the third FYR.

SECTION 3

Five-Year Review Summary Statement

Federal Superfund law requires EPA to conduct a study every five years for hazardous waste cleanups that do not completely remove all contaminants from the site. The purpose of the study is to ***determine whether the remedy is achieving the agency's goals for the cleanup,*** specifically whether the cleanup is protective of human health and the environment. The EPA must answer three fundamental questions in a FYR:

Question A: Is the remedy functioning as intended by the decision document?

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

In this document, the FOCH coalition set out to answer these three questions in advance of EPA's draft third FYR. FOCH utilized the expertise of independent scientists to analyze publicly available data from ongoing EPA and GE monitoring programs and, wherever possible, the

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[6] The first FYR was completed in 2012. The second FYR was released for public comment in 2017 and finalized in 2019.

[7] https://hudsoncag.wspis.com/

format and logic of the established EPA FYR process for consistency. Based on a review of the data we have determined the following:

Question A: The data available since 2015 (last year of dredging) for Upper Hudson sediment and fish illustrate that PCB concentrations do not appear to be recovering at the rates needed to achieve the remedial goals set in the 2002 ROD. The first goal was to achieve average concentrations of 0.4 mg/kg of PCB in fish fillet within five years after the completion of dredging. That goal was not and has not yet been met. In addition, the surface sediment PCB concentrations, as measured by sediment sampling in 2016/17 and again in 2022, appears to be little changed since dredging was completed.

Question B: The exposure assumptions in the 2002 ROD are inaccurate. The site risks may be understated, and the reliance upon fish consumption advisories is not an effective control on human health risks. EPA should update its understanding of the relationship between sediment and fish PCB concentrations to determine how much further active remediation is required to meet the risk reduction targets in the time frames needed to achieve the objectives of the ROD.

Question C: The data available since the 2002 ROD was issued, and since the dredging remedy was implemented, indicate that a significant mass of bioavailable PCBs has been left behind in the surface sediments of the Upper Hudson River. The data also indicate that the sediment and fish concentrations post-dredging are much higher than anticipated and rapid decline in sediment PCB concentrations is not occurring, as a result a corresponding rapid decline in fish PCB concentrations is also not occurring. In addition, the annual average and cumulative PCB load post-dredging is higher than was expected in the 2002 ROD.

In conclusion, the data available support the finding that the selected remedy is not protective of human health and the environment. The human health and ecological risks are well in excess of EPA's acceptable risk ranges, and (based on current trends in fish and sediment PCB levels) will not be in the acceptable range for the foreseeable future.

SECTION 4

Technical Assessment

An FYR is conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1990, as amended ("CERCLA"), 42 U.S.C. 9621(c), and 40 C.F.R. 300.430(f)(4)(ii) and undertaken in accordance with EPA's Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P (June 2001). The triggering action for this third FYR is EPA's April 11, 2019 signature of the second FYR. The purpose of the third FYR is to evaluate the implementation and performance of a remedy to determine if the remedy is or will be protective of human health and the environment. When determining the protectiveness of the remedy, EPA must consider the following questions:

> **Question A:** Is the remedy functioning as intended by the decision document?
>
> **Question B:** Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?
>
> **Question C:** Has any other information come to light that could call into question the protectiveness of the remedy?

EPA issued the 2002 ROD to address the ongoing environmental and human health risks posed by the discharge of millions of pounds of PCBs from GE's capacitor production facilities in Hudson Falls and Fort Edward, NY. The remedy selected in the 2002 ROD called for dredging to remove PCB contamination in-place sediments of the Upper Hudson River, and Monitored Natural Attenuation ("MNA") of PCB contamination remaining in the river after dredging. The selected remedy also assumes separate source control action near the GE Hudson Falls plant and Fort Edward facilities, which are under NYSDEC jurisdiction.

In connection with the 2002 ROD, EPA developed five remedial action objectives ("RAOs") for protection of human health and the environment:

1. Reduce the cancer risks and non-cancer health hazards for people eating fish from the Hudson River by reducing the concentration of PCBs in fish. The risk-based preliminary remediation goal for the protection of human health is 0.05 mg/kg PCBs in fish fillet based on non-cancer hazard indices for the RME adult fish consumption rate of one half-pound meal per week (this level is protective of cancer risks as well). Other target concentrations are 0.2 mg/kg PCBs in fish fillet to be attained within 16 years of completion of dredging, which is protective at a fish consumption rate of one half-pound meal per month, and 0.4 mg/kg PCBs in fish fillet within five years after dredging, which is protective at a rate of one half-pound meal every two months.

2. Reduce the risks to ecological receptors by reducing the concentration of PCBs in fish. EPA identified two preliminary remediation goals for fish PCB concentrations to protect fish-eating wildlife, ranging from 0.07 to 0.3 mg/kg. It should be noted that these numbers are based on whole body PCB concentrations, which are much higher than fillet concentrations.

3. Reduce PCB levels in sediments in order to reduce PCB concentrations in river (surface) water.

4. Reduce the inventory (mass) of PCBs in sediments that are or may be bioavailable.

5. Minimize the long-term downstream transport of PCBs in the river.

The length of time needed to achieve the preliminary remediation goals and RAOs set forth in the 2002 ROD was an important factor considered by EPA in comparing remedial alternatives. EPA's models estimated that it would take decades longer to reach the 0.2 mg/kg and 0.4 mg/kg PCB target levels under either the No Action alternative or the MNA-only alternative (involving no dredging). As a result, EPA concluded that active remediation was necessary to protect human health and the environment. EPA believed that implementation of the selected active remedy would greatly reduce the mass of PCBs in river sediments and lower the average PCB concentration in surface sediments to in turn reduce PCB levels in the water column, fish, and other biota, and thereby rapidly reducing the level of risk to human and ecological receptors.

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Question A: Is the remedy functioning as intended by the decision documents?

At this time, the human health and ecological remedial goals set forth in the 2002 ROD have not been achieved. The post-dredging data indicate that the remedy is inconsistent with modeling analysis and expectations presented in the ROD. The following summarizes the status of the remedy:

- MNA is not occurring as modeled. (*See* Figures 1-6.)

- NYSDEC and NYSDOH maintain fishing restrictions and advisories against consumption of Hudson River fish for the entire 200 mile stretch of the river from Hudson Falls to the Battery in New York City. Altogether, the "don't eat" advisory applicable to all species in the Upper Hudson River has been in place for nearly 40 years.[8] Although there are fish consumption advisories in place and warning signs posted along the river, fishing has been observed and fish are being consumed. In addition, these advisories do not work on ecological receptors, which are still exposed to unacceptable risks posed by PCB contamination in fish, sediments, and surface water.

- EPA chose an active remedy under which significant amounts of PCBs would be removed from the sediments of the Upper Hudson by sediment dredging. EPA selected this remedy primarily based upon the time it would take to achieve targeted fish PCB concentrations after dredging. This was necessary, according to EPA, to protect the human and ecological receptors exposed to PCBs by eating fish. EPA understood advisories for people to stop eating fish were not completely effective, and could never apply to ecological receptors, and thus the remedy selection needed to be based primarily upon the time to meet the targeted reductions in fish PCB concentrations. Specifically,

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[8] The NYSDOH advises women of childbearing age and children under 15 to not eat fish from the Hudson River south of the Corinth Dam. The NYSDOH also recommends that no individual eat any fish caught between the Corinth Dam and the Federal Dam in Troy. Further advisories exist for specific locations and species.

EPA stated in the 2002 ROD that a delay of ten years in reaching target fish concentrations, of 0.4 mg/kg and 0.2 mg/kg, was unacceptable. Based on the data, we can predict that it will take significantly more than ten additional years to achieve the preliminary remediation goals set forth in the 2002 ROD.

- EPA reported and is counting on an 8% per year decline in fish tissue, but actual data show higher than expected post-dredging PCB sediment concentrations and consistently lower recovery rates. The risks to human health and the environment remain well above EPA's acceptable risk range. In fact, the risks remain well above EPA's acceptable risk ranges as they were before dredging started in 2009. (*See* Figures 3-4.)

- The EPA "acceptable risk range" for human health used in the Federal Superfund program has two criteria: excess cancer risk, and the non-cancer health effect metric of "hazard index." In the 2002 ROD, EPA states that the acceptable cancer risk range is between 1 in 10,000 and one in 1,000,000. At the time the 2002 ROD was issued, the cancer risk from PCB exposure in the Upper Hudson was stated as 1 in 1,000 for the "reasonable maximum" exposed people. Also stated in the 2002 ROD was EPA's estimate of Hazard Index. The 2002 ROD stated that the Hazard Index for non-cancer health effects was between 7 and 12 for an average exposure, while the reasonable maximum exposure resulted in a hazard index between 65 and 104. These two metrics describing the health risk associated with PCB exposure in the Upper Hudson are well above the EPA acceptable risk range. Even taking into account reductions in fish PCB concentrations since the 2002 ROD was issued (approximately a threefold decrease), the risks posed by PCB exposure in the Upper Hudson are still well above the acceptable range, for both cancer and non-cancer health effects.

- Current and future concentrations of PCBs in the sediment in the Upper Hudson River are expected to limit the ability to achieve the targets for PCBs in fish. (*See* Figure 6.)

- The magnitude and extent of PCB contamination in the surface top two inches post-dredging is much greater than assumed in the 2002 ROD. While GE removed more sediment than was initially targeted in the ROD, less than 76% of total PCB mass was actually removed.[9]

- The average surface sediment (top two inches) PCB concentrations after dredging are two to three times higher than anticipated in the 2002 ROD. Such concentrations are more consistent with the model predictions for the MNA (no dredging) alternative for River Sections 2 and 3. (*See* Figures 3-4).

- Sampling design de-emphasized cohesive (fine-grained) sediment areas in River Sections 2 and 3, which were identified as the most important primary source of PCBs to the food web and were shown to have the highest surface concentrations in areas surrounding the dredged areas.

[9] Final Second Five-Year Review Report for the Hudson River PCBs Superfund Site, April 11, 2019, p. 5 ("EPA estimates that approximately 76 percent of the overall PCB mass from the Upper Hudson River was removed by the dredging.")

- The rapid reduction in sediment concentrations did not occur, and the expected rate of natural recovery is not occurring either. (*See* Figures 1-2.)

- The selected remedy for the Hudson River PCBs Superfund Site requires the comparison of Tri+ PCB concentrations in the top 12 inches of sediment[10] (surface concentration). However, EPA is only sampling the top two inches of sediment. Such sampling substantially underestimates the amount of bioavailable PCBs, which affects EPA's ability to understand how PCB concentrations in sediment are continuing to impact PCB concentrations in fish, re-contaminating dredged areas, and contributing to loading in the Lower Hudson River.

- EPA established sediment cleanup levels to guide the sediment removal process. These cleanup levels were based upon: (a) EPA's understanding of sediment-based sources of PCBs to fish and water, (b) EPA's understanding of how PCBs moved from sediment to water and to fish, (c) computer modeling efforts that quantified how PCBs moved through the system, and (d) how various remedial alternatives (i.e., different sediment cleanup levels) would impact the trends in fish and water PCB concentrations. The data show that PCB levels in sediment and fish are higher than EPA models expected and are not decreasing at the expected rate. This is an area where further study is needed to determine if further sediment remediation is required to meet the ROD goals.

- In the 2002 ROD, EPA set different cleanup levels in sediment, depending on where the dredging was to be done. In the first six miles from Fort Edward to the Thompson Island Dam, the cleanup levels established were a concentration of ten milligrams per kilogram (mg/kg, or part per million) of Tri-Plus PCBs[11] in the surface top 12 inches and a mass per unit area of three grams of PCB per square meter (g/m^2) of river bottom. For the remaining portion of the Upper Hudson from the Thompson Island Dam downstream to the Federal Dam at Troy, the cleanup levels were 30 mg/kg and 10 g/m^2. The different cleanup levels were primarily driven by the modeling work and based upon the conclusion derived in EPA's "Data Evaluation and Interpretation Report" that the area upstream of the Thompson Island Dam was the primary source of PCBs to the freshwater Hudson. The data available show that pre-dredging concentrations in sediment and fish were higher than expected and post-dredging levels demonstrate that the 2002 ROD goals are not being achieved. EPA must reevaluate the cleanup levels used in the 2002 ROD using post-dredging data to determine what changes to the cleanup levels need to be made to meet EPA's goals set forth in the 2002 ROD.

- Surface sediment (top two inches) concentrations were found to be three to five times greater than assumed at the time of the 2002 ROD. As a result, sediment PCB concentrations post-dredging were far higher than anticipated. The model EPA used to inform the cleanup did not accurately capture the extent of contamination or accurately predict the length of time required to reduce unacceptable risk.

[10] According to EPA, PCBs in the top 12 inches of sediment are bioavailable to ecological receptors.
[11] Total PCB concentrations are approximately twice the Tri-Plus PCB concentration.

- The surface sediment PCB concentrations in the top two inches, as measured by sediment sampling in 2016/17 and again in 2022, have changed very little since dredging was completed. (*See* Figures 1-2.)

- The remedial work at the GE plant sites was designed to achieve an average surface water PCB concentration of two nanograms per liter at Rogers Island. This location is downstream of both GE plants, and upstream of the areas dredged. Surface water monitoring has thus far shown that this goal has been met, but monitoring is ongoing. As such, there are no data to support an argument that upstream loads are a cause for elevated PCB concentrations in sediment and fish.

- Analysis of the data available show that the remedy is not functioning as intended. Full achievement of human health and ecological remedial goals will take decades, and very little progress is being made toward the interim targets.

- For at least 15 years,[12] EPA has known that the models used in the 2002 ROD substantially underestimated PCB concentrations in surface sediment. PCBs remaining after dredging in the surface sediment continue to be bioavailable, contribute to recontamination of dredged areas, and prolong loading to the Lower Hudson River.

<u>In summary, the monitoring data available to date confirm that the remedy is not functioning as intended. The targeted sediment removal has not been successful in allowing for the post-removal natural recovery processes to achieve the anticipated rapid reductions in fish PCB concentrations and in human health and ecological risk.</u>

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Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

The cleanup levels set forth in the 2002 ROD for the sediment-dredging element of the remedy were risk based. EPA established a cleanup level based on the anticipated risk reduction associated with the selected remedy. For the Site, the reductions in risk to be achieved in the specified time frames through application of the sediment cleanup levels were a function of the anticipated reductions in fish PCB concentrations to be achieved as a direct result of the sediment removal, followed by natural recovery. The understanding of site risks may be understated, as the risks of PCB exposure to humans and wildlife are based on outdated assumptions that EPA is still in the process of evaluating on a national basis.

