



*NJ Department of Environmental Protection
Division of Science & Research*

Route 31 Sludge Disposal Site Fish Tissue Sampling and Fish Consumption Advisory Recommendations for the Musconetcong River

March 2026

Fact Sheet Prepared by:

*Daniel R. Millemann, Ph.D.; Division of Science & Research
Brian Henning M.S.; Bureau of Freshwater & Biological Monitoring*

Project Summary:

Resident and hatchery raised fish were collected from three sites along the Musconetcong River. Two sites were located near the confluence of two tributaries affected by the Rt 31 Sludge Disposal Site, an area known to have historical contamination from per- and polyfluoroalkyl substances (PFAS), while a third site in the Point Mountain Trout Conservation Area served as a reference location. Fillet samples from the collected fish were tested for contaminants known to cause fish consumption advisories: PFAS, polychlorinated biphenyls (PCBs), and mercury (Hg). Rainbow trout sampled directly from the Pequest trout hatchery had the lowest concentrations of contaminants compared to resident fish. PFOS concentrations result in the strictest advisory recommendations for all fish cohorts tested. Rainbow trout captured in the wild also had significantly lower concentrations of PFOS tested than resident fish at each site. Other PFAS, Hg, and PCB results were negligible for advisory calculations when compared to PFOS results.

What was the purpose of the study?

A rural area along Route 31 in Washington Twp., Warren County, New Jersey, has become a focal point for environmental PFAS investigations since 2019 due to historic land application of industrial sludge from a former textile manufacturing facility, known as Castle Creek Fabrics and Northern Dyeing Corporation. The industrial sludge was spread over at least 45 acres of farmland from the late 1950s through the 1970s and now impacts the groundwater beneath over 2,000 acres of residential, commercial, and agricultural land (US EPA, 2025). The United State Environmental Protection Agency (US EPA) is currently conducting an assessment under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly referred to as Superfund) to evaluate the site conditions for removal action eligibility and placement on the National Priority List. The Musconetcong River, a National Wild & Scenic River¹, borders the southern extent of this area of concern. Elevated PFAS concentrations have been detected in two tributaries that are fed by seeps and springs originating from the study area and drain directly into the

¹ National Wild and Scenic River page for the Musconetcong River: <https://rivers.gov/river/musconetcong>

Musconetcong River near the Shurts Road and New Hampton Road overpasses. Other potentially affected waterbodies include the Pohatcong Creek (Zervas, 2024).

The New Jersey Department of Environmental Protection (NJDEP) Division of Science & Research (DSR) maintains a fish consumption advisory program to assess and provide guidance to residents on the health risks of eating fish caught in New Jersey. Several contaminants, including mercury (Hg), polychlorinated biphenyls (PCBs), pesticides, and PFAS, are known to bioaccumulate in fish tissue to levels that may cause harm to those consuming fish. PFAS are increasingly gaining attention as contaminants of concern related to fish consumption advisories, as evidence shows that recreationally caught freshwater fish are likely a leading source of PFAS exposure (Barbo et al, 2023). Contaminant data are collected primarily through the State's routine fish tissue monitoring program, led by the NJDEP Bureau of Freshwater and Biological Monitoring (BFBM). Additional research projects and partner agencies often supplement these data and are considered for the development of advisories (Keller et al, 2024). Stocked trout, sourced from the Pequest Trout Hatchery (Warren County, NJ), are not typically sampled through the New Jersey routine fish tissue monitoring due to the understanding that bioaccumulation of legacy contaminants such as PCBs and mercury is relatively slow, and most stocked trout do not survive year to year. Preliminary data from Maine and the US EPA suggest that PFAS uptake can occur and reach equilibrium in a matter of days to weeks, indicating a potential concern for the uptake of PFAS in stocked fish at sites that may have high concentrations of PFAS. The NJDEP Division of Fish & Wildlife (DFW) stocks thousands of rainbow trout annually along the Musconetcong River (52,410 estimated in Spring 2025², accounting for nearly 10% of all stocked trout during this period).

The objective of this sampling effort is to provide current and comprehensive data on concentrations of PFAS, PCBs, and Hg in edible fish residing in the Musconetcong River, adjacent to the Route 31 Sludge Disposal site. These concentrations can be used to establish the potential for uptake of PFAS in both stocked trout and resident fish affected by the area of concern. Once these concentrations are determined, NJDEP can assess the potential consumption risk to anglers and their families. These data are essential to assess the overall status and trends in levels of contaminants that contribute to water quality impairments, natural resource damage assessments, and fish consumption advisories related to the Rt. 31 Sludge Disposal Site.

What was the general approach of the study?

Resident fish, including American eel (*Anguilla rostrata*), bluegill (*Lepomis macrochirus*), brown trout (*Salmo trutta*), eastern blacknose dace (*Rhinichthys atratulus*), redbreast sunfish (*Lepomis auritus*), and white sucker (*Catostomus commersonii*), as well as stocked rainbow trout (*Oncorhynchus mykiss*), were collected from three stretches along the Musconetcong River (Figure 1), with sample origin points near: Shurts Road overpass

² NJDEP F&W Spring 2025 Trout Allocations: <https://dep.nj.gov/wp-content/uploads/njfw/spring-trout-allocations-2025.pdf>

(40.70432, -74.98765), New Hampton Road overpass (40.72319, -74.95987), and the Point Mountain Trout Conservation Area (TCA; 40.77161, -74.90280). These sites were sampled three times in the spring/summer of 2025, on May 1st, June 25th, and July 17th. A subsequent sampling event occurred on July 24th in the Point Mountain TCA to supplement sample sizes for the primary target species (rainbow trout). Rainbow trout from the Pequest trout hatchery were collected directly from the hatchery as a baseline on May 1st. A small subsample of fish was also collected on May 1st from an unnamed tributary to the Musconetcong River fed by a small spring with elevated PFAS concentrations originating from the study area (hereafter referred to as Shurts Road Spring; 40.70454, -74.98829). All rainbow trout in this study are presumed to be of hatchery origin, with the majority being recently stocked in spring 2025. There is the potential for stocked rainbow trout to persist through the summer and multiple years (holdover) from these locations, but no tagging or marking of individual fish was performed to positively identify each fish as a part of the spring 2025 stocking period. None of the rainbow trout captured in this study exhibited the typical characteristics of a wild rainbow trout and there are no documented naturally reproducing rainbow trout populations in the Musconetcong River watershed (Hamilton and