[12] 2012 Five-Year Review, Appendix A, Technical Memorandum Comparison of ROD and SSAP-based Estimates of the Reduction in Surface Sediment, May 30, 2012, "Over the past few years, there have been several discussions and analyses regarding the differences between the concentrations used in the ROD and the ones developed from the SSAP program. Concerns have been raised that the remedial design as currently planned will not yield the level of improvement in surface sediment concentrations of Tri+ PCBs anticipated by the ROD in all river sections."

The assumptions in the 2002 ROD about site uses may understate the actual risks associated with PCB exposure to humans, as the reliance by EPA on the State Department of Health fish consumption advisories continues to allow for uncontrolled human exposures to PCBs in fish.

EPA also continues to rely on the assumption, stated in the investigation documents leading up to the 2002 ROD and stated in the 2002 ROD itself, that the area upstream of the Thompson Island Dam (the first six miles of river to be remediated) was the primary source of PCBs to the rest of the river. This assumption, which was the primary basis for the less stringent cleanup levels set forth in the 2002 ROD for the portion of the river downstream of the Thompson Island Dam, resulted in significant masses of bioavailable PCBs remaining in the 34 miles of Upper River downstream to Troy.

In summary, it appears that the site risks may be understated, that the reliance upon fish consumption advisories is not an effective control on human health risks, and that the fundamental understanding of what cleanup level in sediment would be necessary to achieve the remedial goals in the ROD needs to be revisited and updated. This requires extensive sampling of surface sediment in the top 12 inches with an emphasis on the areas identified in the remedial design sampling with elevated PCBs. Comprehensive understanding of the currently remaining surface PCBs is essential to any revisiting of cleanup levels.

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Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

In answering this third question in a FYR, all new information, including monitoring data gathered during remedy implementation and during post-remedial monitoring, should be evaluated to determine if this new information would lead the reviewer to conclude that the remedy is not protective. As discussed above, the data available since the 2002 ROD was issued, and since the dredging remedy was implemented, indicate that a significant mass of bioavailable PCBs was left behind in the surface sediments of the Hudson River. These data also indicate that the anticipated rapid decline in surface sediment PCB concentrations – and as a result, a corresponding rapid decline in fish PCB concentrations – is not occurring.

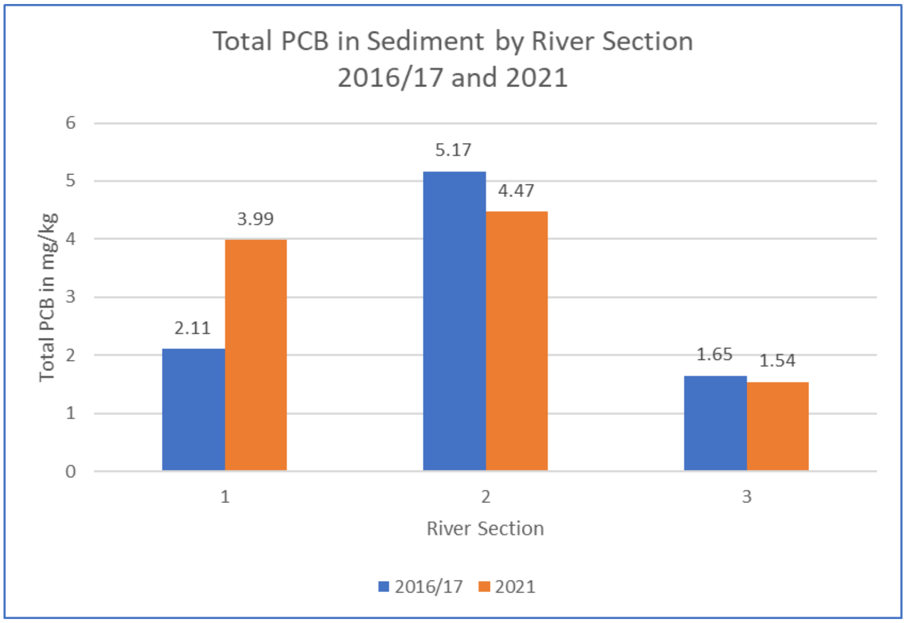
SECTION 5

<u>Figures</u>

PCBs in Sediment by River Section

Figure 1

Total PCB in Sediment by River Section



Note: The rate of change in the PCB concentrations of post-dredged sediment between 2016 and 2021 is much less than what is necessary to achieve the targeted reductions in fish concentrations.

Figure 2

Total Tri+ PCB in Sediment by River Section

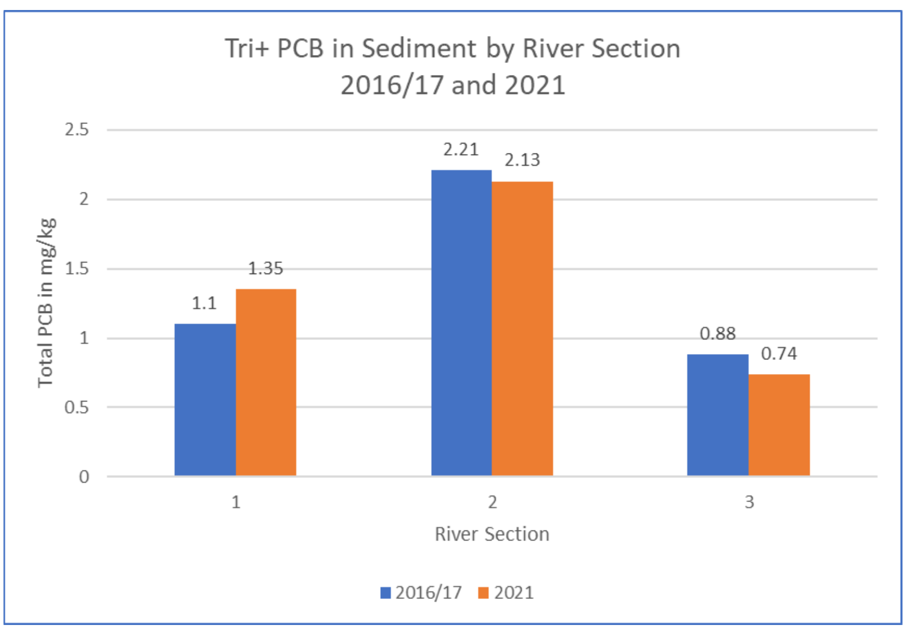
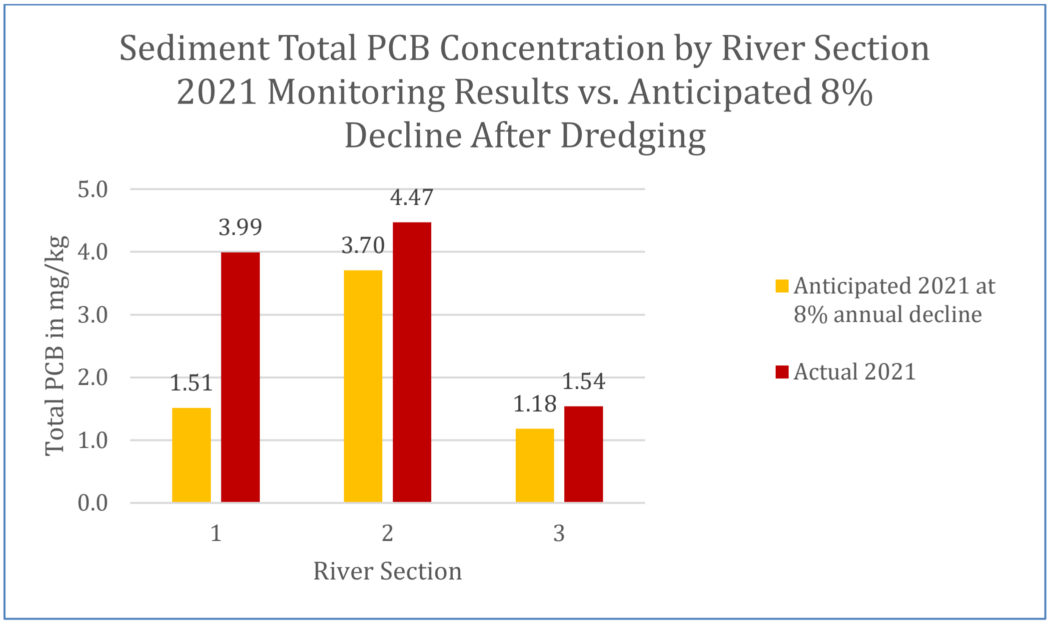


Figure 3

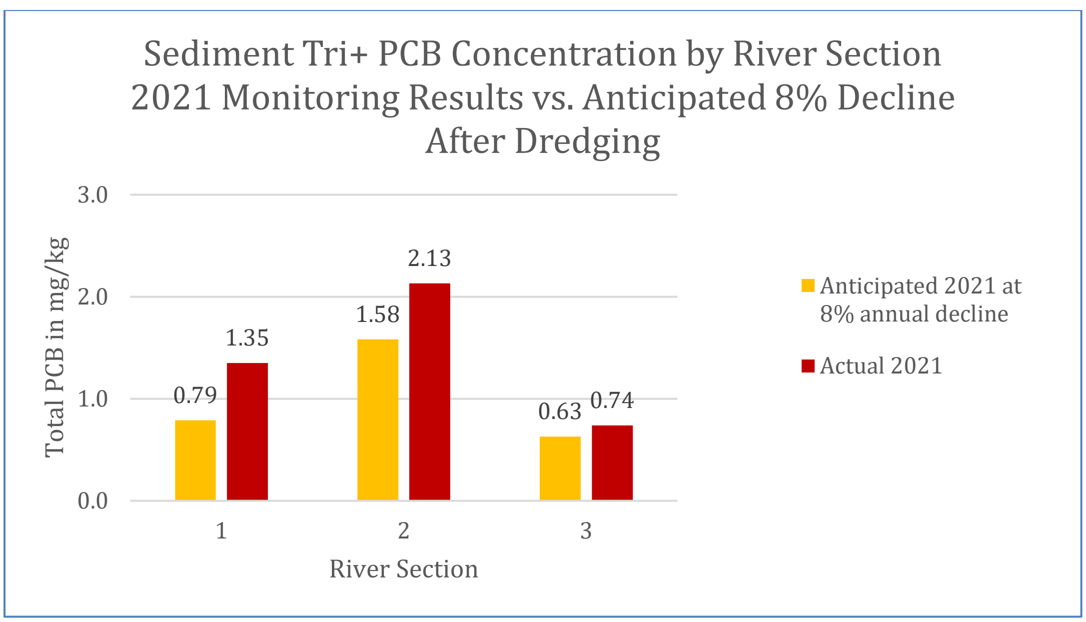
Total PCB Concentrations in Sediment by River Section: Sediment Sampling Results EPA Anticipated for 2021 Compared to the Actual Sediment Sampling Results Collected in 2021



Note: The 8% rate of decay is the rate[13] EPA anticipated in the 2002 ROD. The projected 8% rate of decay is based on data collected in 2016/2017 (the first year after dredging) as the baseline year.

Figure 4

Sediment Tri+ PCB Concentrations in Sediment by River Section: Sediment Sampling Results EPA Anticipated for 2021 Compared to the Actual Sediment Sampling Results Collected in 2021

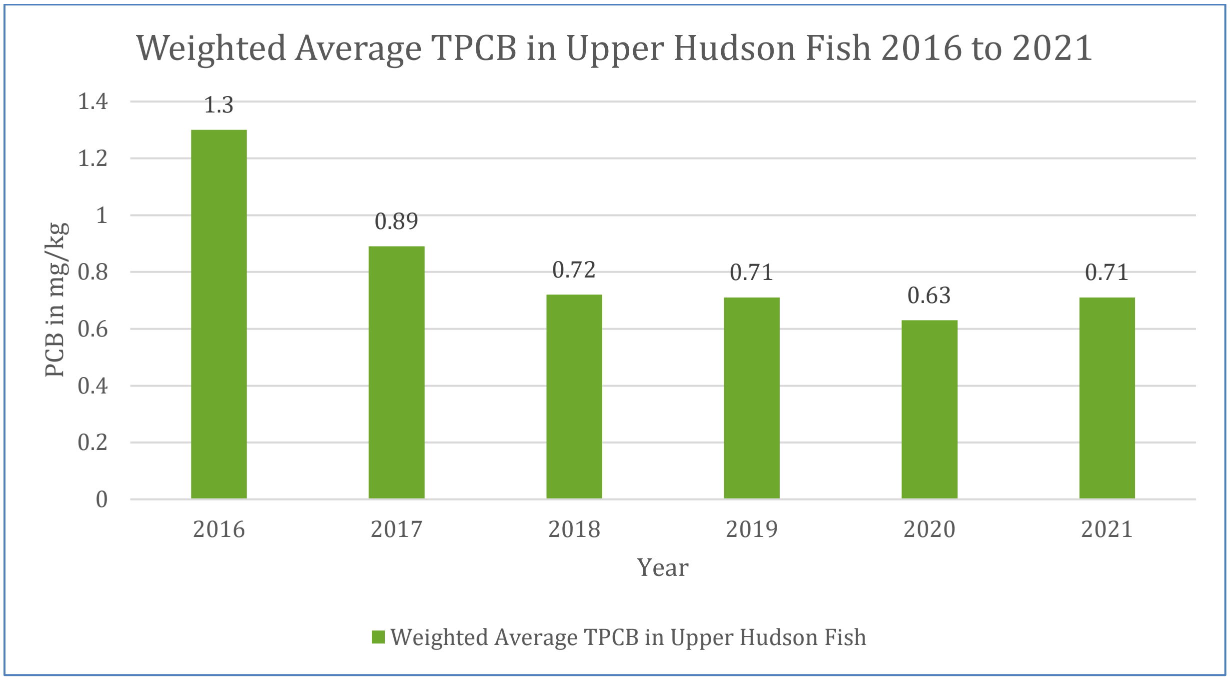


[13] The rate of decay is how quickly concentrations decline or the rate PCB concentrations decrease in sediment.