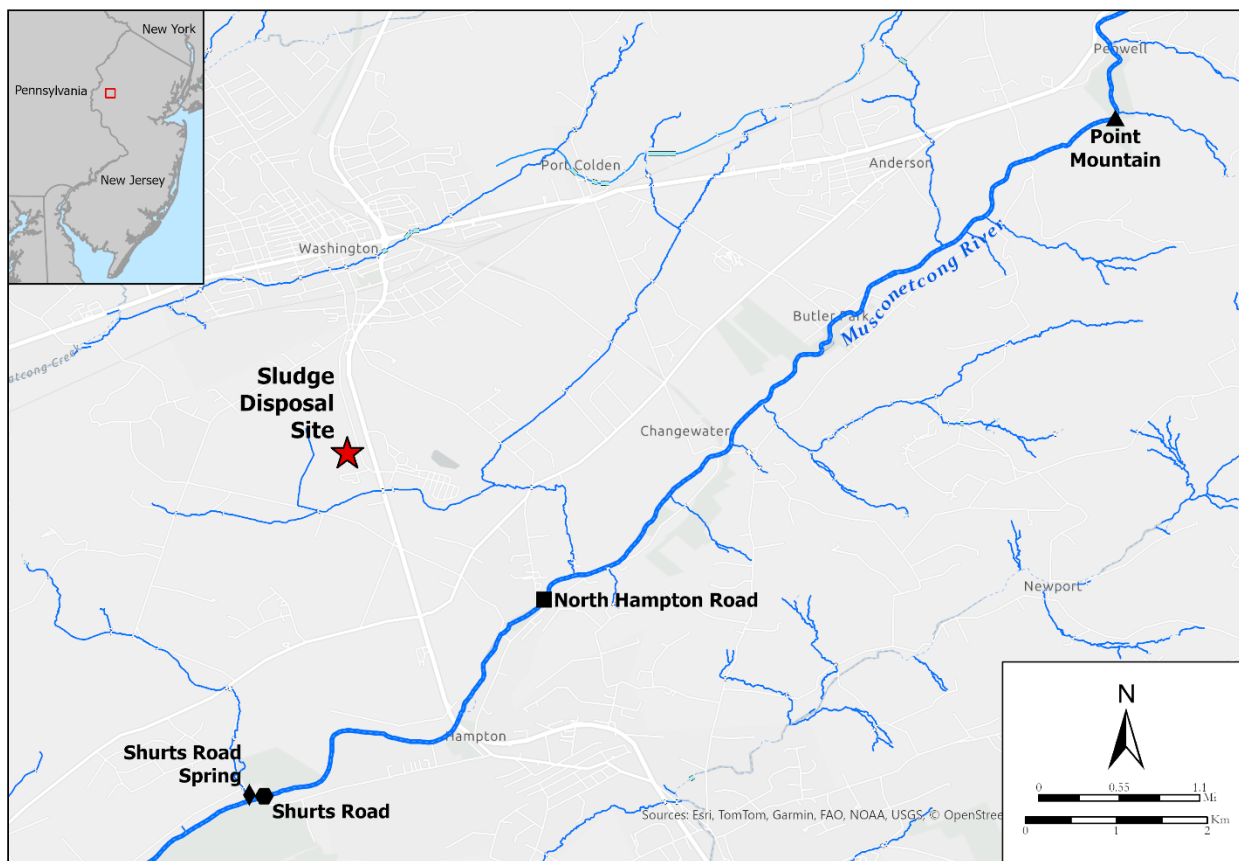


Figure 1. Fish tissue sampling sites with black markers along the Musconetcong River, adjacent to the Route 31 Sludge Disposal site (centered at the red star). The area of concern is approximately 2,200 acres along a 4-mile stretch of the northwestern bank of the Musconetcong River. Water flows from the northeast section of the map to the southwestern corner of the map, with Point Pountain being the most upstream site and Shurts Road being the most downstream site on the mainstem of the Musconetcong River.

Barno, 2005). All brown trout in this study were presumed to be wild, naturally reproducing brown trout and were not stocked by the hatchery. The state of New Jersey has not stocked brown trout since 2013, after an outbreak of the bacterial disease furunculosis at the Pequest trout hatchery (Lovy, 2014).

Sample collection, electrofishing, and sample processing methods are described in the annual routine fish tissue monitoring program's quality assurance project plan (QAPP), *Freshwater Fish Tissue Monitoring Program (2025-2029)*³. Briefly, fish from each of the study sites were collected using an electrofishing barge or multiple backpack electrofishing units as described by Vile and Henning (2019). Target species were temporarily held in buckets and/or live wells until the sampling was complete. Selected fish were culled to meet the project requirements, assigned a unique sample ID number, measured, weighed, packaged in PFAS-free sample bags, and immediately stored on ice for transport back to the NJDEP BFBM lab (Ewing, NJ) for freezer storage. Whole fish were shipped to a contract laboratory for processing and analysis. Fish were filleted at the contracted laboratory to minimize the risk of cross-contamination. Fillets were processed and analyzed for PFAS via US EPA method 1633 (results reported for 39 compounds), total mercury via US EPA method 1631E, and total PCBs via US EPA method 1668A. PCB samples were run as composites of all 5 fish from each cohort (2 cohorts of 5 for Pequest hatchery fish), which minimizes data resolution but meets the primary objective of screening for PCB concentrations and estimating advisory thresholds. In addition to consumable species, twenty five eastern blacknose dace were collected and combined into 5 composites of 5 whole fish (of approximately equal size) during each sampling event to be analyzed for PFAS and support future ecological endpoint assessments. Eastern blacknose dace are a small minnow species that rarely grow larger than 3 inches and are not typically consumed by humans. These data are reported alongside consumable fish species.

Figures and statistics were run using R-studio2025.5.1513 (Posit team, 2025) and JMP Version 16 (SAS Institute Inc., 2022). To compare the differences in PFOS concentration between species at each collection site, all sampling events per site were pooled prior to execution of a Kruskal-Wallis rank sum test followed by a Dunn's test of multiple comparisons using the `kruskal_test()` function within the R package `rstatix` (Kassambara, 2023). Results were considered significant when the $p\text{-value} \leq 0.05$. Fish consumption advisory thresholds were developed following NJDEP guidance at the time of this report (New Jersey Interagency Toxics in Biota Risk Subcommittee, 2024). As a basis for comparison, a meal size for fish is assumed to be 8 oz (uncooked), and daily meals allow for "unlimited" consumption. Average fillet concentrations of contaminants for each species tested at each site (combining all sampling events) were used to develop recommended advisory thresholds for general and high-risk populations according to current NJDEP methodology. These advisories should be considered draft for presentation purposes only.

³ NJDEP Fish Tissue Monitoring webpage: <https://dep.nj.gov/wms/bfbm/fish-monitoring/#tissue>

Please see the NJDEP fish consumption advisory website⁴ for the most up to date advisory information.

Overall, what did the study show?

Generally, fish sampling was successful for all three sampling events. Primary target species included American eel, rainbow trout, and redbreast sunfish due to their relative abundance and relevance as a consumable fish. Secondary target species included brown trout (uncommon), bluegill sunfish (uncommon), white sucker (not often consumed), and eastern blacknose dace (not often consumed). Table 1 shows the summary of fish that were analyzed for contaminants via at least one of the reported methods. Target numbers of American eel and rainbow trout were successfully collected from all sites at all sampling events. Redbreast sunfish were successfully collected at 7 of the 9 possible sampling events. All fish samples were analyzed for PFAS, all fish except eastern blacknose dace were analyzed for mercury, and equal mass composites of American eel, brown trout, and rainbow trout were analyzed for PCBs.

Contaminant data summary tables, calculated draft advisories, and current advisory thresholds are presented in Appendix A. New Jersey advisory calculations based on PFAS are only applicable for PFOS, PFOA, PFNA, and PFUnA at this time based on developed toxicity factors and thresholds. PFOS was detected in 99% (206 out of 208) of fish tissue samples (Table 2) and is the primary contaminant of concern based on the site profile, likelihood to bioaccumulate, and results of the current study. PFOS results were below the detection limit for two hatchery collected rainbow trout. The mean PFOS concentration for stocked rainbow trout was lower than other species at each site (Table 3; Figure 3), and comparison to advisory thresholds generally resulted in favorable (unlimited/daily or weekly) consumption recommendations (Appendix A). Rainbow trout from the Pequest Trout Hatchery had the lowest average concentration of PFOS (0.3 µg/kg) while American eel from Shurts Road Spring had the highest average concentration of PFOS (78 µg/kg). Eastern blacknose dace PFOS concentrations were also relatively high, which is consistent with other sources documenting that whole body concentrations are typically higher than muscle fillet concentrations (Blazer et al. 2023, Walsh et al. 2025). Rainbow trout had significantly lower PFOS concentrations compared to other fish at each site (Appendix B). The concentration of PFOS in hatchery reared rainbow trout were significantly lower than the rainbow trout collected from the Musconetcong River at New Hampton Road and Shurts Road ($p < 0.0001$, Figure 3). Rainbow trout PFOS concentrations did not significantly differ from hatchery reared fish at Point Mountain and Shurts Road Spring (Figure 3).

PFOS concentrations also differed between resident fish species at each site (Figure 3). American eels from Point Mountain TCA had significantly lower PFOS concentrations than Shurts Road Spring ($p < 0.0001$), Shurts Road ($p < 0.0001$), and New Hampton Road ($p < 0.001$) (Figure 3). Eastern blacknose dace from Point Mountain TCA had significantly lower

⁴ NJDEP Fish Consumption Advisory Page: <https://dep.nj.gov/dsr/fish-advisories-studies/>

PFOS concentrations than Shurts Road ($p < 0.001$) and New Hampton Road ($p < 0.001$) (Figure 3). Redbreast sunfish and all sunfish (redbreast sunfish and bluegill combined) from Point Mountain TCA had significantly lower PFOS concentrations than Shurts Road ($p < 0.01$ and $p < 0.001$ respectively), but not significantly lower than New Hampton Road (Figure 3). White sucker from Point Mountain TCA had significantly lower PFOS concentrations than from Shurts Road ($p < 0.05$) (Figure 3).

Table 1. Sample result summary, including the number of individuals for each species collected. *Sample numbers for eastern blacknose dace represent 5 whole-body composites of 5 comparably sized individuals.

Site Name <i>Lat, Long</i>	Species	Sample Date (2025)			Total
		May 1st	June 25th	July 17th & 24th	
Pequest Hatchery 40.83635, - 74.94547	Rainbow trout	10			10
Musconetcong River within Point Mountain Trout Conservation Area 40.77161, - 74.90280	American eel	5	5	5	15
	Bluegill			3	3
	Brown trout	1		4	5
	Eastern Blacknose Dace	5		5	10
	Rainbow trout	5	5	5	15
	Redbreast Sunfish		5	9	14
	White Sucker			5	5
Musconetcong River near New Hampton Road overpass 40.72319, - 74.95987	American eel	5	5	5	15
	Eastern Blacknose Dace	5		5	10
	Rainbow trout	5	5	5	15
	Redbreast Sunfish	5		5	10
Musconetcong River near Shurts Road overpass 40.70432, - 74.98765	American eel	5	5	5	15
	Brown trout		1	1	2
	Eastern Blacknose Dace	5		5	10
	Rainbow trout	5	5	5	15
	Redbreast Sunfish	5	4	5	14
	White Sucker	5	5	5	15
Shurts Road Spring (unnamed tributary) 40.70454, - 74.98829	American eel	5			5
	Brown trout	3			3
	Rainbow trout	2			2

Table 2. PFAS detection frequencies from fish collected from the Musconetcong River for PFAS used to develop fish consumption advisory determinations. A full list of PFAS detection frequencies, maximum observed concentrations, and detection limit ranges are in Appendix A.