PCBs in Fish

Figure 5

Total PCB (Weighted Average) in Upper Hudson River Fish

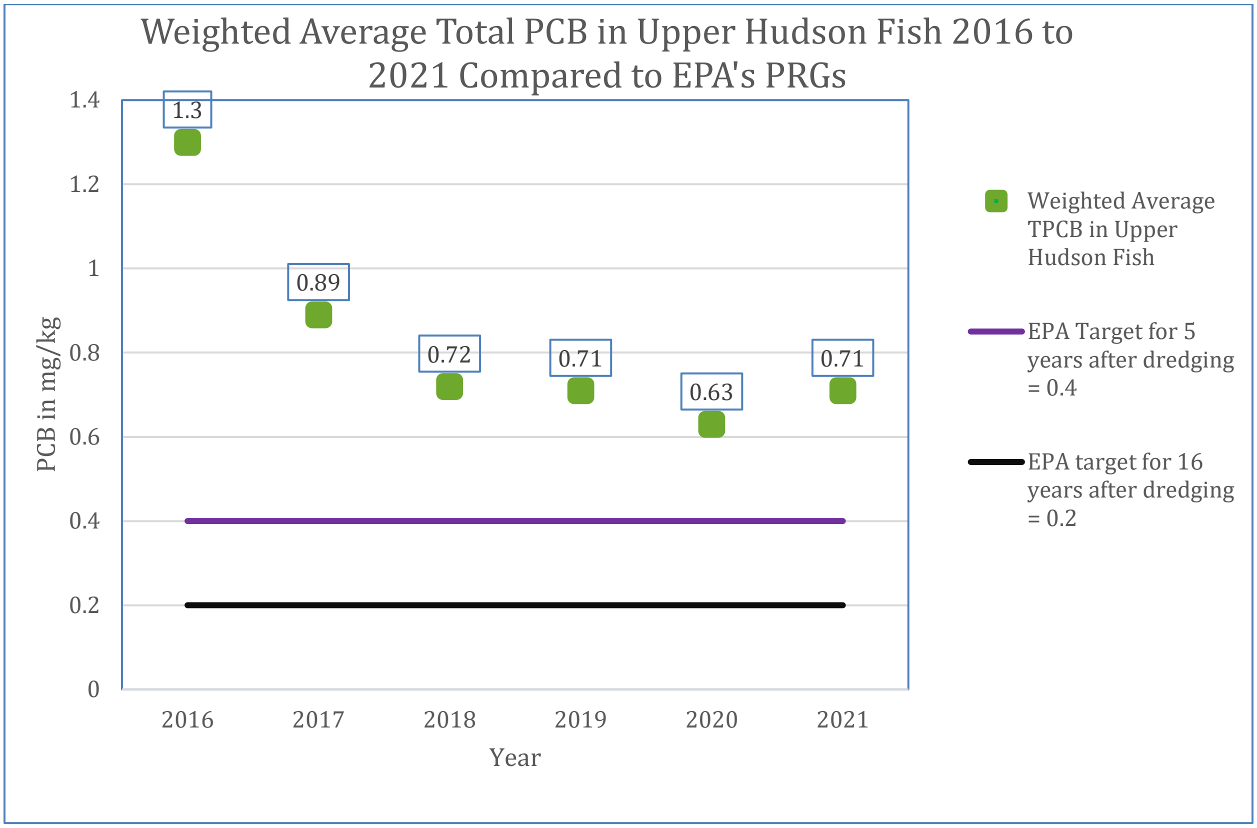


Note: In the 2002 ROD, EPA adopted target concentrations of 0.4 mg/kg and 0.2 mg/kg PCBs in species-weighted fish fillet to be attained by 2020 and 2031, respectively.[14] Meeting these target concentrations was expected to facilitate the relaxation of fish consumption advisories from the current "eat none" recommendation in the Upper Hudson River to one of limited fish ingestion.

[14] EPA's modeling projected that the target concentration of 0.4 mg/kg PCB in fish fillet would be attained within five years of completion of dredging. The target of 0.2 mg/kg PCB would be attained within 16 years of completion of dredging for the three active remediation alternatives.

Figure 6

Total PCB (Weighted Average) in Upper Hudson River Fish Compared to EPA's Preliminary Remediation Goals in the 2002 ROD



SECTION 6

Environmental Justice

Risk Avoidance v. Risk Reduction

For nearly 76 years,[15] human and environmental health threats posed by GE's PCBs in the river have been borne by generations of people living along its shores. The health effects – cancers, birth defects, neurological impacts – are long-term and cumulative but that does not minimize the urgency nor the responsibility to more effectively prevent or reduce these risks. Consumption of contaminated fish is the single greatest source of human exposure to PCBs[16] and for many decades, the only protection from the negative health impacts due to "exposure" to PCB-laden fish has been fish consumption advisories. Such advisories are part of EPA's "risk-avoidance" strategy. This strategy forces the public to alter their behaviors so as to avoid the harms from exposure to contamination. The burden is on the risk-bearers to protect themselves – in this case, the fish consumers – rather than those who caused the risk (polluters) or those who are tasked with protecting the public from the dangers of toxic pollution in systems like the Hudson River (EPA).

In addition to fish advisories, EPA concluded in the 2002 ROD that active remediation, i.e., dredging, followed by MNA,[17] was "necessary to protect the public health or welfare and the environment"[18] from the significant health and ecological risks associated with the ingestion of PCB-laden fish. EPA's active remedy was a risk-reduction[19] strategy designed to clean up environmental contamination by requiring GE to reduce or eliminate the contamination.

In the 2002 ROD, EPA adopted PRGs as the final remediation goals for the Site.[20] The risk-based PRG for the protection of human health is 0.05 mg/kg PCBs in fish fillet based on non-cancer hazard indices for the reasonable maximum exposure adult fish consumption rate of one half-pound meal per week.[21] EPA also adopted interim target concentrations of 0.2 mg/kg PCBs in fish fillet, which is protective at a fish consumption rate of one half-pound meal per month, and 0.4 mg/kg PCBs in fish fillet, which is protective of the average angler, who consumes one half-pound meal every two months.[22] EPA's models projected that these interim targets would be attained within 16 and 5 years of the completion of dredging, respectively.[23] EPA had hoped that attaining such levels would facilitate the relaxation of the fish consumption advisories and fishing restrictions.[24]

Today, eight years after the completion of active dredging, the first goal for fish has not been met

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[15] *Hudson River PCBs Superfund Site*. New York, NY: US Environmental Protection Agency (EPA). 2020-08-25.

[16] Office of Water, EPA, Fact Sheet, Polychlorinated Biphenyls (PCBs) Update: Impact on Fish Advisories (1999), https://www.epa.gov/sites/default/files/2018-11/documents/polychlorinated-pcbs-impact-fish-advisories-factsheet.pdf

[17] Natural attenuation relies on natural processes to decrease or "attenuate" concentrations of contaminants in soil and groundwater. Community Guide to Monitored Natural Attenuation EPA-542-F-21-018, 2021

[18] Hudson River PCBs Site, Record of Decision (2002), at 49.

[19] Environmental Protection Agency, Risk Assessment, https://www.epa.gov/risk/about-risk-assessment ("EPA considers risk to be the chance of harmful effects to human health or to ecological systems resulting from exposure to an environmental stressor.")

[20] Hudson River PCBs Site, Record of Decision (2002), at 51.

[21] Hudson River PCBs Site, Record of Decision (2002), at 50.

[22] Hudson River PCBs Site, Record of Decision (2002), at 50.

[23] Hudson River PCBs Site, Record of Decision (2002), at 103.

[24] Hudson River PCBs Site, Record of Decision (2002), at 50.

and the expected rates of MNA recovery are not being achieved. (*See* Figures 3 and 4.) Without a robust natural recovery, the current elevated human health and ecological risks posed by fish consumption will likely persist for the foreseeable future. Because sediment and fish PCB concentrations have not declined as EPA anticipated for the Hudson River, EPA is forced to rely on risk avoidance efforts. The reliance on fish consumption advisories is not an effective nor a just solution for mitigation of human health risks, particularly for environmental justice communities who rely on subsistence fishing. In addition, risk avoidance does not address the risks threatening the ecological receptors.

For far too long, communities along the Hudson River have faced persistent environmental injustice through toxic PCB pollution. These communities have experienced disproportionate and adverse human health and environmental burdens. Recently, EPA has made commitments to prioritize environmental justice in general operations and has specifically provided tools and guidance for cleanup actions such as the Hudson River Superfund Cleanup. In a July 1, 2021 memo,[25] regional Superfund directors were instructed to consider additional enforcement actions at sites, like the Hudson River PCBs Superfund Site, that have been designated as "human exposure not under control."[26] Furthermore, on April 21, 2023, President Biden signed Executive Order 14096 to revitalize our nation's commitment to environmental justice for all.[27] Building on prior directives to incorporate environmental justice into their operations, the Executive Order directs agencies to consider measures to address and prevent disproportionate and adverse environmental and health impacts on communities. In light of these commitments to environmental justice, EPA must address the needs and concerns of environmental justice communities in the Hudson River Valley by taking additional actions to meet the RAOs set forth in the 2002 ROD. Instead, EPA has essentially done the opposite; EPA is backing away from the modest goals and time frames laid out in the 2002 Record of Decision, which already included decades of delay before providing real relief to environmental justice communities along the Hudson.

[25] Memorandum from Acting Assistant Administrator for Enforcement and Compliance Assurance Larry Starfield, "Strengthening Environmental Justice Through Cleanup Enforcement Actions," July 1, 2021, available at: https://www.fedcenter.gov/Documents/index.cfm?id=37173&pge_prg_id=45198&pge_id=4339

[26] *See* Memorandum from Acting Assistant Administrator for Enforcement and Compliance Assurance Larry Starfield, "Strengthening Environmental Justice Through Cleanup Enforcement Actions," July 1, 2021, available at: https://www.epa.gov/enforcement/environmental-justice-enforcement-and-compliance-assurance. In addition, CERCLA RI/FS ASAOC and SOW Model Documents, issued just days after the ASAOC was entered into, include provisions in accordance with this commitment. *See* 2022 CERCLA RI/FS ASAOC and SOW Model Documents, available at: https://www.epa.gov/enforcement/2022-cercla-rifs-asaoc-and-sow-model-documents.

[27] https://www.federalregister.gov/documents/2023/04/26/2023-08955/revitalizing-our-nations-commitment-to-environmental-justice-for-all

SECTION 7

Protectiveness

EPA's continued statement that additional data is needed to render a protectiveness determination is not supported by any specific decision criteria. EPA's continued demand for more data essentially abandons the time frames laid out in the 2002 ROD. Given the current fish and sediment data and observed trends, waiting for more data will only prolong the inevitable determination that the remedy is not protective of human health and the environment.

EPA's own data supports the conclusion that the interim targets identified in the 2002 ROD will not be reached within the time frames estimated at the time the ROD was issued. A critical factor needed for the protectiveness determination is a reliable calculation of the rate of decline in post-dredging fish tissue PCB levels. Natural attenuation processes have not helped the river reach the interim remediation goals for the protection of human health with regard to fish consumption.[28] In the interim, the State of New York is relying on fishing restrictions and fish consumption advisories to control human exposure pathways that lead to unacceptable risks. However, these consumption advisories are not fully effective in that they rely on voluntary compliance in order to prevent or limit fish consumption. For the reasons stated herein, the selected remedy is currently not protective of human health and the environment as there are known exposures to both human and ecological receptors, which have not been controlled and which remain in excess of EPA's acceptable risk range.

SECTION 8

Conclusions

Conclusion 1 - The Upper Hudson sediment remedy is not protective of human health and the environment. The human health and ecological risk are well in excess of EPA's acceptable risk ranges, and (based on current trends in fish and sediment PCB levels) will not be in the acceptable range for the foreseeable future.

Conclusion 2 - The observed rates of natural recovery in fish and sediment PCB concentrations are significantly less than anticipated in the 2002 ROD, and significantly less than those needed to achieve the RAOs set forth in the 2002 ROD and remedial goals.

Conclusion 3 - The understanding of the relationship between how much PCB was left behind in Upper Hudson sediments and the rates of recovery in sediment and fish needs to be updated to determine if further remedial work is necessary to achieve remedy protectiveness.

Conclusion 4 - EPA should determine what further active remediation is needed to allow the remedy to function as intended (allow for natural recovery after dredging to achieve the rapid reductions in human health and ecological risk) to allow the RAOs to be achieved.

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[28] 0.2 mg/kg PCBs in fish fillet to be attained within 16 years of completion of dredging, and 0.4 mg/kg PCBs in fish fillet within 5 years after dredging.

SECTION 9

Recommendations for Next Steps

To illustrate the next steps needed, the EPA's five-year review guidance provides a specific course of action. The guidance states that:

> *If your evaluation of data indicates that the remedy is not meeting and will not be able to meet the RAO stated in the ROD, then you may need to determine if the remedy is protective and, if not protective, what additional actions are needed. For example, if the risk associated with the cleanup levels currently being achieved by the remedy are within EPA's acceptable risk range, the remedy generally should be considered protective. However, if the remedy will not be able to meet the RAOs, further actions may be needed, depending on the specificity of the original RAOs in the ROD. Your Five-Year Review report should identify such further actions as recommendations and/or follow-up actions.*[29]

EPA has many tools available to it to reevaluate the remedy and take additional steps to clean up PCBs in the Hudson River. In order for EPA to compel additional action in the Upper Hudson River, the EPA must first issue a "not protective determination." This section highlights paths forward, but none can be pursued without a finding from EPA that the remedy is not protective of human health and the environment.

Remedy Optimization

In recent years, EPA has increasingly turned to remedy optimization to resolve complex issues at particularly challenging Superfund sites. Through the remedy optimization process, EPA brings in a team of independent technical experts to recommend ways to improve the effectiveness of a cleanup action. Those recommendations can include improvements to the conceptual site model, changes to the remedial approach, and best practices for data management. While remedy optimization can take place at any stage in the Superfund process and at any type of Superfund site, EPA prioritizes large and complex sites where there is a "desire to accelerate or improve effectiveness of the remedial process."

The Hudson River Superfund Site is exactly the type of site that EPA should be targeting for remedy optimization. First, the site has many of the features that EPA looks for: It is a large and complex site that has concerns about the effectiveness of the remedy and uncertainty regarding the conceptual site model. Second, the Hudson River Superfund Site urgently needs outside review from independent experts. The same team has been working at the site for years (in some cases, for decades); fresh eyes and a new perspective would be extremely helpful. Third, remedy optimization is intended for sites in all phases of the Superfund process. Since the Upper Hudson and Lower Hudson are at very different stages, it is important to have a flexible approach that can address both portions of the Site.

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[29] Environmental Protection Agency, Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P (June 2001), at p. 4-9.

Remedial Investigation and Feasibility Study for the Lower Hudson River

EPA should expand the investigation of the Site to include performance of a formal Remedial Investigation and Feasibility Study ("RI/FS") for the Lower Hudson River. Such RI/FS is necessary to determine the nature and extent of PCB contamination in the sediments, water, and biota of the Lower Hudson River, and to evaluate remedial alternatives to address the currently uncontrolled, unacceptable risks to human health and the environment.

The sampling and investigation to be carried out by GE is not a substitute for an RI/FS; it will merely delay the beginning of an RI/FS, which must occur before any meaningful response action can take place. The 160-mile Lower Hudson portion of the Hudson River PCBs Superfund Site has waited nearly 40 years for resolution of the legacy PCB pollution that has poisoned the river's wildlife, destroyed a vibrant fishing industry, impaired new commercial activity, and compromised the health of those living along its shores. The proposed sampling and investigation of the water column, sediment, and fish in the Lower Hudson described in the sampling plan is unlikely to yield significant useful information to resolve the spatial distribution of PCBs and other contaminants in the Lower Hudson. The Lower Hudson is a much larger and more complex ecosystem than the Upper Hudson. A plan should be developed now to expand the initial sampling work to provide a meaningful understanding of the distribution of PCB contamination in Lower Hudson fish and of the relationships between water, sediment, and biota. This sampling effort should include the various fish species that are commonly consumed by humans, and ecological receptors from various locations in the estuary. This effort should also include using PCB congener analysis as the primary analytical approach rather than relying on the outdated Aroclor method that provides minimal information necessary to understand processes and source identification.

In addition, the proposed supplemental exploratory sediment sampling program will provide extremely limited insight into the spatial variation in sediment PCB concentrations throughout the Hudson estuary. The planned water column monitoring, sampling, and analysis will only demonstrate small incremental improvement in understanding the distribution of PCBs in the river. In addition, sampling locations 50 miles apart, in the complex environment of the Hudson River estuary, simply will not provide the spatial resolution necessary to meaningfully advance the understanding of the nature and extent of PCB contamination in the Lower Hudson.

Adaptive Management of the Remedy[30]

EPA may consider using adaptive site management to make progress toward the RAOs and remediation goals, inform uncertainties, and make decisions about whether and when additional remediation is necessary to achieve the RAOs for the Site.

Adaptive site management relies on monitoring to continually improve site understanding and track progress toward goals. This allows decision-makers to:

- better establish the contaminant relationship between soils/sediments, water, and biota;
- identify unknown contaminant sources or exposure drivers;
- assess the effectiveness of remedial approaches; and

[30] https://semspub.epa.gov/work/HQ/100003040.pdf

- determine the degree of remediation necessary to achieve a final, protective remedy.

At a practical level, the value of adaptive site management at sediment sites is the potential for expediting significant progress toward final remediation goals while monitoring the system response and gauging what, if any, additional steps are needed to achieve those goals. Remediation under adaptive site management acts on what is known while acknowledging what is not fully understood. It includes plans to collect the necessary information to reduce uncertainties and achieve a final, protective remedy for the site. This approach allows work to proceed in areas with high contaminant exposure and transport while additional data collection and testing of responses is conducted to determine the appropriate level of remediation in remaining areas.

Explanation of Significant Differences ("ESD")

EPA should consider incorporating significant changes into the 2002 ROD to amend the scope and performance of the alternative to protect human health and the environment. An ESD must describe to the public the nature of the significant changes, summarize the information that led to making the changes, and affirm that the revised remedy complies with the NCP and the statutory requirements of CERCLA. To describe the nature of the significant changes, it is suggested that a side-by-side comparison of the original and proposed remedy components be used to clearly display the significant differences. The ESD should provide additional information on changes that have resulted in the remedy as a result of the change (e.g., changes in the cleanup cost estimate or remediation time frame).

ROD Amendment

If "fundamental," rather than merely "significant," changes are made to the scope, performance, or cost of a remedial action, then EPA must propose an amendment to the ROD. A ROD amendment requires an evaluation of the proposed change, a revised proposed plan, and an opportunity for public comment.

Reopener

Although EPA issued a Certificate of Completion of the Remedial Action for the Upper Hudson, EPA can still compel GE to perform additional response actions in the Upper Hudson to the extent that the reopener provisions in the 2006 Consent Decree are satisfied. Specifically, the reopener provisions require that EPA discover "previously unknown conditions, or previously unknown information" indicating that the remedial action is not protective. Since EPA issued the certificate in 2019, a great deal of new information – including information about the amount of remaining contaminated sediment and the lack of recovery in fish – has revealed that the remedy in the Upper Hudson is not protective of human health and the environment. Therefore, EPA can compel GE to take additional remedial action in the Upper Hudson.

Attachment 4

The Friends of a Clean Hudson: Extended Analysis of PCB Concentrations in Fish and Sediment

June 2024

EXTENDED ANALYSIS OF PCB CONCENTRATIONS IN FISH AND SEDIMENT: NEW INSIGHTS AND DATA

Prepared by: The Friends of Clean Hudson

Hudson River Sloop Clearwater, Hudson Riverkeeper, Scenic Hudson

June 2024

AN ADDENDUM TO THE REPORT TITLED:

THE FRIENDS OF A CLEAN HUDSON:
AN INDEPENDENT REVIEW OF EPA'S
UPPER HUDSON RIVER PCB DREDGING REMEDY

Hudson River PCBs Superfund Site
Operable Unit 2 (Upper Hudson)

Prepared By:
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Hudson Riverkeeper, Scenic Hudson,
Sierra Club-Atlantic Chapter
November 2023

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I. Abstract

In 2023, the Friends of a Clean Hudson (FOCH) coalition worked with technical experts to conduct an independent analysis of EPA's Upper Hudson River PCB dredging remedy. The FOCH published their findings and recommendations on November 14, 2023 in a report titled "An Independent Review of EPA's Upper Hudson River PCB Dredging Remedy." Since the November 2023 report was published, the FOCH coalition has continued to work with its technical experts to review and analyze publicly available project data to better understand PCB concentrations in Upper Hudson sediment and fish. The FOCH coalition now expands its November 2023 report with additional analysis of PCB concentrations in fish and sediment.

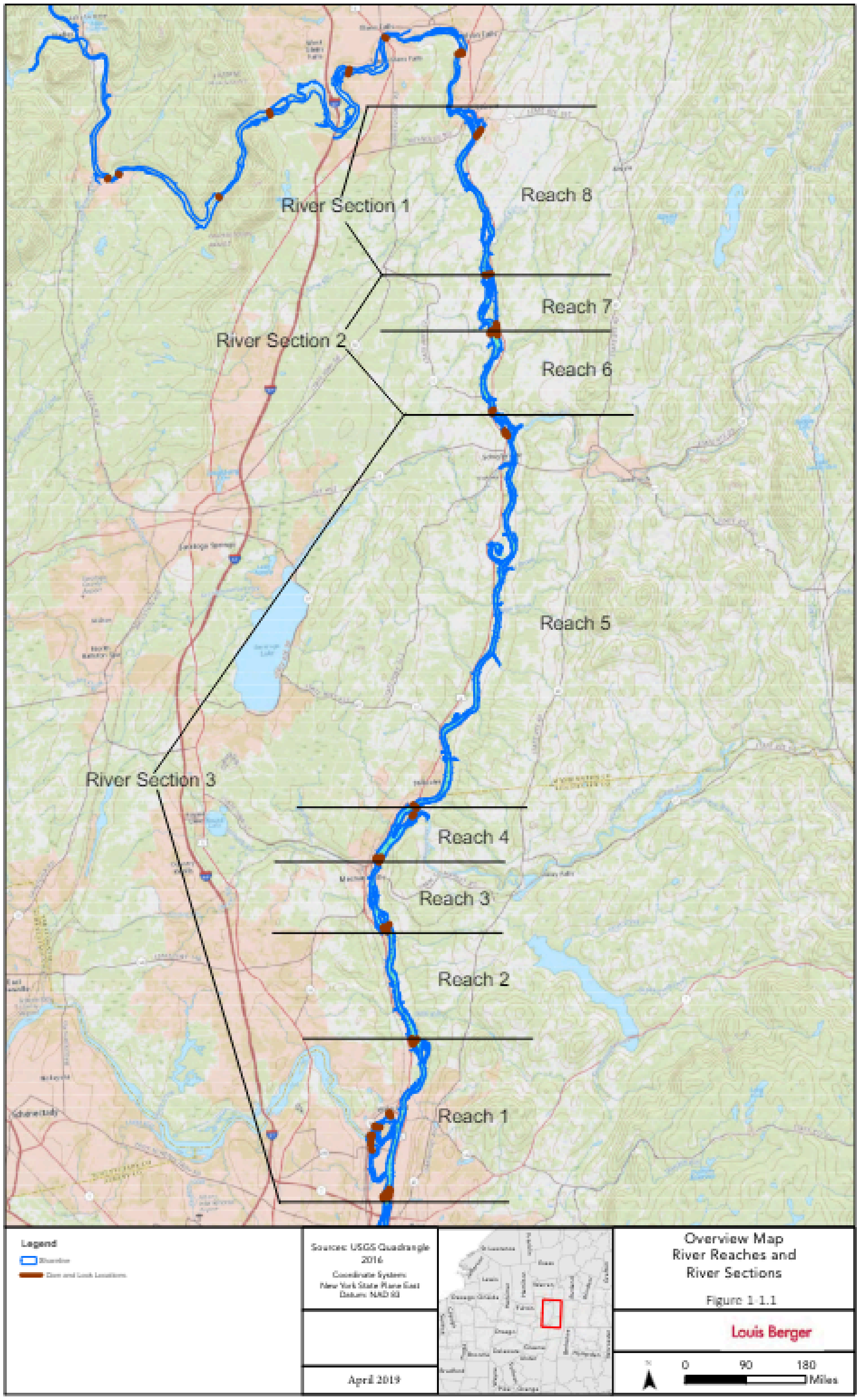
Based on the additional analysis, the conclusions set forth in the November 2023 FOCH report are even more supported: PCB concentrations in Upper Hudson River fish and sediment since dredging ended in 2015 are not decreasing as anticipated by EPA at the time it selected the PCB cleanup remedy 2002. Based on the trends observed, there appears to be little improvement in fish and sediment PCB concentrations after dredging. EPA must take steps to reevaluate the Upper Hudson River cleanup remedy to protect human health and the environment.

II. Hudson River PCBs Superfund Site Background

The Hudson River PCBs Superfund Site (the Site) includes a nearly 200-mile stretch of the Hudson River from the Village of Hudson Falls, NY, to the Battery in New York City. In 2002, the U.S. Environmental Protection Agency (EPA) issued a Record of Decision (ROD) to address the ongoing environmental and human health risks posed by the discharge of millions of pounds of polychlorinated biphenyls (PCBs) by General Electric (GE) from its capacitor production facilities in Hudson Falls and Fort Edward, NY (referred to herein as the 2002 ROD). The cleanup plan selected in the 2002 ROD called for targeted environmental dredging in the Upper Hudson River followed by a period of monitored natural recovery.

The Upper Hudson River includes 40 miles of the river between Hudson Falls, NY and the Federal Dam at Troy. The Upper Hudson River was further divided into three river sections. River Section 1 extends from the former location of the Fort Edward Dam to Thompson Island Dam (approximately 6.3 river miles); River Section 2 extends from the Thompson Island Dam to the Northumberland Dam near Schuylerville (approximately 5.1 river miles); and River Section 3 extends from below the Northumberland Dam to the Federal Dam at Troy (approximately 29.5 river miles). The Upper Hudson River was also divided into eight river reaches or "pools." Each reach represents an isolated ecosphere which could offer potentially different results than those found through aggregating the data by "River Section."

Upper Hudson River Overview Map with River Sections and River Reaches[1]



[1] Louis Berger US, Inc. & Kern Statistical Services, Inc. Hudson River PCBS Superfund Site, Technical Memorandum, Evaluation of 2016 EPA/GE and 2017 NYSDEC Surface Sediment Data (April 2019), https://www.epa.gov/sites/default/files/2019-04/documents/hudson_technical_memorandum_part_1_of_2.pdf

With the completion of dredging in 2015, the cleanup has transitioned from the dredging phase to the monitoring natural recovery phase. During the monitoring phase, EPA will track the long-term recovery of the river over time to determine if the cleanup is functioning as intended. This includes monitoring of sediment, fish, water, and reconstructed habitats.

Under the Superfund law, five-year reviews are required when hazardous substances, pollutants, or contaminants remain at a site that would not allow for unrestricted use. The purpose of the five-year review is to ensure that implemented remedial actions are working as intended and are protective of human health and the environment. Five-year reviews are performed by the EPA following the start of a Superfund response action and are repeated every succeeding five years so long as future uses remain restricted. Even after dredging, PCBs remain in the river at levels that remain unsafe to humans and the environment, restricting the use of the Hudson River.

The first five-year review for the Hudson River PCBs Superfund site was completed in June 2012 while the selected remedy was under construction. At that time EPA determined that the remedy for the in-river sediments of the Upper Hudson River "will be protective of human health and the environment" upon completion of dredging. The Second Five-Year Review report was finalized and released in April 2019. EPA concluded therein that a protectiveness determination of the Upper Hudson River cleanup remedy could not be made until further information was obtained. EPA determined that there was not enough data available to determine if the remedy will be protective within the time frames anticipated in the 2002 ROD, and to assess whether the interim targets identified in the ROD would be reached in the time frames estimated.[2]

EPA initiated its third five-year review in the spring of 2022 and is expected to release its most recent review this summer. Since EPA initiated its third five-year review, the FOCH coalition has been asking EPA to use the best available science and analysis to acknowledge in the upcoming report that the cleanup is "not protective of human health and the environment." The human health and ecological risks are well in excess of EPA's acceptable risk ranges, and based on current trends in fish and sediment PCB levels will not be in the acceptable range for the foreseeable future.

[2] In the 2002 ROD, EPA established two interim remediation targets: 0.2 mg/kg PCBs in fish fillet (which is protective at a fish consumption rate of one half-pound meal per month) and 0.4 mg/kg PCBs in fish fillet (which is protective at a consumption rate of one half-pound meal every two months). EPA projected that for the Upper Hudson River as a whole, a target level of 0.4 mg/kg wet weight could be achieved in about 5 years after completing dredging and after about 16 years for the 0.2 mg/kg wet weight target level.

III. Introduction

In November 2023, the FOCH coalition released a new report titled, “An Independent Review of EPA’s Upper Hudson River PCB Remedy,” in which available sediment, water, and fish PCB data were evaluated by technical experts to provide EPA and the public with analyses of publicly available data in advance of EPA’s third Five-Year Review (FYR) of the Upper Hudson River remedial program (referred to as Operable Unit 2 or OU2).