Parameter	Detections in Fish Tissue	Total Samples Tested	Detection Frequency
PFNA	124	208	60%
PFOA	80	208	38%
PFOS	206	208	99%
PFUnA	182	208	88%

Additional PFAS (PFOA, PFNA, and PFUnA) detection frequencies for compounds with advisory-development potential are also listed in Table 2. Generally, rainbow trout had significantly lower PFAS concentrations than other species at each site. In depth statistical analyses are not presented here, but summary concentrations and advisory thresholds can be found in Appendix A, including detection frequencies for all 39 PFAS analyzed. Mercury was detected in all samples tested, and hatchery trout had significantly lower levels of Hg than rainbow trout from Shurts Road ($p < 0.0001$), New Hampton Road ($p < 0.001$), and Point Mountain TCA ($p < 0.001$; Appendix B, Figure 4). Additional tissue results are summarized in Appendix A, Appendix B, and supplemental information. PCBs were also detected in all samples, but there were no significant differences in PCB concentrations between species or across sites. Small sample sizes due to the use of composites for PCB analyses decrease the data resolution, and data usability is limited to advisory calculations and recommendations. Kruskal-Wallis test at a significance of $p \leq 0.05$, and Dunn's multiple comparison for paired differences. Compared to PFOS, the other PFAS, Hg, and PCB results were negligible for advisory calculations based on current advisory thresholds.

Table 3. Mean PFOS concentrations ($\mu\text{g}/\text{kg}$) for each species at each site. NA = Species not collected at that site; +/- indicates 1 standard deviation, N = number of samples analyzed

Species	Hatchery	Point Mountain	New Hampton Road	Shurts Road	Shurts Road Spring
American Eel	NA	9.56 +/- 2.83, N= 15	26.34 +/- 9.61, N= 15	29.13 +/- 11.65, N= 15	77.96 +/- 33.39, N= 5
Bluegill	NA	10.07 +/- 6.98, N= 3	NA	NA	NA
Brown Trout	NA	12.26 +/- 7.46, N= 5	NA	45.6 +/- 31.11, N= 2	50.63 +/- 21.9, N= 3
Eastern Blacknose Dace	NA	17.68 +/- 5.23, N= 10	58.99 +/- 26.67, N= 10	56.48 +/- 20.19, N= 10	NA
Rainbow Trout	0.3 +/- 0.08, N= 10	1.19 +/- 0.73, N= 15	3.81 +/- 2.67, N= 15	4.87 +/- 6.6, N= 15	1.09 +/- 0.86, N= 2
Redbreast Sunfish	NA	12.2 +/- 5.78, N= 14	16.85 +/- 11.08, N= 10	22.88 +/- 9.21, N= 14	NA
White Sucker	NA	11.36 +/- 3.56, N= 5	NA	18.62 +/- 6.26, N= 15	NA

Mean concentration of PFOS ($\mu\text{g}/\text{kg}$) in fish tissue +/- SD, N= number of samples

Discussion:

Generally, the highest PFAS concentrations in fish filets were found at the Shurts Road and New Hampton Road sites, located downstream of tributaries known to be affected

by the Rt. 31 Sludge Disposal site. PFOS had the highest detection frequency (99%) and is the primary driver of all advisory recommendations for this study. Detection frequencies for PFUnA (89.4%), PFNA (59.6%), and PFOA (38.5%) indicate their presence, but their concentrations were generally negligible alongside PFOS for advisory recommendations. The elevated PFOS concentrations found in fish tissue are consistent with our hypothesis that fish from these locations are accumulating PFAS originating from the area of concern. American eel collected from Shurts Road Spring had significantly higher PFOS concentrations than all other fish cohorts, indicating that fish from the affected tributaries may be more impacted relative to the main stem of the Musconetcong. The overall biomass of consumable fish is likely low in these tributaries, but cool water species such as rainbow, brown, and brook trout are known to inhabit cool shallow waters, so focused efforts to test these fish in these tributaries would help to evaluate the impacts on these species.

All rainbow trout collected as part of this study were assumed to be stocked fish originating from the Pequest hatchery either just prior to or during the study period. Due to the nature of fish stocking programs, it is very difficult to confirm that fish collected as part of this study were stocked recently or from prior stocking events. Some larger rainbow trout were collected during the first sampling event at the Shurts Road site, which resulted in the highest mean concentration of PFOS for the species in this study. These results may indicate that some rainbow trout may have been in the Musconetcong River prior to the spring 2025 stocking. Overall, stocked fish showed slight increases in PFAS concentrations once collected in the Musconetcong River watershed relative to hatchery fish. Still, overall hatchery fish

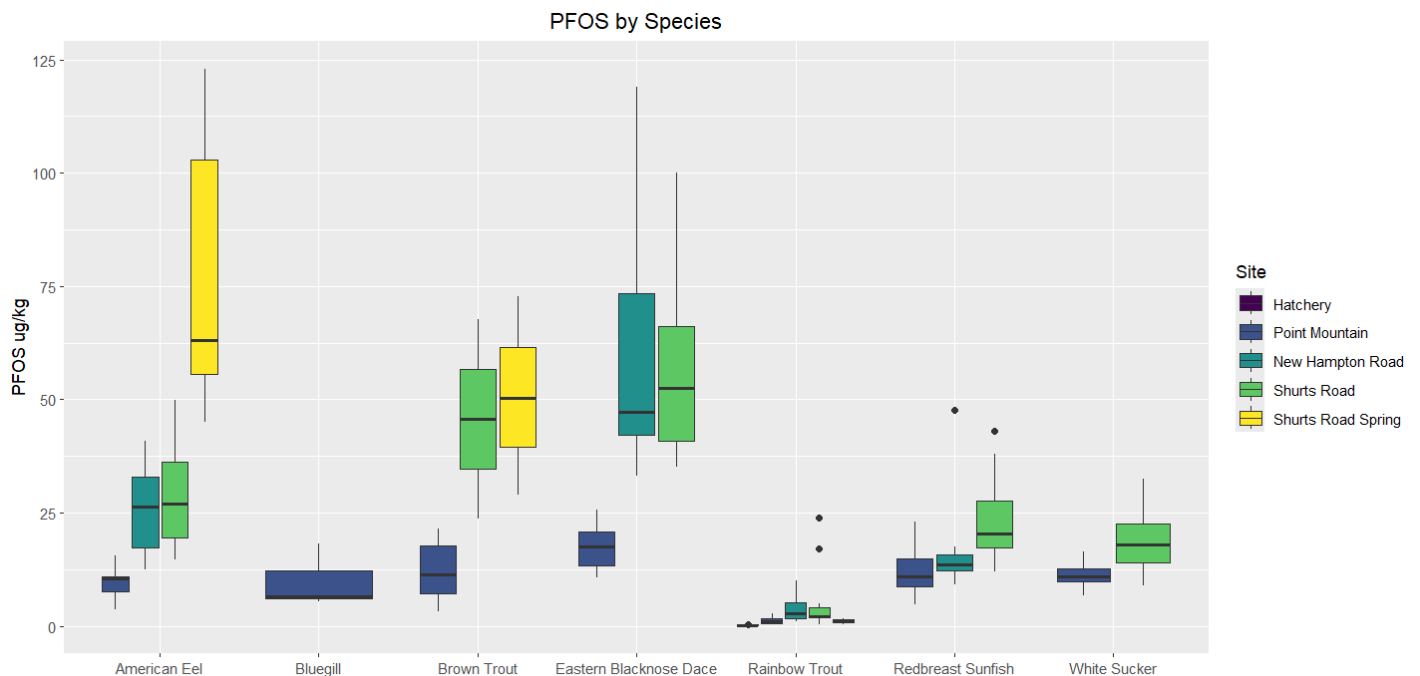


Figure 2. Boxplot of the concentration of PFOS (ug/kg) for each of the seven fish species collected across the three primary sampling locations on the Musconetcong River (Point Mountain, New Hampton Road and Shurts Road), sub sampling location (Shurts Road Spring), and control site (hatchery). Black horizontal bars inside each box indicate the median. The top and bottom of the box represent the first and third quartiles.

were lower than resident fish for all tested contaminants (Appendix A, Appendix B). Rainbow trout maintained significantly lower levels of PFOS than resident fish in all sample cohorts.