In the FYR finalized in 2019, EPA stated the following concerning remedy protectiveness:

> A protectiveness determination of the remedy at OU2 cannot be made until further information is obtained. There is not enough data available since the completion of dredging and related project activities in 2015 to determine if the remedy will be protective within the time frame anticipated by the Record of Decision (ROD). There is also not sufficient data available to assess whether the interim targets identified in the ROD will be reached in the time frames estimated at the time the ROD was issued in 2002. A critical factor needed for the protectiveness determination is a reliable calculation of the rate of decline in post-dredging fish tissue PCB levels. It is necessary to examine the annual record over a longer period of time in order to calculate this rate with statistical certainty. EPA estimates that as many as eight or more years of post-dredging fish tissue data are needed. This information will be obtained through the collection and evaluation of fish tissue data along with the water and sediment data collected as part of the long-term monitoring program. Once statistically relevant rates of decline in post-dredging fish tissue PCB levels can be established, EPA will estimate the rates of recovery and determine if they are reasonably consistent with those predicted in the ROD. It is anticipated that this additional information will be obtained with the results of the 2024 fish data. (Emphasis added).

In the November 2023 FOCH report, preliminary evaluations of available sediment and fish PCB data were presented which illustrated how the concentrations of PCBs in these media were higher than EPA expected and were not declining as anticipated by EPA at the time of remedy selection, which means that the time to recovery in the Upper Hudson River will take much longer than EPA projected in the ROD. Further evaluations of fish data (presented below) conducted since November 2023 by the FOCH’s technical experts illustrate the need to evaluate the fish PCB data on a “lipid basis,” meaning that the amount of lipids (fats) in the sample needs to be taken into account in determining the change (or lack thereof) in fish PCB concentrations over time. The FOCH coalition also conducted a detailed analysis of the PCB concentrations in (a) pumpkinseed, which represent an interim trophic level between sport fish and the primary source of PCB to Upper Hudson fish (and terrestrial piscivores such as mink and kingfisher), and (b) the remaining PCB contaminated sediments in the Upper Hudson. These two analyses, of lipid-based PCBs in fish and PCBs in pumpkinseed, support the conclusion that the remedy is not performing as anticipated and that the appropriate protectiveness determination in the third FYR should be “not protective.”

IV. PCB Concentrations in Fish After Dredging

A. Analysis of Fish Data on a Lipid Basis

EPA has developed a composite metric to evaluate sport fish PCB concentrations over time. This metric, a species-weighted and river section-length-weighted average PCB concentration, is used by EPA to represent the changes in PCB concentrations over time.

This composite metric uses black bass, bullhead, and perch, weighted as follows[3]:

Black Bass – 47%; Bullhead – 44%; Perch – 9%

There are three discrete stretches of river from Fort Edward to Thompson Island Dam (River Section 1), Thompson Island Dam to the Northumberland Dam (River Section 2), and from the Northumberland Dam to the Federal Dam at Troy (River Section 3). These river sections are weighted according to their length as follows:

River Section 1 – 15.4%; River Section 2 – 12.5%; River Section 3 – 72.1%

This metric is presented by EPA using the total PCB data from individual fish collected at fourteen locations in the Upper Hudson, averaged by species and river section length using the weighting described above.

While using the total PCB data informs evaluations of potential exposure to humans and wildlife who consume fish from the Upper Hudson, the use of total PCB without accounting for the changes in fish lipid (fat) content can confound evaluations of the changes (or lack thereof) in exposure over time. Apparent declines in fish PCB concentrations using the total PCB data need to be evaluated in the context of changes in lipid content in the fish collected from year to year, as changes in lipid content will cause changes in PCB concentration even though there may not be changes in the amount of PCB exposure to the fish from sediment and water. It is therefore necessary, when evaluating changes in conditions over time, to account for the changes in fish lipid content.

PCBs are lipophilic (tending to accumulate in the fatty portion of the fish), therefore the more lipid in the sample, the more PCB tends to accumulate; less lipids means less PCB accumulation in the fish. Thus, PCB concentrations in fish are highly correlated with lipid content. Fortunately, this has been recognized and lipid content has been included as a key data point in the monitoring program for Upper Hudson fish. EPA has recognized this and used lipid-based PCB concentrations as the basis for the modeling work done to understand the anticipated reductions in PCB concentrations after dredging during the monitored natural recovery phase of the remedy.

Evaluation of fish PCB data on a lipid basis is a straightforward exercise. The total PCB concentrations in fish, typically expressed as milligrams PCB per kilogram of sample (mg/kg, or

[3] U.S. EPA, Phase 2 Report, Further Site Characterization and Analysis, Volume 2F-Revised Human Health Risk Assessment Hudson River PBs Reassessment RI/FS, p. 14. (November 2000), https://www3.epa.gov/hudson/revisedhhra-text.pdf

parts per million) are divided by the percentage of lipid in the sample. The resulting lipid-based PCB concentration is expressed in mg/kg/percent lipid.

The lipid-based PCB concentrations can be evaluated for each species at each location, averaged over river sections, and weighted by species and river section length to present the data over time. In this way, a river section and species weighted average, on a lipid basis, can be evaluated over time to understand the actual changes in PCB concentrations without the confounding factor of changing lipid content in the fish samples.

B. Comparison of Total PCB and Lipid-Based PCB

In the two figures below, the Total PCB and Lipid-Based PCB weighted average concentrations during the period of monitored natural recovery after dredging are presented.

In Figure No. 1, the weighted average total PCB concentrations are presented. While there is an apparent decline in total PCB concentrations, this decline is much less significant than the decline EPA anticipated it would see at the time of remedy selection, and the targeted reductions in PCB concentrations identified in the ROD have not occurred. Specifically, the weighted average PCB concentration was targeted by EPA to achieve a reduction to 0.4 mg/kg five years after dredging was completed. Under that model, the average PCB concentration in fish should have been 0.4 mg/kg by 2020.

In Figure No. 2, the weighted average lipid-based PCB concentrations are presented. Taking into account the changes in fish lipid concentrations, it appears that the apparent decline in fish PCB concentrations observed in the first figure is not due to changes in the exposure of fish to PCBs in water and sediment, but rather due to changes in fish lipid content. In the period since the dredging ended and the remedy entered the monitored natural recovery phase, there have been very limited declines in fish PCB concentrations that are not due to changing lipid content.

FIGURE 1.

Total PCB Concentrations (Weighted Average) in Upper Hudson River Fish

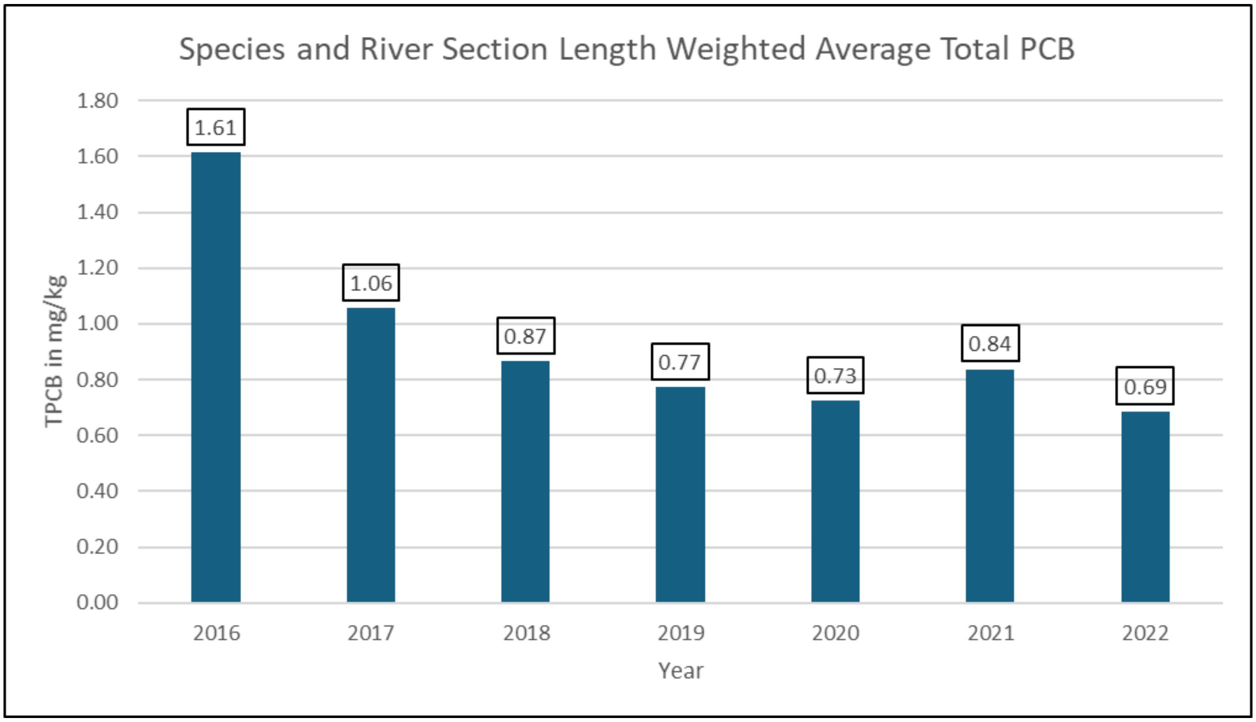
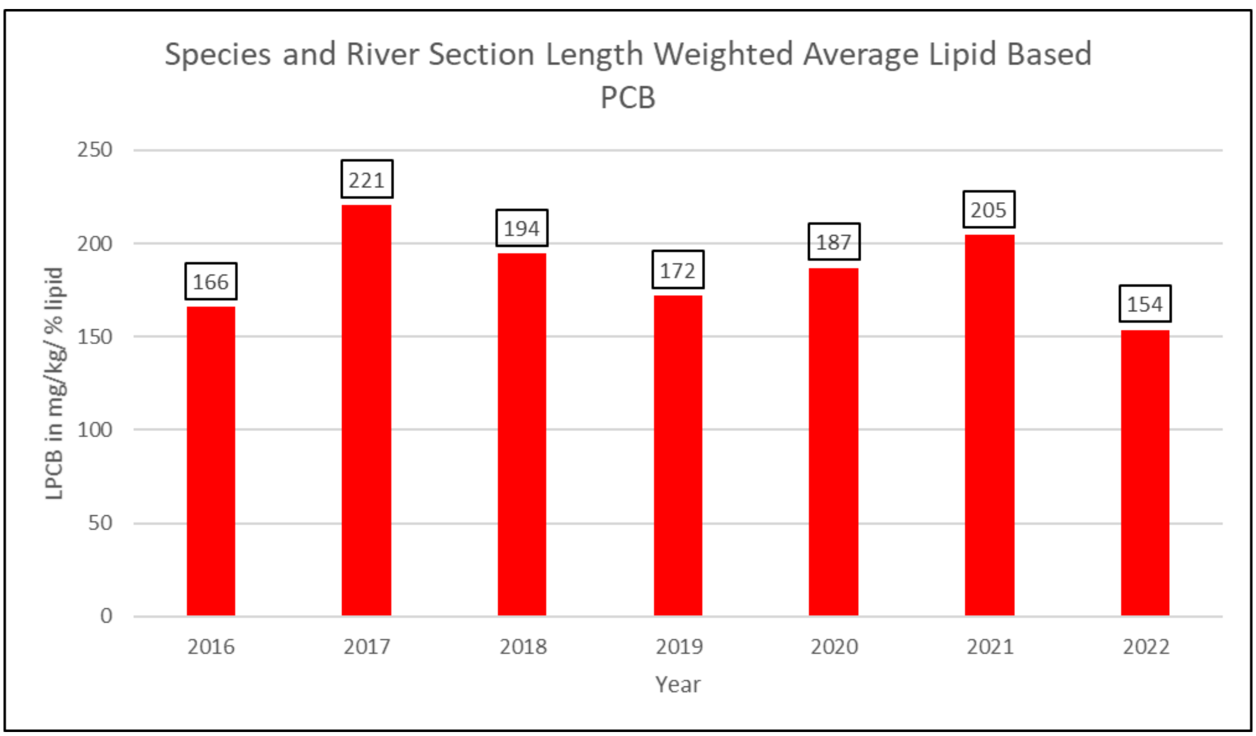


FIGURE 2.

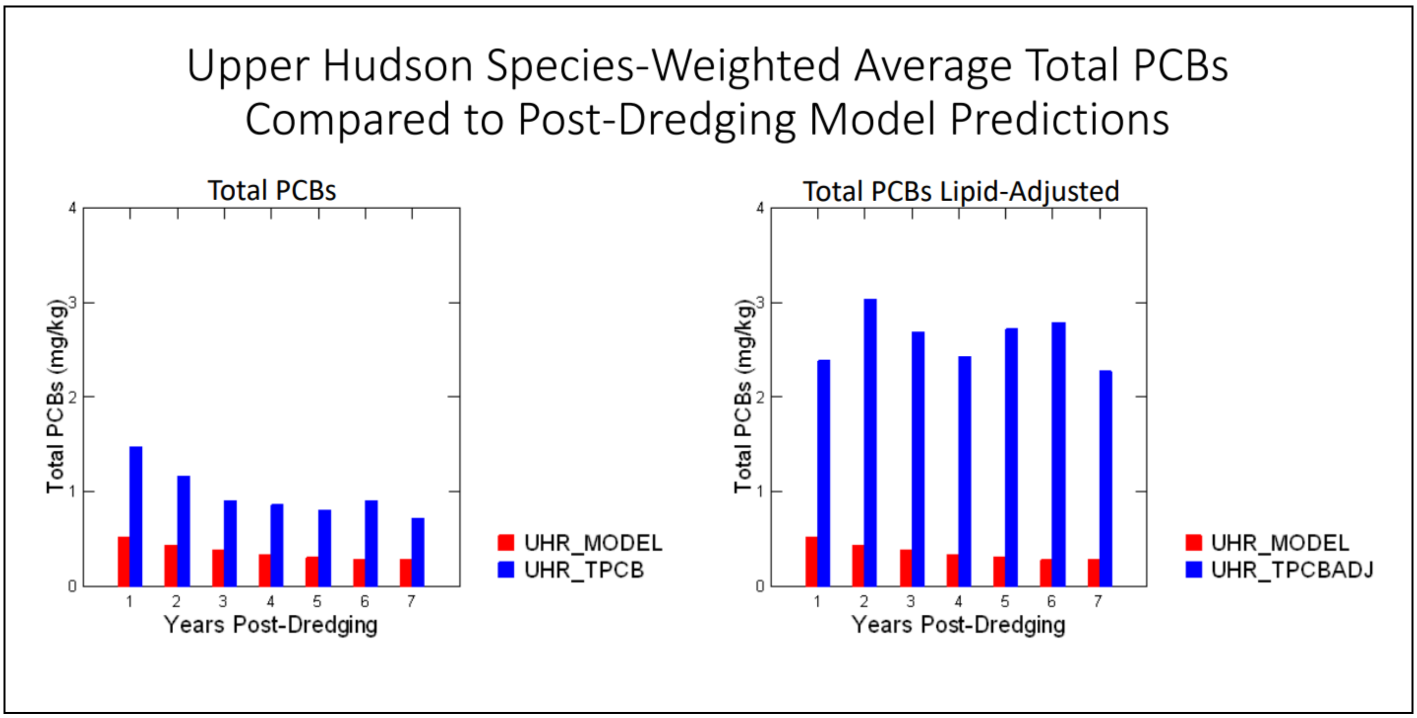
Lipid-Based PCB Concentrations (Weighted Average) in Upper Hudson River Fish



An alternative way to look at the data is to compare the weighted average fish PCB concentration with the fish PCB concentrations anticipated by EPA using modeling during remedy selection. In Figure No. 3 below, one can compare the PCB concentrations anticipated by EPA in the 2002 ROD to the actual measured concentrations. The anticipated concentrations in red are compared to the measured concentrations in blue, both for total PCB and for lipid-adjusted PCB, taking into account changes in lipid content. In both comparisons, the actual PCB concentrations are higher than anticipated by EPA.

FIGURE 3.

Total PCB Concentrations (Weighted Average) in Upper Hudson River Fish[4] Compared to Total PCB Concentrations (Weighted Average) in Upper Hudson River Fish Predicted by EPA's Models in 2002[5]



[4] Total PCB Concentrations (Weighted Average) in Upper Hudson River Fish ("UHR_TPCB")

[5] Total PCB Concentrations (Weighted Average) in Upper Hudson River Fish Predicted by EPA's Models in 2002 ("UHR_Model"); Lipid-Adjusted Total PCB Concentrations (Weighted Average) in Upper Hudson River Fish ("UHR_TPCBADJ")

C. Changes in Lipid Content

The following figures depict changes in lipid content over time at three selected sampling sites in the Upper Hudson. To illustrate how lipid content has changed over time since the start of the monitored natural recovery phase of the remedy, Figures No. 4, No. 5, and No. 6 below evaluate data collected from 2016 to 2022 after the end of dredging in 2015. Bass and bullhead are presented as they make up the largest portion of the EPA's species-weighted average metric.

FIGURE 4.

Percent Lipid in Bullhead Samples Collected in River Section 1 From 2016-2022

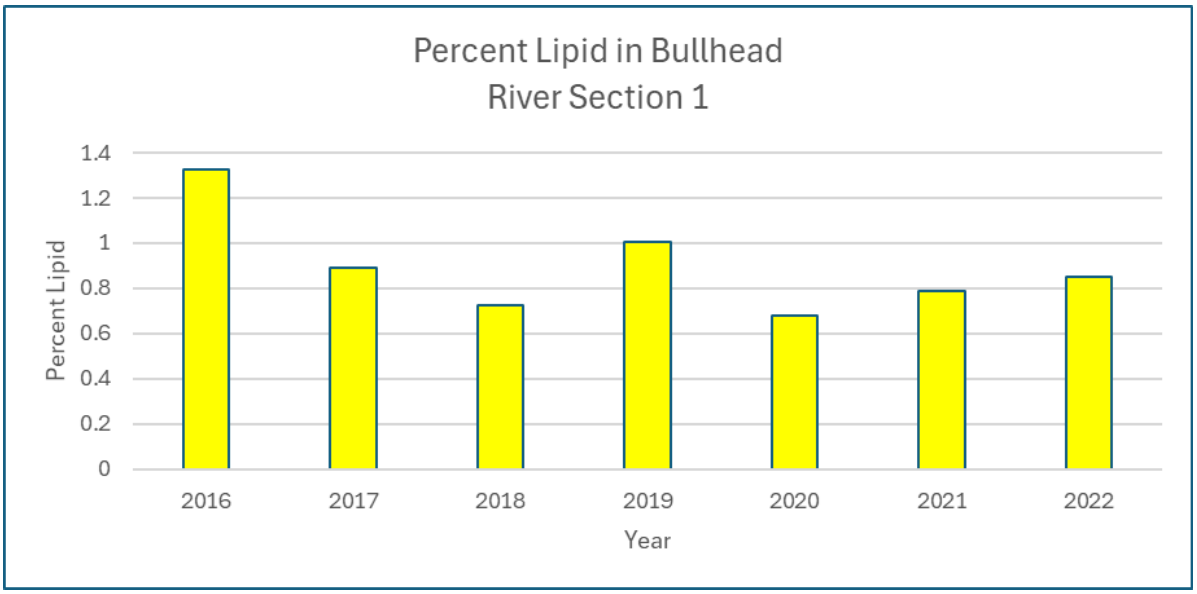


FIGURE 5.

Percent Lipid in Black Bass Samples Collected in River Section 2 From 2016-2022

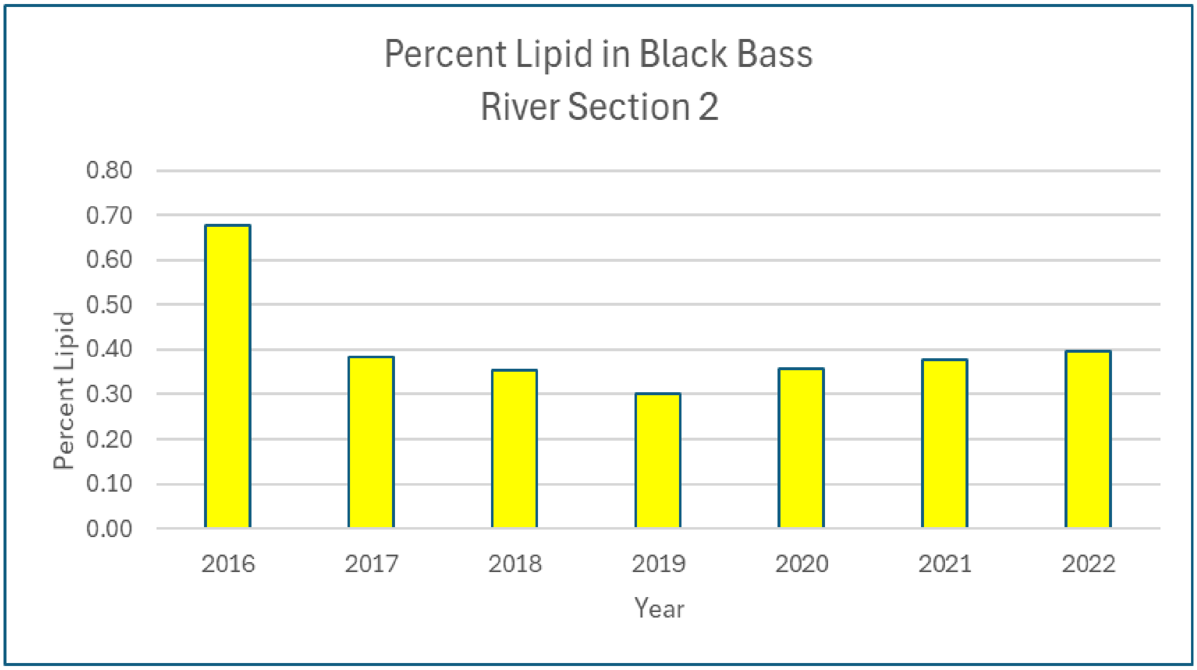
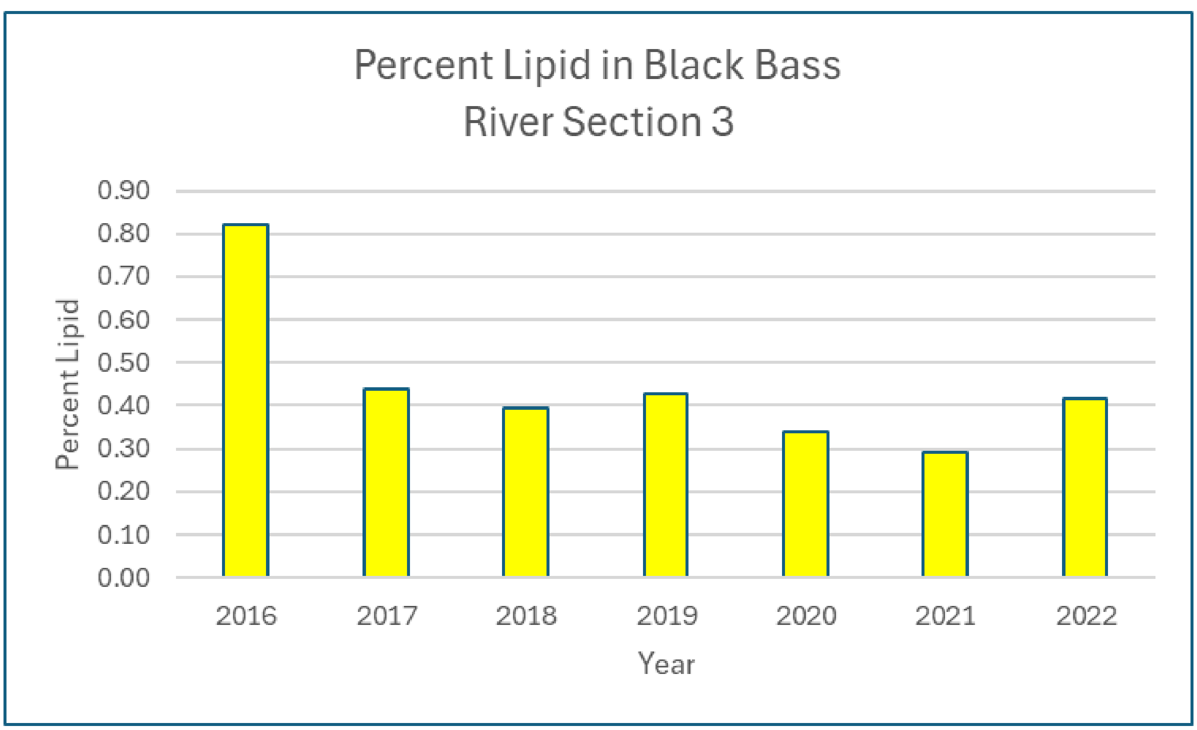


FIGURE 6.

Percent Lipid in Black Bass Samples Collected in River Section 3 From 2016-2022



D. Evaluation of Pumpkinseed Data During Monitored Natural Recovery

Besides the three main sport fish used in the weighted average metric used by EPA,[6] the monitoring program also includes the collection of forage fish (primarily minnow species) and pumpkinseed. The pumpkinseed are collected utilizing a size criterion intended to collect primarily yearling (age 1+), however, the pumpkinseed are not aged and may be of different age classes. The forage fish are collected at the same time; however, from year to year, differing mixes of species are collected according to availability which may confound year-to-year comparisons. Pumpkinseed have been collected consistently from the same Upper Hudson River stations since 2004 and provide a high-quality dataset of forage fish PCB content.

The FOCH coalition has evaluated the PCB concentrations of pumpkinseed during the period of monitored natural recovery (2016-2021). This analysis is done using both total PCB and lipid-based PCB concentrations, in order to take into account the potential for changing lipid content in the fish to better understand the trends in total PCB concentrations.

In evaluating the pumpkinseed data, it appears that there has been little change in PCB concentrations overtime during the period of monitored natural recovery. In terms of both total PCB and lipid-based PCB there has been little reduction in concentrations. This similarity is due to relatively small changes in lipid content in the pumpkinseed sampled from year-to-year.

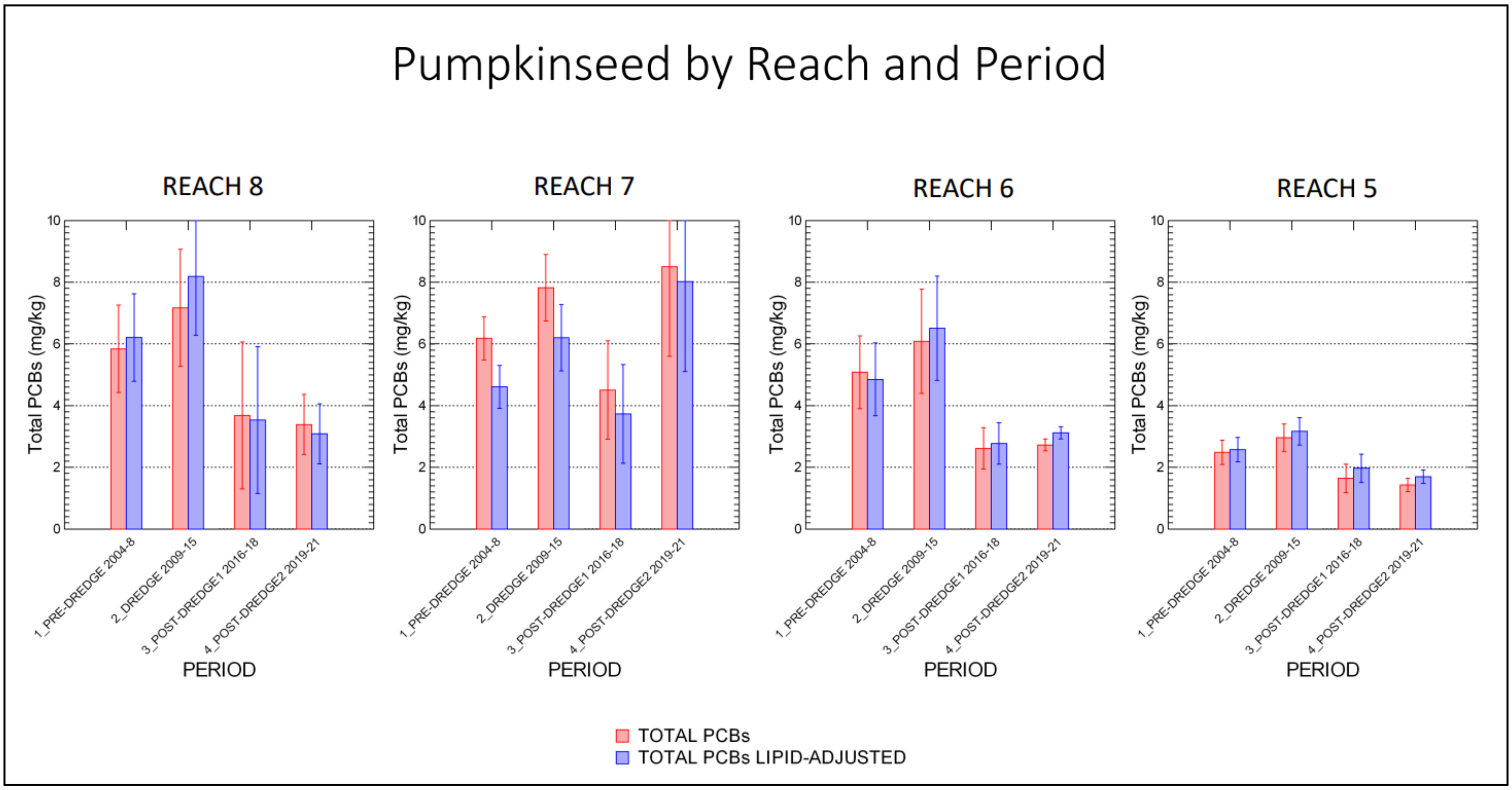
Pumpkinseed data collected during the period of monitored natural recovery is a key factor to take into consideration when evaluating the sport fish data used in EPA's weighted average metric. Pumpkinseed are monitored to represent the year to year changes in PCB exposure conditions in the Upper Hudson, and also represent the food base for the sport fish in the monitoring program. With little change in pumpkinseed PCB concentrations over this period, there is little reason to believe that there has been any significant decline in sport fish concentrations during this same period. This, combined with the observations noted in the November 2023 FOCH report that there has been little decline in PCB concentrations in the average top two inches of surface sediment during the period of monitored natural recovery, is an important element of the FOCH finding that the remedy is not performing as anticipated and that the appropriate protectiveness determination in the upcoming FYR should be not protective.