Surprisingly, PFAS concentrations decreased at each subsequent sampling event in target species (Appendix B, Figures 1-3). This result is unexpected based on the assumption that stocked fish would accumulate contaminants over time after being introduced to contaminated waterways. Additional comparisons with surface and ground water concentrations may indicate changes in groundwater recharge or runoff sources that could dilute the impact of the contaminated site. As run-off conditions increase, groundwater sources become diluted and body burdens of PFAS may decrease. Another possible explanation could include increased fish metabolism during warmer months, resulting in PFAS concentrations decreasing through normal mechanisms, especially if exposure is reduced. Seasonal changes in bioaccumulation and elimination from biota are not well understood for PFAS and should be the subject of future research efforts.

Based on the results from this study, it is recommended that the calculated PFOS advisories in Appendix A be reviewed and summarized for proposal through the New Jersey Interagency Toxics in Biota Committee to publish as New Jersey fish consumption advisories for the respective sites. Exposure to PFOS concentrations in fish from the Musconetcong result in the highest risk, and these advisories would be protective of exposure to all other contaminants based on current threshold values. Rainbow trout would have the least restrictive advisories for PFOS based on the sampling results (0.27-4.9 ng/kg), and stocking programs should continue to provide a safer alternative for anglers to consume compared to resident fish (American eel, brown trout, sunfish species) in these waters. Results from the Point Mountain TCA do indicate that there may be additional sources of PFAS upriver, which is consistent with results and previously established advisories for fish collected from Lake Musconetcong. Additional studies should continue to monitor and track PFAS sources and potential impacts to surface waters, including Lake Musconetcong and Pohatcong Creek.

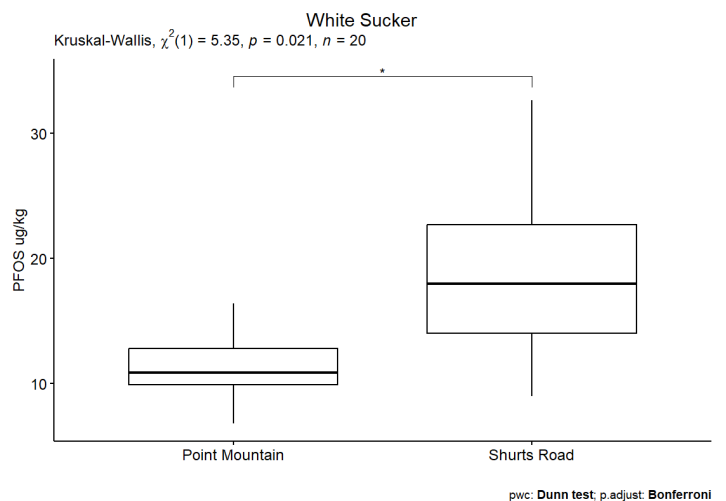
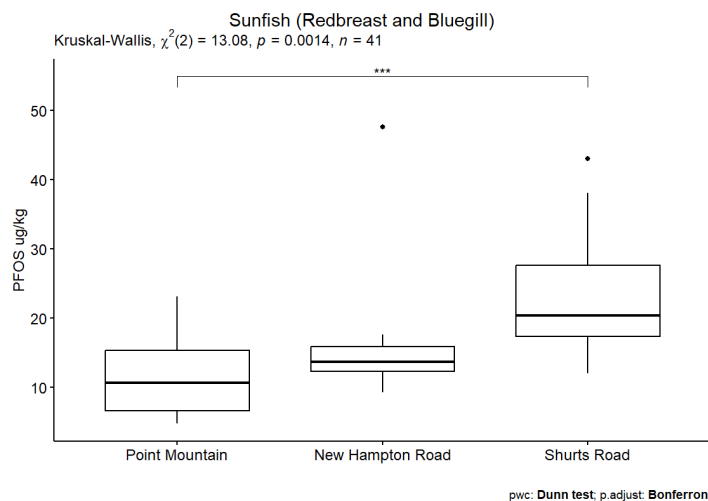
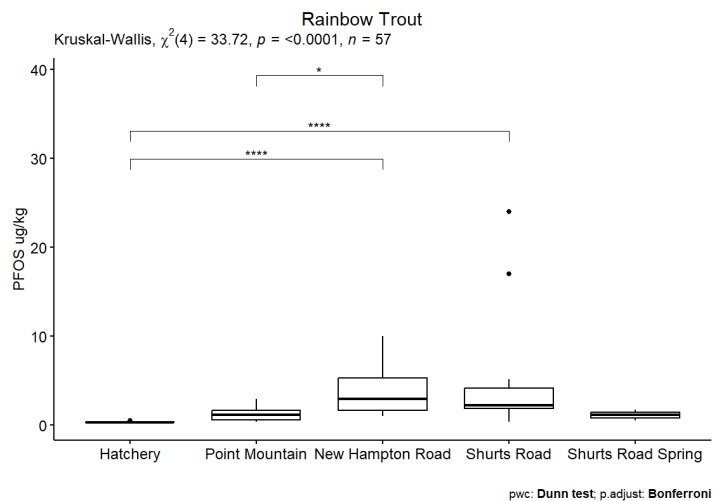
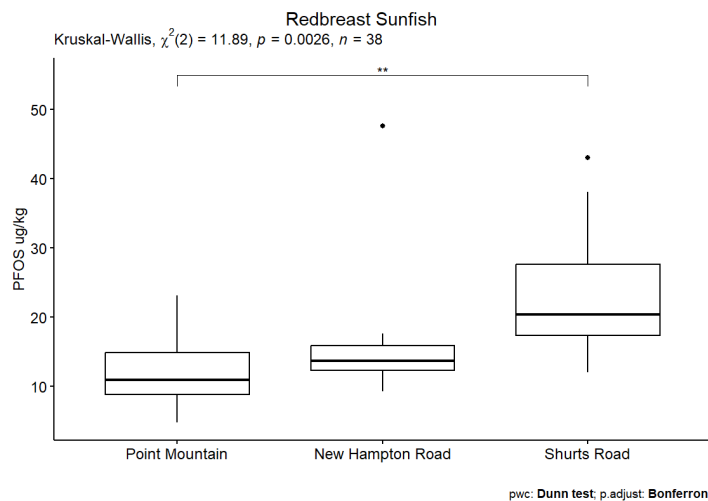
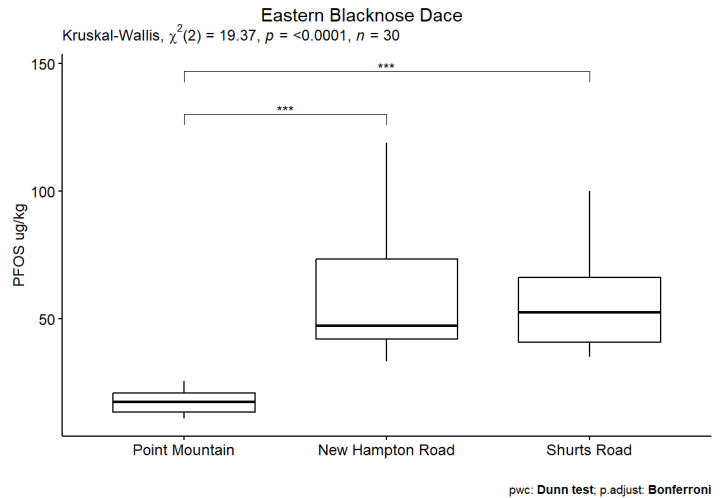
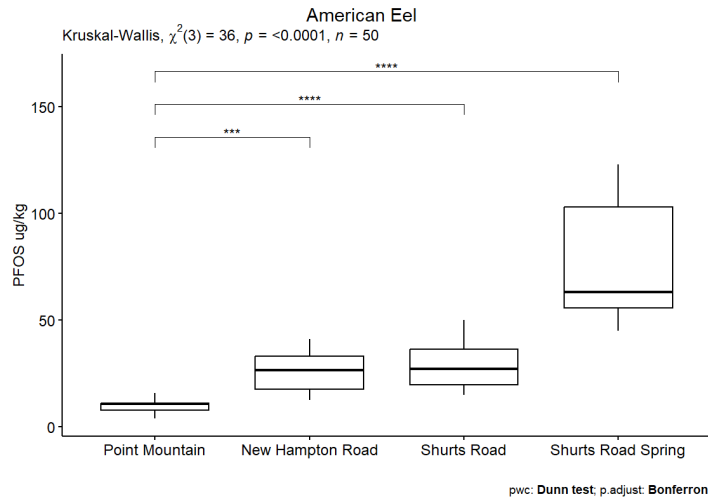


Figure 3. Boxplots of the PFOS concentration (ug/kg) for each species or species group, collected from multiple sites across three sampling visits and pooled. Black horizontal bars inside each box indicate the median. The top and bottom of the box represent the first and third quartiles. Differences in species means were tested by a Kruskal-Wallis rank sum test followed by a Dunn's test of multiple comparisons using $\alpha = 0.05$. Statistical significance is indicated by asterisks between sites as adjusted p values: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$.