The pumpkinseed data set in the Upper Hudson represents a continuous series of data from the start of the baseline monitoring program in 2004, continuing to the present, and is one of the most complete data sets available for PCB concentrations in Upper Hudson fish. In the graphs below, the pumpkinseed PCB data are grouped into four time periods; before dredging, during dredging, during the first three years post dredging, and the second three-year period after dredging. While there has been some small reduction after dredging, there appears to be little improvement during the post-dredging period of monitored natural recovery. In these graphs, both the total PCB data and lipid-adjusted PCB (taking into account changes in lipid content in the samples) are presented. *(It is important to note that EPA has not included Reaches 1 through 4 in the routine monitoring program; as a result, Figure No. 7 below depicts the available data for Reaches 5 through 8, from Mechanicville to Fort Edward.)*

[6] The three main sport fish used in the weighted average metric used by EPA are Black Bass (47%), Bullhead (44%), and Perch (9%).

FIGURE 7.

Total PCB Concentrations in Pumpkinseed by River Reach and Period



E. Fish Data Summary

As described in the November 2023 report, FOCH found that the concentrations of PCB in Upper Hudson fish have not recovered as anticipated at the time of remedy selection. Using the reach and species weighted total PCB metric developed by EPA, the FOCH coalition found that the first targeted PCB concentration (0.4 mg/kg total PCB, to be met five years after dredging) was not met in 2020, and remains unmet today.

Further analysis of the available fish data has also led to the finding that the apparent decline in fish PCB concentrations after dredging is primarily due to changes in fish lipid concentration. When accounting for the measured declines in fish lipid concentrations, the FOCH coalition has found that there has been little change in fish PCB concentrations.

EPA anticipated at the time of remedy selection that there would be an ongoing decline in fish PCB concentrations of approximately 8% per year. This anticipated decline is not observed in the available total PCB data. Additionally, after accounting for changes in fish lipid concentrations, the apparent rate of decline appears to also be very small.

V. PCB Concentrations in Sediment After Dredging

A. PCB Concentrations in Sediment Have Failed to Decline as Anticipated in the ROD

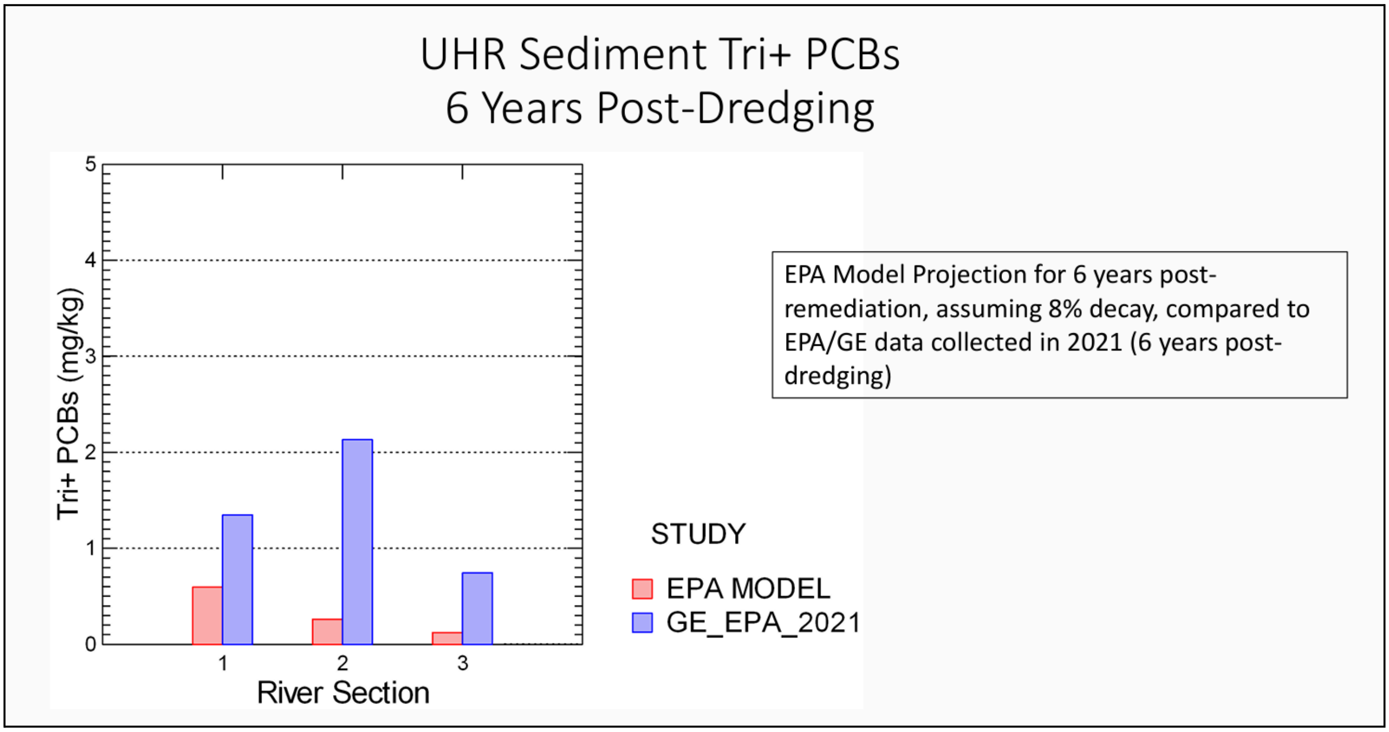
As described in the November report, the FOCH coalition found that there has been little improvement in surface sediment PCB concentrations after the sediment removal was completed. Throughout the Upper Hudson, surface sediment PCB concentrations were found in 2021 to be similar, or even higher, than was found after dredging in 2016 and 2017.

Unfortunately, as the sediment monitoring programs only sampled the top two inches of sediment, EPA is unable to compare surface sediment PCB concentrations to target cleanup levels for the surface which were based on PCBs in the surface top 12 inches. As a result, the currently bioavailable sediments in the Upper Hudson have not been evaluated after sediment removal, and the changes (if any) in the available PCB exposure to biota from the remaining contaminated sediment cannot be quantified. In Figure No. 8 below, the surface sediment PCB concentrations in 2021 are compared to the concentrations that would be expected given the anticipated 8% per year reduction starting with the first post-dredging sampling events in 2016/17. (*The metric presented, Tri Plus PCBs, is one used by EPA to define those PCBs that accumulate most in fish - those with three or more chlorine atoms in the PCB molecules).*

One conclusion that can be drawn from the available data is that the rate of change in post-dredging sediment PCBs between 2016 and 2021 is much less than expected throughout the Upper Hudson. Six years after dredging, PCB concentrations in the top two inches of surface sediment remain higher than models used by the ROD to predict remedial effectiveness.

FIGURE 8.

Tri+ PCB Concentrations in Upper Hudson River Sediment Samples Collected in 2021 Compared to Tri+PCB Concentrations in Upper Hudson River Sediment Projected to be Achieved in 2021 by EPA's Models[7]

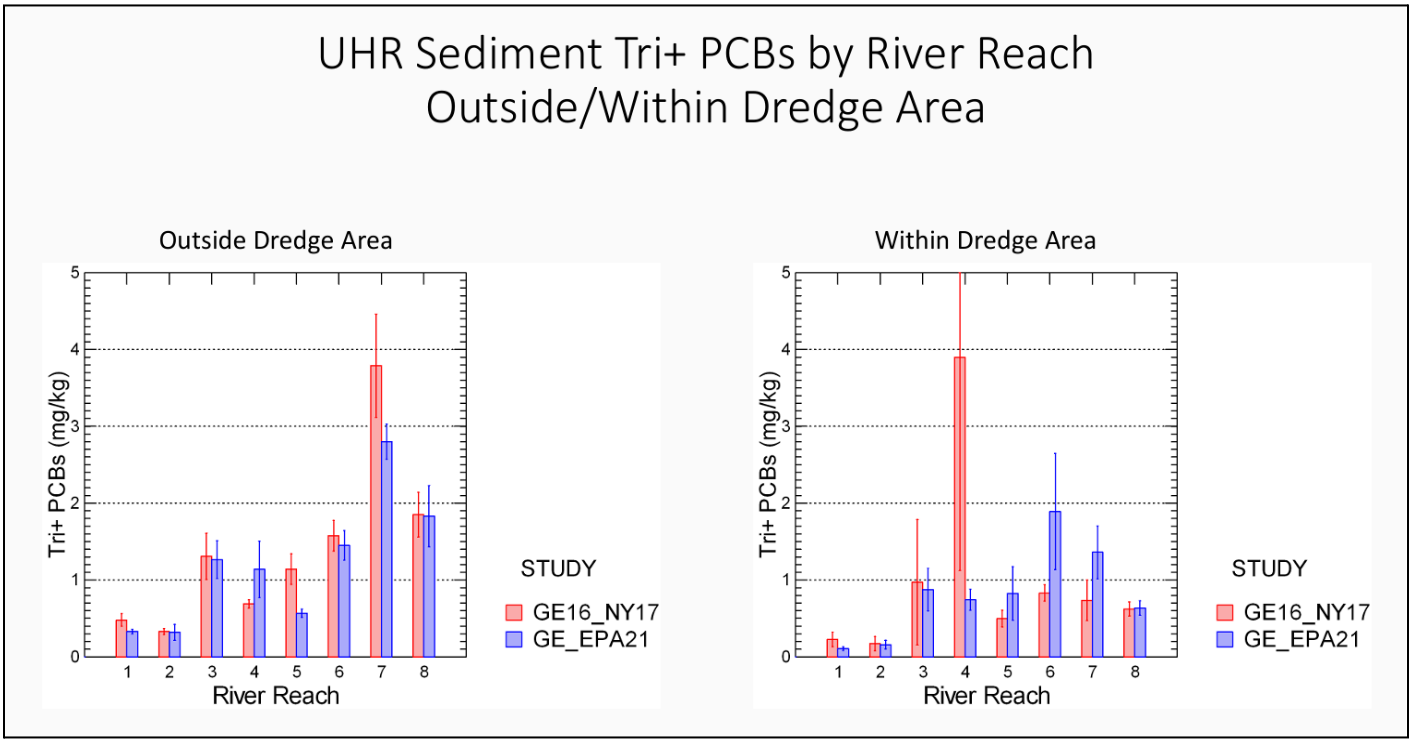


[7] Tri Plus PCBs is one metric used by EPA to define those PCBs that accumulate most in fish - those with three or more chlorine atoms in the PCB molecules.

PCB concentrations in the top two inches of surface sediment in areas that were dredged are also much higher than EPA expected in the 2002 ROD, indicating re-contamination from un-dredged PCB-contaminated sediment. Re-contamination of dredged areas is particularly high in River Section 2, where highly elevated concentrations in surface sediment adjacent to dredged areas were documented.

FIGURE 9.