Who to contact with further questions:

Please reach out to Dr. Daniel Millemann (Dan.Millemann@dep.nj.gov) or Brian Henning (Brian.Henning@dep.nj.gov) with additional questions on the results of this project.

Additional acknowledgements: Sampling leads John Vile (NJDEP BFBM) and Ross Shramko (NJDEP F&W) for significant contributions to study design and leading sampling teams. Joseph Bilinski and Andrew Jensen for sampling support and project organization. Additional sampling support from full-time and seasonal staff is greatly appreciated by the study authors and research team.

References:

- Barbo, N., Stoiber, T., Naidenko, O.V. and Andrews, D.Q., 2023. Locally caught freshwater fish across the United States are likely a significant source of exposure to PFOS and other perfluorinated compounds. *Environmental Research*, 220, p.115165.
- Blazer, V.S., Walsh, H.L., Smith, C.R., Gordon, S.E., Keplinger, B.J. and Wertz, T.A., 2024. Tissue distribution and temporal and spatial assessment of per-and polyfluoroalkyl substances (PFAS) in smallmouth bass (*Micropterus dolomieu*) in the mid-Atlantic United States. *Environmental Science and Pollution Research*, 31(49), pp.59302-59319.
- Hamilton, P. & Barno, L. 2005. Coldwater Fisheries Management Plan. New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Bureau of Freshwater Fisheries. 362p.
- Keller, D. H., Maguire, T., Kurz, M. J., Morrill, D., Curran, T., Heiczinger, J., & Gannon, M. (2024). Determination of fish bioaccumulation factors (BAFs) for selected PFAS contaminants in marine and freshwater systems (Report No. 24-2). New Jersey Department of Environmental Protection. Trenton, NJ. 232 pages. Available at web link: <https://hdl.handle.net/10929/144666>
- Lovy, J. 2014. Pequest Trout Hatchery Biosecurity Improvements. NJ Division of Fish & Wildlife, New Jersey Department of Environmental Protection.
- New Jersey Interagency Toxics in Biota Risk Subcommittee. 2024. Methods for the Development of Fish Consumption Advisories in the State of New Jersey. New Jersey Department of Environmental Protection. Trenton, NJ. Available at web link: <https://dep.nj.gov/wp-content/uploads/dsr/summary-of-the-basis-for-new-jersey-fish-consumption-advisories-november-2024.pdf>
- Posit team (2025). RStudio: Integrated Development Environment for R. Posit Software, PBC, Boston, MA. URL <http://www.posit.co/>.
- SAS Institute Inc. 2022. JMP® 16 Documentation Library. Cary, NC: SAS Institute Inc.

U.S. Environmental Protection Agency, 2025. US EPA Site Profile: Route 31 Sludge Disposal Site. Retrieved January 2026. Available at:

https://response.epa.gov/site/site_profile.aspx?site_id=16763

Vile, J. S., & Henning, B. F. 2019. Standard Operating Procedures Fish Monitoring 2019. NJDEP Standard Operating Procedure. Available at:

<https://www.state.nj.us/dep/wms/bfbm/docs/FishMonitoringSOP-FinalSignBlank.pdf>

Walsh, H.L., Blazer, V.S., Lord, E., Hurley, S.T. and LeBlanc, D.R., 2025. Occurrence and tissue distribution of per-and polyfluoroalkyl substances (PFAS) in fishes from waterbodies with point and non-point sources in Massachusetts, USA. *Aquatic Toxicology*, p.107499.

Zervas G.B. to Pat Evangelista. November 7th, 2024. NJDEP Referral for US EPA Assessment and Removal Actions Route 31 and Rymon Road Ground Water Contamination Site.

Available at:

<https://response.epa.gov/sites/16763/files/Rymon%20Rd%20NJDEP%20Referral%20to%20EPA.pdf>

State of New Jersey
Phil Murphy, Governor

**Department of Environmental
Protection**
*Shawn M. LaTourette,
Commissioner*



Division of Science & Research
Nicholas A. Procopio, Ph.D., Director

Visit the DSR website:
<https://dep.nj.gov/dsr>

Appendix A. Summary tables of contaminant results and advisory calculations

Note: These advisories are not official recommendations of the NJDEP and are used for presentation purposes only. Please see the NJDEP fish consumption advisory website¹ for the most up to date advisory information and methodology for advisory determination.

¹ NJDEP Fish Consumption Advisory Page: <https://dep.nj.gov/dsr/fish-advisories-studies/>

Table 1. PFAS detection frequencies for fish collected from the Musconetcong River. Nineteen of the tested PFAS were detected in at least one fish sample. Advisory calculations are only applicable for PFOS, PFOA, PFNA, and PFUnA at this time (bolded rows) based on developed toxicity factors and thresholds. Results are sorted by detection frequency, high to low.

PFAS	Number of Detects	Number of Samples	Maximum Concentration Observed (µg/kg)	Detection Frequency	Method Detection Limit Range (µg/kg)
PFOS	206	208	123	99.0%	0.15-0.41
PFDA	186	208	22	89.4%	0.11-0.2
PFUnA	182	208	6.5	87.5%	0.097-0.18
PFDoA	174	208	2.5	83.7%	0.077-0.14
PFTTrDA	162	208	2.1	77.9%	0.12-0.22
PFTTeDA	158	208	0.97	76.0%	0.08-0.15
PFNA	124	208	4.4	59.6%	0.22-0.41
PFHxS	116	208	1.4	55.8%	0.086-0.25
PFDS	97	208	0.86	46.6%	0.12-0.23
PFOA	80	208	5.7	38.5%	0.13-0.24
PFHpS	23	208	0.79	11.1%	0.11-0.21
PFOSA	23	208	0.21	11.1%	0.081-0.18
7:3 FTCA	21	208	3.4	10.1%	1.3-3.5
PFBA	14	208	0.81	6.7%	0.32-0.65
PFHpA	9	208	0.27	4.3%	0.1-0.19
NFDHA	7	208	0.73	3.4%	0.21-0.4
PFHxA	7	208	0.91	3.4%	0.095-0.23
PFPeS	5	208	0.19	2.4%	0.097-0.18
5:3 FTCA	1	208	2.1	0.5%	1.6-3
11Cl-PF3OUdS	0	208	-	0.0%	0.36-0.67
3:3 FTCA	0	208	-	0.0%	0.83-1.5
4:2 FTS	0	208	-	0.0%	0.39-0.98
6:2 FTS	0	208	-	0.0%	0.4-1.4
8:2 FTS	0	208	-	0.0%	0.45-1.3
9Cl-PF3ONS	0	208	-	0.0%	0.47-1.1
ADONA	0	208	-	0.0%	0.32-0.59
HFPO-DA	0	208	-	0.0%	0.34-0.64
NEtFOSA	0	208	-	0.0%	0.13-0.25
NEtFOSAA	0	208	-	0.0%	0.11-0.2
NEtFOSE	0	208	-	0.0%	1-3.7
NMeFOSA	0	208	-	0.0%	0.13-0.24
NMeFOSAA	0	208	-	0.0%	0.19-0.35
PFBS	0	208	-	0.0%	0.073-0.16
PFDoS	0	208	-	0.0%	0.12-0.23
PFEESA	0	208	-	0.0%	0.11-0.2
PFMBA	0	208	-	0.0%	0.15-0.28
PFMPA	0	208	-	0.0%	0.17-0.31
PFNS	0	208	-	0.0%	0.087-0.16
PFPeA	0	208	-	0.0%	0.15-0.29

Table 2. Average PFOS concentrations (in fish fillets), detection frequencies, and draft advisories for fish collected from the Rt 31 study area and reference locations. Three primary stretches (2 impacted by the study area and 1 reference location) were sampled along the Musconetcong River, with sample origin points near: Shurts Road (40.70432, -74.98765; impacted), North Hampton Road (40.72319, -74.95987; impacted), and Point Mountain (40.77161, -74.90280; reference). Rainbow trout from the Pequest hatchery were collected directly from the hatchery as a baseline. A small subsample of fish was collected from Shurts Road Spring (40.70454, -74.98829), a small spring fed tributary of the Musconetcong River, directly affected by the site. Data are presented by contaminant concentrations, low to high. For samples that were non-detects, one-half the detection limit was used for advisory calculations. N = number of fish collected from site over the course of the study.

Site	Species	Average PFOS Concentration (µg/kg)	Detected	Total N	Detection %	General Population	High Risk Population
Pequest Hatchery	Rainbow trout	0.27	8	10	80%	Unlimited	Unlimited
Shurts Road Spring	Rainbow trout	1.1	2	2	100%	Weekly	Weekly
Point Mountain	Rainbow trout	1.2	15	15	100%	Weekly	Weekly
North Hampton Road	Rainbow trout	3.8	15	15	100%	Weekly	Weekly
Shurts Road	Rainbow trout	4.9	15	15	100%	Monthly	Monthly
Point Mountain	American eel	9.6	15	15	100%	Monthly	Monthly
Point Mountain	Bluegill	10	3	3	100%	Monthly	Monthly
Point Mountain	White sucker	11	5	5	100%	Monthly	Monthly
Point Mountain	Redbreast sunfish	12	14	14	100%	Monthly	Monthly
Point Mountain	Brown trout	12	5	5	100%	Monthly	Monthly
North Hampton Road	Redbreast sunfish	17	10	10	100%	Monthly	Monthly
Point Mountain	Eastern blacknose dace*	18	10	10	100%	NA	NA
Shurts Road	White sucker	19	15	15	100%	Once every 3 months	DO NOT EAT
Shurts Road	Redbreast sunfish	23	14	14	100%	Once every 3 months	DO NOT EAT
North Hampton Road	American eel	26	15	15	100%	Once every 3 months	DO NOT EAT
Shurts Road	American eel	29	15	15	100%	Once every 3 months	DO NOT EAT
Shurts Road	Brown trout	46	2	2	100%	Once every 3 months	DO NOT EAT
Shurts Road Spring	Brown trout	51	3	3	100%	Once every 3 months	DO NOT EAT
Shurts Road	Eastern blacknose dace*	56	10	10	100%	NA	NA
North Hampton Road	Eastern blacknose dace*	59	10	10	100%	NA	NA
Shurts Road Spring	American eel	78	5	5	100%	Yearly	DO NOT EAT

*Eastern blacknose dace are not considered for consumption; in this study, five composites of five whole specimens were tested for potential ecological assessment. Advisory thresholds are not applicable (NA).

Table 3. Average PFUnA concentrations (in fish fillets), detection frequencies, and draft advisories for fish collected from the Rt 31 study area and reference locations. Three primary stretches (2 impacted by the study area and 1 reference location) were sampled along the Musconetcong River, with sample origin points near: Shurts Road (40.70432, -74.98765; impacted), North Hampton Road (40.72319, -74.95987; impacted), and Point Mountain (40.77161, -74.90280; reference). Rainbow trout from the Pequest hatchery were collected directly from the hatchery as a baseline. A small subsample of fish was collected from Shurts Road Spring (40.70454, -74.98829), a small spring fed tributary of the Musconetcong River, directly affected by the site. Data are presented by contaminant concentrations, low to high. For samples that were non-detects, one-half the detection limit was used for advisory calculations. N = number of fish collected from each site over the course of the study.

Site	Species	Average PFUnA Concentration (µg/kg)	Detected	Total N	Detection %	General Population	High Risk Population
Pequest Hatchery	Rainbow trout	0.05	0	10	0%	Unlimited	Unlimited
Shurts Road Spring	Rainbow trout	0.05	0	2	0%	Unlimited	Unlimited
Point Mountain	Rainbow trout	0.13	8	15	53%	Unlimited	Unlimited
North Hampton Road	Rainbow trout	0.29	12	15	80%	Unlimited	Unlimited
Shurts Road	Rainbow trout	0.30	11	15	73%	Unlimited	Unlimited
Shurts Road Spring	Brown trout	0.72	3	3	100%	Weekly	Weekly
Shurts Road Spring	American eel	0.75	5	5	100%	Weekly	Weekly
Point Mountain	Brown trout	1.2	5	5	100%	Weekly	Weekly
North Hampton Road	Redbreast sunfish	1.3	10	10	100%	Weekly	Weekly
Shurts Road	Redbreast sunfish	1.3	14	14	100%	Weekly	Weekly
North Hampton Road	American eel	1.4	15	15	100%	Weekly	Weekly
Point Mountain	Redbreast sunfish	1.4	14	14	100%	Weekly	Weekly
Point Mountain	American eel	1.5	15	15	100%	Weekly	Weekly
Shurts Road	Brown trout	1.5	2	2	100%	Weekly	Weekly
Point Mountain	Bluegill	1.7	3	3	100%	Weekly	Weekly
Shurts Road	American eel	1.7	15	15	100%	Weekly	Weekly
Shurts Road	White sucker	2.0	15	15	100%	Weekly	Weekly
Point Mountain	White sucker	2.7	5	5	100%	Weekly	Weekly
Point Mountain	Eastern blacknose dace*	2.7	10	10	100%	NA	NA
Shurts Road	Eastern blacknose dace*	3.3	10	10	100%	NA	NA
North Hampton Road	Eastern blacknose dace*	3.8	10	10	100%	NA	NA

*Eastern blacknose dace would not typically be considered for consumption; in this study, five composites of five whole specimens were tested for potential ecological assessment. Advisory thresholds are not applicable (NA).

Table 4. Average PFNA concentrations (in fish fillets), detection frequencies, and draft advisories for fish collected from the Rt 31 study area and reference locations. Three primary stretches (2 impacted by the study area and 1 reference location) were sampled along the Musconetcong River, with sample origin points near: Shurts Road (40.70432, -74.98765; impacted), North Hampton Road (40.72319, -74.95987; impacted), and Point Mountain (40.77161, -74.90280; reference). Rainbow trout from the Pequest hatchery were collected directly from the hatchery as a baseline. A small subsample of fish was collected from Shurts Road Spring (40.70454, -74.98829), a small spring fed tributary of the Musconetcong River, directly affected by the site. Data are presented by contaminant concentrations, low to high. For samples that were non-detects, one-half the detection limit was used for advisory calculations. N = number of fish collected from each site over the course of the study.

Site	Species	Average PFNA Concentration (µg/kg)	Detected	Total N	Detection %	General Population	High Risk Population
Shurts Road Spring	Rainbow trout	0.11	0	2	0%	Unlimited	Unlimited
Pequest Hatchery	Rainbow trout	0.11	0	10	0%	Unlimited	Unlimited
Point Mountain	Rainbow trout	0.13	0	15	0%	Unlimited	Unlimited
Point Mountain	Redbreast sunfish	0.14	2	14	14%	Unlimited	Unlimited
Point Mountain	Bluegill	0.17	1	3	33%	Unlimited	Unlimited
Shurts Road	Redbreast sunfish	0.20	5	14	36%	Unlimited	Unlimited
North Hampton Road	Redbreast sunfish	0.21	4	10	40%	Unlimited	Unlimited
Shurts Road	Rainbow trout	0.30	4	15	27%	Weekly	Weekly
North Hampton Road	Rainbow trout	0.31	7	15	47%	Weekly	Weekly
Shurts Road	Brown trout	0.50	1	2	50%	Weekly	Weekly
Point Mountain	American eel	0.51	11	15	73%	Weekly	Weekly
Point Mountain	Eastern blacknose dace*	0.53	9	10	90%	NA	NA
Point Mountain	Brown trout	0.61	4	5	80%	Weekly	Weekly
North Hampton Road	American eel	0.64	14	15	93%	Weekly	Weekly
Shurts Road	American eel	0.69	14	15	93%	Weekly	Weekly
Point Mountain	White sucker	0.82	5	5	100%	Weekly	Weekly
North Hampton Road	Eastern blacknose dace*	0.99	10	10	100%	NA	NA
Shurts Road	White sucker	1.1	15	15	100%	Weekly	Weekly
Shurts Road	Eastern blacknose dace*	1.4	10	10	100%	NA	NA
Shurts Road Spring	Brown trout	1.8	3	3	100%	Monthly	Monthly
Shurts Road Spring	American eel	2.2	5	5	100%	Monthly	Monthly

*Eastern blacknose dace would not typically be considered for consumption; in this study, five composites of five whole specimens were tested for potential ecological assessment. Advisory thresholds are not applicable (NA).

Table 5. Average PFOA concentrations (in fish fillets), detection frequencies, and draft advisories for fish collected from the Rt 31 study area and reference locations. Three primary stretches (2 impacted by the study area and 1 reference location) were sampled along the Musconetcong River, with sample origin points near: Shurts Road (40.70432, -74.98765; impacted), North Hampton Road (40.72319, -74.95987; impacted), and Point Mountain (40.77161, -74.90280; reference). Rainbow trout from the Pequest hatchery were collected directly from the hatchery as a baseline. A small subsample of fish was collected from Shurts Road Spring (40.70454, -74.98829), a small spring fed tributary of the Musconetcong River, directly affected by the site. Data are presented by contaminant concentrations, low to high. For samples that were non-detects, one-half the detection limit was used for advisory calculations. N = number of fish collected from site over the course of the study.