Tri+ PCB Concentrations in Upper Hudson River Sediment Samples Collected in 2016/17 Compared to Tri+PCB Concentrations in Upper Hudson River Sediment Samples Collected in 2021 Based on River Reach and Dredge Area

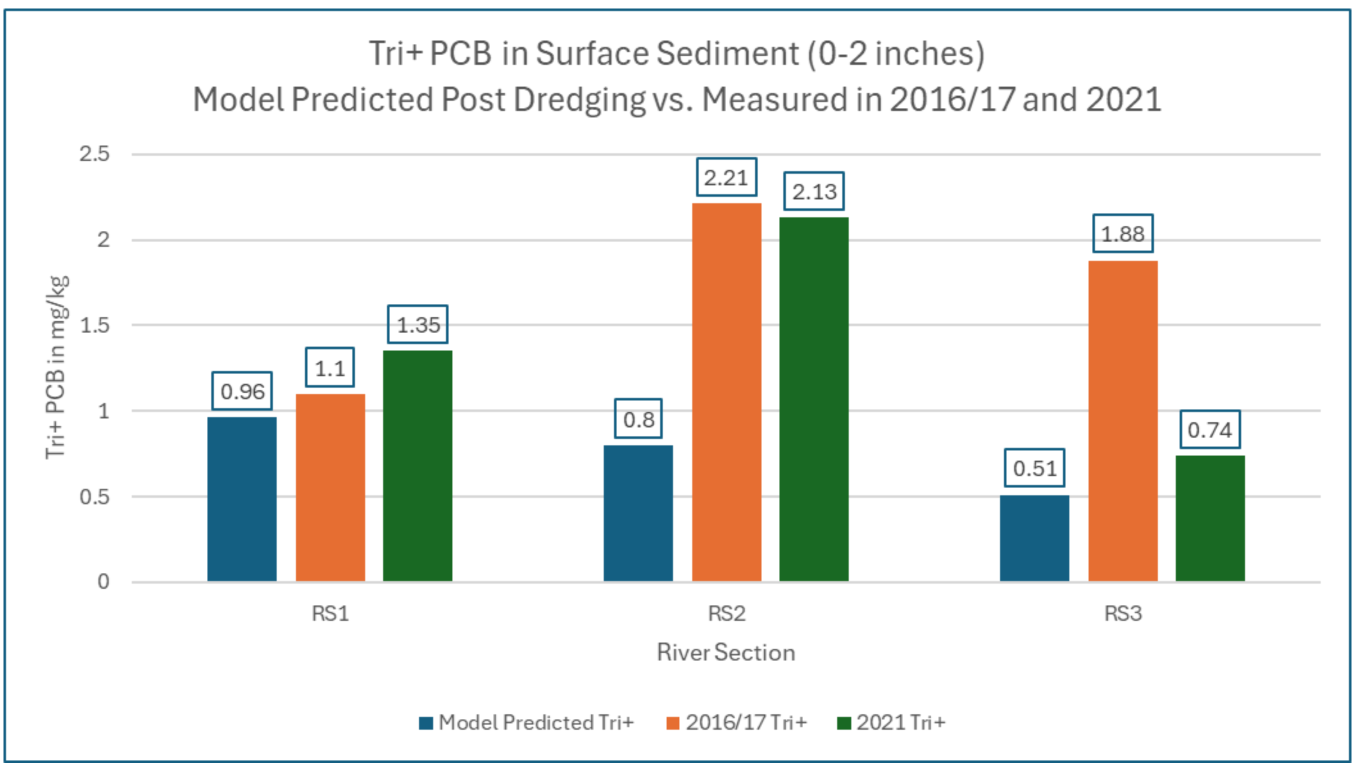


B. EPA's Anticipated PCB Decline in Surface Sediment has not Been Observed in Post Dredging Monitoring

In reviewing the available information related to EPA's anticipated sediment concentrations (in the top two inches) after dredging, the FOCH coalition also reviewed a memo issued by EPA in May 2012. In this memo, EPA summarized the available sediment PCB data and published a table comparing the anticipated PCB concentrations before and after dredging at the time of remedy selection. The anticipated post-dredging surface sediment PCB concentrations, when viewed in concert with the relative stability of the surface PCB concentrations measured in 2016/17 and in 2021, indicate that the magnitude of remaining surface PCB concentrations, and the lack of recovery in the surface PCB concentrations, are not in keeping with EPA's anticipated performance of the remedy.

FIGURE 10.

Tri+ PCB Concentrations in Upper Hudson River Sediment Samples Collected in 2016/17 Compared to Tri+PCB Concentrations in Upper Hudson River Sediment Samples Collected in 2021 and Tri+ PCB Concentrations in Upper Hudson River Sediment Projected to be Achieved in 2021 by EPA's Models



VI. Status of Upper Hudson Remedy

The FOCH coalition concludes that the performance of the remedy has proven to be much less complete than EPA believed at the time of remedy selection. Sediment PCB concentrations indicate that there has been little recovery during monitored natural recovery. In addition, when taking into account changes in fish lipid concentrations, there appears to be little improvement in PCB concentrations in Upper Hudson River fish.

The observed PCB concentrations in bass, bullhead, and perch (the sport fish species that make up the EPA's composite metric) follow similar patterns as other data from pumpkinseed and surface sediment. As described above and in the November 2023 FOCH report, there has been little improvement in both surface sediment and pumpkinseed.

The data available support the conclusion that the monitored natural recovery element of the remedy is not functioning as anticipated and that the targeted reductions in fish and sediment PCB concentrations in the Upper Hudson have not occurred. Surface sediment, pumpkinseed, and sport fish data all show similar trends – limited improvement as compared to the declines anticipated by EPA at the time of remedy selection. As a result, the FOCH coalition recommends that the appropriate protectiveness determination for the current Five-Year Review should be "not protective."

VII. Conclusion

The FOCH coalition finds that sufficient data exists for EPA to draw conclusions on the performance of the remedy at this time. EPA has been, since the last five-year review report, stating that sufficient data had yet been collected to evaluate the trends in fish PCB concentrations in the Upper Hudson. However, this report concludes that sufficient data exists to understand the performance of the remedy, particularly the performance of monitored natural recovery as compared to the anticipated performance of the remedy at the time of remedy selection. This conclusion is based primarily on available sediment and fish tissue data collected in the Upper Hudson since the active portions of the remedy (source control and targeted dredging of contaminated sediments) have been completed.

Attachment 5

Professional Resume of
Kevin L. Farrar

Kevin L. Farrar
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Kfarrar104@yahoo.com

Professional Summary

32 years of experience in the hazardous waste remedial program at the New York State Department of Environmental Conservation (NYSDEC).

Currently consulting with Scenic Hudson to evaluate environmental quality data, to support advocacy efforts related to the Hudson River PCB Site.

Skills

Site Characterization, Remedy Selection, and Remediation

Interpretation of Environmental Quality and Exposure Data

Conceptual Site Model Development and Refinement

Public Presentations

Work Experience

12/08 – 7/19: Engineering Geologist 3, NYSDEC, Albany NY

- Managed a unit responsible for remediation of major hazardous waste sites in New York State, including the Hudson River PCBs Site.
- Represented NYSDEC at EPA's Hudson River Community Advisory Group meetings, to answer questions and make technical presentations concerning the State's efforts on addressing the PCB pollution in the Hudson River.
- Act as expert resource for DER staff to consult on technical and project management issues, including PCB remediation, remedy selection, geology/hydrogeology and geotechnical issues, data interpretation and analysis, and conceptual site model development.

8/92 to 12/08: Engineering Geologist 2, NYSDEC, Albany NY

- Led the NYSDEC efforts on remedial programs at several major Superfund sites, including primary responsibility for data interpretation and analysis, conceptual site model development, and remedy selection.

• Co-chaired the DER program development working group on the remedy selection process which led to significant legislative changes in the remedial program, including the mandate for development of Soil Cleanup Objectives in NYSDEC regulations.

• Testified during administrative hearings as an expert witness on issues related to the movement of PCBs in the environment.

• Performed numerous public meetings to explain the results of site investigations and describe remedial alternatives.

6/86 to 8/92: Junior / Assistant Engineering Geologist, NYSDEC, Albany NY

• Performed day to day project management, data analysis and interpretation, and remedy selection for numerous remedial sites throughout New York State.

Education

BS (Geology), 1985, State University of New York at New Paltz

Presentations

I have made numerous presentations upon invitation on various subjects to internal audiences at NYSDEC, and at USEPA, the Hudson River Environmental Society, the Hudson River Foundation, and the Association of State and Territorial Solid Waste Management Officials. Subjects of these presentations cover a broad range of technical and administrative issues related to the hazardous waste site remedial program. I also made regular presentations to EPA's Community Advisory Group for the Hudson River PCBs site, addressing the State's involvement in the site, from 2005 to 2019.

Attachment 6

Professional Resume of
Jay Field

L. Jay Field
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EDUCATION:

University of Washington School of Fisheries, M.S. Fisheries Biology 1984

University of Michigan, B.A. Biology (Honors) 1968

EXPERIENCE

1975-1986:
Jay Field worked as a fisheries biologist on a wide variety of projects assessing the potential impacts of oil (and other) development activities on fishery resources.

1986 to 2017:
Jay Field worked as a marine biologist and environmental scientist for NOAA's Office of Response and Restoration (ORR) in Seattle since 1986 until his retirement in the fall of 2017. Primary responsibilities included the evaluation of the potential effects of hazardous chemicals on aquatic resources and identification of ways to minimize those effects. This work required detailed knowledge of the biological and physical transport of pollutants and the effects of these pollutants on aquatic resources. A major aspect of this work involved the development of cost-effective study plans, including the selection of sampling and analytical protocols for evaluating hazardous waste site impacts. His major areas of expertise include the fate and effects of PCBs and dioxins, development of sediment quality guidelines, ecological risk assessment, the evaluation of physical processes such as sediment transport and hydrodynamic models, geochemistry, toxicology, fisheries, aquatic biology and database management. His involvement with remedial investigations and natural resource damage assessments of several major PCB river Superfund sites in the U.S., including the Hudson, Passaic, Newtown Creek, Berry's Creek, Kalamazoo, Sheboygan, and Duwamish rivers, has addressed technical issues related to PCB congener analysis, geochemistry, sediment transport, hydrodynamic and food-web modeling, toxicological effects of PCBs on fish and invertebrates, chemical source identification, and long-term remedial effectiveness monitoring. In a multi-year collaboration with an EPA Office of Research & Development (ORD), Jay developed a new approach to developing sediment quality guidelines involving logistic regression modeling that estimates the probability of sediment toxicity to marine and freshwater amphipods from sediment chemistry. The results of this work have been published in three peer-reviewed journal articles and an EPA – NOAA report. The approach was adopted by the EPA National Sediment Inventory to classify sediment chemistry in their 2004 Report to Congress assessing sediment conditions throughout the U.S. Jay collaborated with the State of California in the development and application of sediment toxicity models as a major component of the California Sediment Quality Objectives Project. The approach has also

been applied to the Portland Harbor Superfund site and as a tool to scale benthic injury at other sites. Jay developed the database for sediment chemistry, tissue chemistry, and sediment toxicity that serves as the foundation for ORR's watershed database and mapping projects. Jay also guided the development of ORR's Query Manager™ , an application that allowed users to easily extract and view data in a spatial context. During the Exxon Valdez Oil Spill, Jay managed the response to subsistence seafood safety issues for ORR and was lead editor of a multidisciplinary book that discussed lessons learned in evaluating and communicating subsistence seafood safety in a cross-cultural context. Jay has served on several technical advisory committees for US EPA for the Remedial Investigation of the Hudson River PCBs Superfund site, the National Sediment Inventory methodology evaluation, Kalamazoo River PCB fate and sediment transport modeling advisory group, and the EPA Great Lakes National Program Office guidance manual to support the assessment of contaminated sediments in the Great Lakes. Jay was an invited participant to an EPA Science Advisory Board review of the EPA sediment research program and made recommendations for important sediment research questions.

<u>2018 to 2019</u>
Jay Field worked part-time as an independent consultant on environmental issues related to PCBs and other contaminants in coastal rivers, providing data analysis and interpretation and document reviews.

<u>2019 to 2022</u>
Jay Field worked as a consultant to NOAA on environmental issues related to PCBs and other contaminants in coastal rivers, providing data analysis and interpretation and document reviews.

<u>2023 to Present</u>
Jay Field serves as an technical advisor to Hudson Riverkeeper on issues related to the Hudson River Superfund site Five Year Review and Lower Hudson River investigation.

AWARDS

NOAA Administrator's Award. 2017. For revealing the extended time needed for fish on the lower Hudson River to be safe for human consumption after a mandated dredging remedy.

NOAA Distinguished Career Award. 2012. For exceptional contributions to advancing the assessment, clean-up, and restoration of contaminated NOAA trust resources and habitats nationwide via the development, distribution, and application of innovative ecological risk assessment tools and approaches.

NOAA Administrator's Award 2009. For providing critical technical, legal and strategic leadership in settlement negotiations to expand and expedite clean up at the Kalamazoo River Superfund Site.

NOAA Bronze Medal Award 2008. For finding innovative solutions to reduce toxic threats to the public's natural resources and restore habitats at the Hudson River Superfund site. December 2008.

Florida Technical Communication Competition "Excellence" award 2000. For Evaluating And Communicating Subsistence Seafood Safety In A Cross-Cultural Context: Lessons Learned From The Exxon Valdez Oil Spill. Society of Environmental Toxicology and Chemistry technical publication. Pensacola, FL. 338 p.

Department of Commerce Silver Medal Award 1992. For outstanding scientific support to Federal On-Scene Coordinators during HAZMAT emergency response to the Exxon Valdez Oil Spill. November, 1992.

PUBLICATIONS & PRESENTATIONS

Field LJ, JW Kern, LB Rosman. 2016a. Re-visiting projections of PCBs in Lower Hudson River fish using model emulation. Science of the Total Environment 557–558: 489–501.

Field LJ, JW Kern, LB Rosman. 2015. Re-Visiting Model Projections of Lower Hudson River Fish PCBs. Invited presentation. EPA's Contaminated Sediment Forum on August 20, 2015.

Field LJ, JW Kern, LB Rosman. 2015. Re-Visiting Model Projections of Lower Hudson River Fish PCBs Using Model Emulation and Recent Data. Presentation at Hudson River Foundation, New York City. May 2015.

Field LJ, JW Kern, LB Rosman. 2015. Using Model Emulation with New Data to Evaluate Mechanistic Model Projections of Lower Hudson River Fish Tissue PCBs. Battelle Eighth International Conference on Remediation and Management of Contaminated Sediments, New Orleans, JAN 2015.

Myre PL, Shorr B, Field LJ, Sayler C, Severn CG, Oelrich J. 2014. "What is a Sample? Complexities of Sharing Contaminant Data Across Multiple Data Management Platforms." Data Management and Informatics Supporting Gulf of Mexico Oil Spill and Ecosystem Science. January 26, 2014

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Field LJ, SB. Norton 2013. Are region-specific models better predictors of sediment toxicity than national models? Poster presentation. Society of Environmental Toxicology and Chemistry North America 33rd Annual Meeting. Long Beach, CA.

Bay SM, Ritter KJ, Vidal-Dorsch DE, Field LJ. 2012. Comparison of national and regional sediment quality guidelines for classifying sediment toxicity in California. Integrated Environmental Assessment and Management 8:597-609.

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Field J, J Kern, LB Rosman. 2011 The Importance of Natural Recovery Rate Estimates for Application of Risk Assessment Outcomes to Remedial Decisions. Platform presentation at Society of Environmental Toxicology and Chemistry North America 32nd Annual Meeting. Boston, MA.

Shephard B, M. Poulsen, L. Peterson, J. Field, D. MacDonald, J. Goulet. 2010. Reliability for Dummies: A Reference on Sediment Quality Benchmark Accuracy for the Rest of Us. Poster at Society of Environmental Toxicology and Chemistry North America 31st Annual Meeting. Portland, Oregon. November 7–11, 2010.

Field LJ, JW Kern, LB Rosman. 2009. Evaluation of Natural Recovery Models for Sediment in the Upper Hudson River. Poster presented at Battelle Fifth International Conference on Remediation of Contaminated Sediments. Jacksonville, FL.

Rosman LB, LJ Field,T Brosnan. 2008. Sediment PCB contamination in the especially sensitive or unique habitats of the Upper Hudson River. Poster presented at 2008 Society of Environmental Toxicology and Chemistry meeting, Tampa, FL.

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