Site	Species	Average PFOA Concentration (µg/kg)	Detected	Total N	Detection %	General Population	High Risk Population
Pequest Hatchery	Rainbow trout	0.07	0	10	0%	Unlimited	Unlimited
Shurts Road	Brown trout	0.07	0	2	0%	Unlimited	Unlimited
Point Mountain	Redbreast sunfish	0.07	0	14	0%	Unlimited	Unlimited
Point Mountain	Bluegill	0.07	0	3	0%	Unlimited	Unlimited
Shurts Road	Redbreast sunfish	0.08	1	14	7%	Unlimited	Unlimited
Point Mountain	Rainbow trout	0.08	0	15	0%	Unlimited	Unlimited
North Hampton Road	Rainbow trout	0.08	0	15	0%	Unlimited	Unlimited
Shurts Road	Rainbow trout	0.09	3	15	20%	Unlimited	Unlimited
North Hampton Road	Redbreast sunfish	0.09	0	10	0%	Unlimited	Unlimited
Shurts Road Spring	Rainbow trout	0.11	1	2	50%	Unlimited	Unlimited
Point Mountain	Brown trout	0.11	1	5	20%	Unlimited	Unlimited
Point Mountain	White sucker	0.14	3	5	60%	Unlimited	Unlimited
Point Mountain	Eastern blacknose dace*	0.17	7	10	70%	NA	NA
Point Mountain	American eel	0.23	10	15	67%	Unlimited	Unlimited
Shurts Road	American eel	0.24	4	15	27%	Unlimited	Unlimited
Shurts Road	Eastern blacknose dace*	0.26	9	10	90%	NA	NA
North Hampton Road	Eastern blacknose dace*	0.27	8	10	80%	NA	NA
North Hampton Road	American eel	0.27	11	15	73%	Unlimited	Unlimited
Shurts Road Spring	Brown trout	0.60	3	3	100%	Unlimited	Unlimited
Shurts Road	White sucker	0.62	14	15	93%	Weekly	Weekly
Shurts Road Spring	American eel	1.8	5	5	100%	Weekly	Weekly

*Eastern blacknose dace would not typically be considered for consumption; in this study, five composites of five whole specimens were tested for potential ecological assessment. Advisory thresholds are not applicable (NA).

Table 6. Average mercury (Hg) concentrations (in fish fillets), detection frequencies, and draft advisories for fish collected from the Rt 31 study area and reference locations. Three primary stretches (2 impacted by the study area and 1 reference location) were sampled along the Musconetcong River, with sample origin points near: Shurts Road (40.70432, -74.98765; impacted), North Hampton Road (40.72319, -74.95987; impacted), and Point Mountain (40.77161, -74.90280; reference). Rainbow trout from the Pequest hatchery were collected directly from the hatchery as a baseline. A small subsample of fish was collected from Shurts Road Spring (40.70454, -74.98829), a small spring fed tributary of the Musconetcong River, directly affected by the site. Data are presented by contaminant concentrations, low to high.

Site	Species	Average Hg Concentration (ng/g)	General Population	High Risk Population
Pequest Hatchery	Rainbow trout	4.73	Unlimited	Unlimited
Shurts Road Spring	Rainbow trout	5.42	Unlimited	Unlimited
Point Mountain	Rainbow trout	9.28	Unlimited	Unlimited
North Hampton Road	Rainbow trout	9.35	Unlimited	Unlimited
Shurts Road	Rainbow trout	10.0	Unlimited	Unlimited
Shurts Road Spring	Brown trout	17.2	Unlimited	Unlimited
Point Mountain	Brown trout	31.7	Unlimited	Weekly
Shurts Road	Brown trout	34.2	Unlimited	Weekly
North Hampton Road	Redbreast sunfish	48.5	Unlimited	Weekly
Point Mountain	Redbreast sunfish	53.5	Unlimited	Weekly
Shurts Road	Redbreast sunfish	57.3	Unlimited	Weekly
Point Mountain	American eel	64.8	Unlimited	Weekly
Point Mountain	White sucker	66.6	Unlimited	Weekly
Shurts Road	White sucker	69.8	Unlimited	Weekly
Shurts Road Spring	American eel	71.5	Unlimited	Weekly
North Hampton Road	American eel	104	Weekly	Weekly
Shurts Road	American eel	110	Weekly	Weekly
Point Mountain	Bluegill	113	Weekly	Weekly

Table 7. Polychlorinated biphenyl (PCB) concentrations (in fish fillets), detection frequencies, and draft advisories for fish collected from the Rt 31 study area and reference locations. Three primary stretches (2 impacted by the study area and 1 reference location) were sampled along the Musconetcong River, with sample origin points near: Shurts Road (40.70432, -74.98765; impacted), North Hampton Road (40.72319, -74.95987; impacted), and Point Mountain (40.77161, -74.90280; reference). Rainbow trout from the Pequest hatchery were collected directly from the hatchery as a baseline. A small subsample of fish was collected from Shurts Road Spring (40.70454, -74.98829), a small spring fed tributary of the Musconetcong River, directly affected by the site. Data are presented by contaminant concentrations, low to high. Sample results consist of equal mass composites (N= # of composites); each composite contains 5 fish, except brown trout from Shurts Road Spring containing 3 fish.

Site	Species (N)	PCB Concentration (µg/kg)	General Population	High Risk Population
Pequest Hatchery	Rainbow trout (2)	16	Weekly	Weekly
Shurts Road Spring	Brown trout (1)	17	Weekly	Weekly
Shurts Road	Rainbow trout (3)	25	Weekly	Weekly
Point Mountain	Rainbow trout (3)	27	Weekly	Weekly
North Hampton Road	Rainbow trout (3)	34	Weekly	Weekly
Shurts Road	American eel (2)	38	Weekly	Weekly
North Hampton Road	American eel (2)	49	Weekly	Weekly
Point Mountain	American eel (2)	62	Weekly	Monthly
Point Mountain	Brown trout (1)	73	Weekly	Monthly
Shurts Road Spring	American eel (1)	74	Weekly	Monthly

Table 8. PFAS fish tissue concentrations triggering consumption advisories for the general population and high-risk population (ng/g; µg/kg; ppb).

Advisory Level:	General Population (ng/g)				High-Risk Population (ng/g)			
	PFOA	PFNA	PFOS	PFUnDA	PFOA	PFNA	PFOS	PFUnDA
No restrictions (based on one 8oz. meal daily)	≤0.62	≤0.23	≤0.56	≤0.4	≤0.62	≤0.23	≤0.56	≤0.4
One meal per week	>0.62-4.3	>0.23-1.6	>0.56-3.9	>0.4-2.8	>0.62-4.3	>0.23-1.6	>0.56-3.9	>0.4-2.8
One meal per month	>4.3-19	>1.6-6.9	>3.9-17	>2.8-12	>4.3-19	>1.6-6.9	>3.9-17	>2.8-12
One meal every 3 months	>19-57	>6.9-21	>17-51	>12-37	Not applicable	Not applicable	Not applicable	Not applicable
One meal every year	>57-226	>21-84	>51-204	>37-146	Not applicable	Not applicable	Not applicable	Not applicable
Do not eat	>226	>84	>204	>146	>19	>6.9	>17	>12

Triggers for PFOS and PFOA are based on DWQI RfDs; PFNA and PFUnDA triggers are based on NJDEP developed RfDs. Trigger calculations are based on a meal size of 8 oz. (227 g), and a body weight of 70 kg.

Table 9. Mercury fish tissue concentrations ($\mu\text{g/g}$; mg/kg ; ppm) triggering consumption advisories for the general population and high-risk population

Fish Consumption Advisory	General Population ($\mu\text{g/g}$)	High-Risk Population ($\mu\text{g/g}$)
No restrictions (based on one 8oz. meal daily)	≤ 0.093	≤ 0.019
One meal per week	$> 0.093 - 0.65$	$> 0.019 - 0.13$
One meal per month	$> 0.65 - 2.81$	$> 0.13 - 0.58$
One meal every three months	Not applicable	
One meal per year	Not applicable	
Do not eat	> 2.81	> 0.58

These calculations are based on an RfD of 3×10^{-4} mg/kg-day for adults in the general population and 7×10^{-5} mg/kg-day for the high-risk population (pregnant and nursing women, women of childbearing age, young children), a meal size of 8 oz. (227 g), a body weight of 70 kg for adults for the general population advisories, and a body weight of 62 kg for women for the high-risk population advisories.

Table 10. PCB tissue concentrations ($\mu\text{g}/\text{kg}$; ppb) triggering consumption advisories based on cancer risk for the general population and non-cancer effects for the high-risk population

Fish Consumption Advisory	General Population ($\mu\text{g}/\text{kg}$; 1×10^{-4} Cancer Risk)	High-Risk Population ($\mu\text{g}/\text{kg}$; Non-Cancer Risk)
No restrictions (based on one 8oz. meal daily)	≤ 15	≤ 8
One meal per week	>15-110	8-56
One meal per month	>110-470	56-240
One meal every three months	>470-1400	Not applicable
One meal per year	>1400-5600	Not applicable
Do not eat	>5600	>240

Calculations are based on a cancer slope factor of $2 \text{ (mg/kg/day)}^{-1}$ for cancer risk in the general population (1×10^{-4} cancer risk), a reference dose of $2.5 \times 10^{-5} \text{ mg/kg/day}$ for non-cancer risk, a meal size of 8 oz. (227 g), and a body weight of 70 kg.

Appendix B. Summary figures of PFOS and mercury results for consumable species and site-specific comparisons

Note: Advisories thresholds displayed on these figures are not official recommendations of the NJDEP and are used for presentation purposes only. Please see the NJDEP fish consumption advisory website¹ for the most up to date advisory information.

¹ NJDEP Fish Consumption Advisory Page: <https://dep.nj.gov/dsr/fish-advisories-studies/>

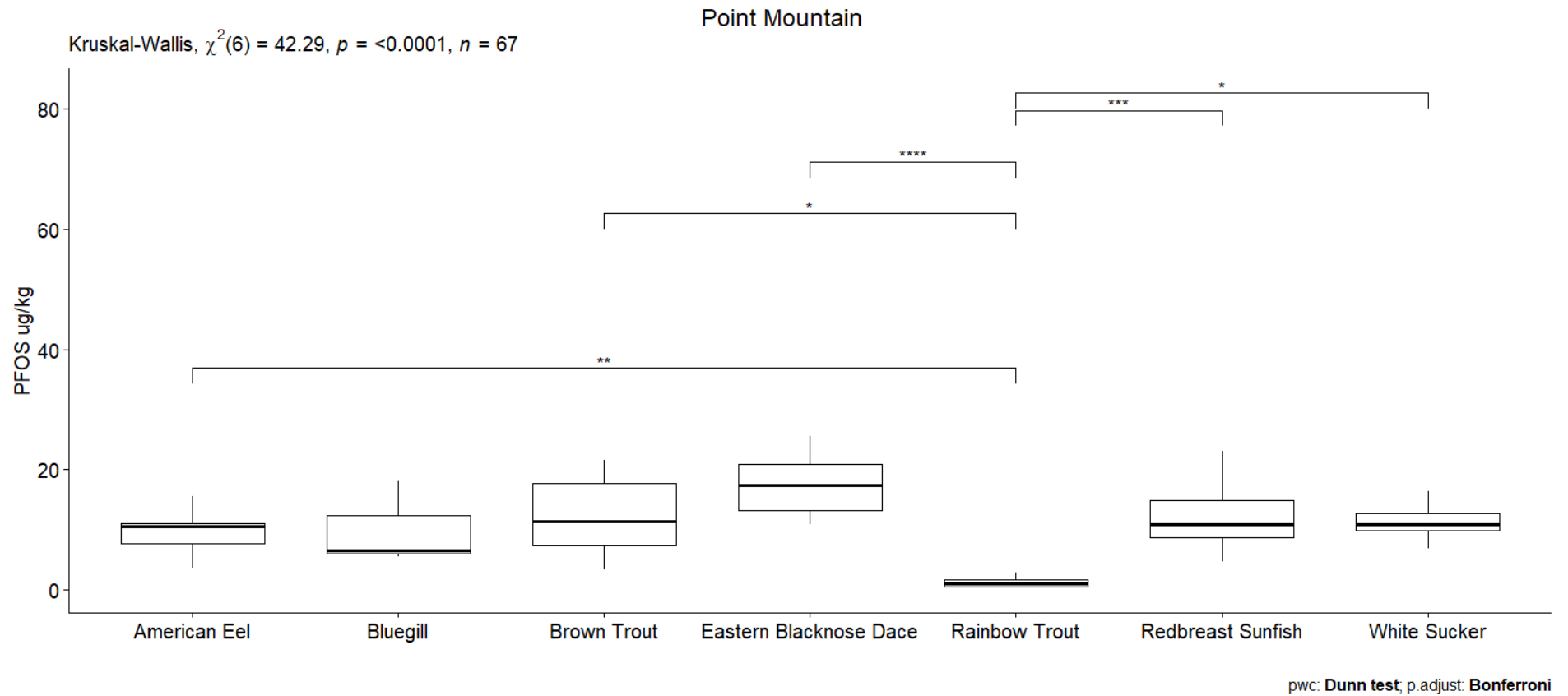


Figure 1. Median PFOS concentrations for rainbow trout were significantly lower than all other species except bluegill at Point Mountain Trout Conservation Area. Kruskal-Wallis test at a significance of $p \leq 0.05$, and Dunn's multiple comparison for paired differences. Connecting bars indicate significant differences in pairs, and asterisks indicate magnitude of Dunn's test p-value. Statistical significance is indicated by asterisks between species, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$.

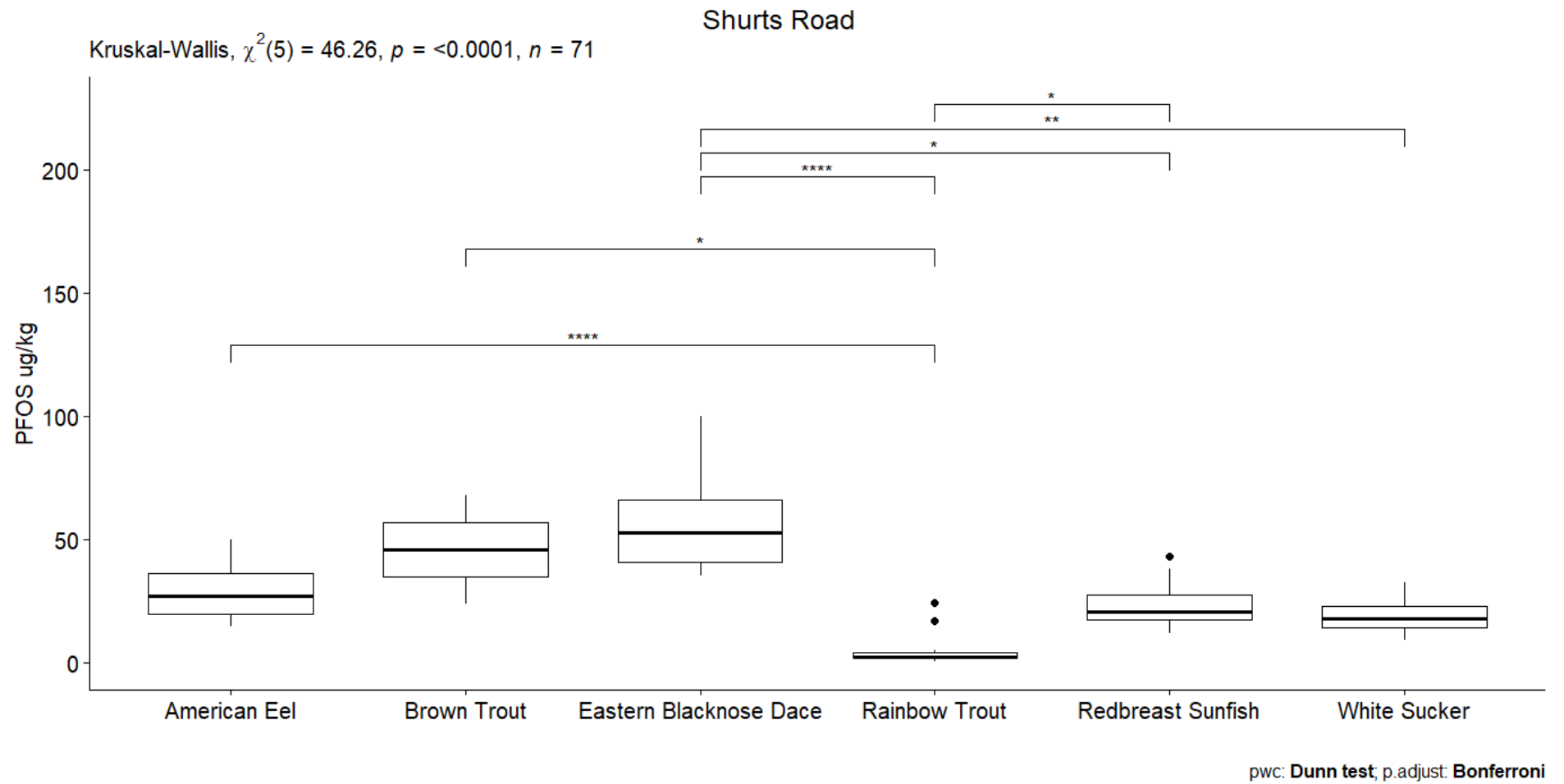
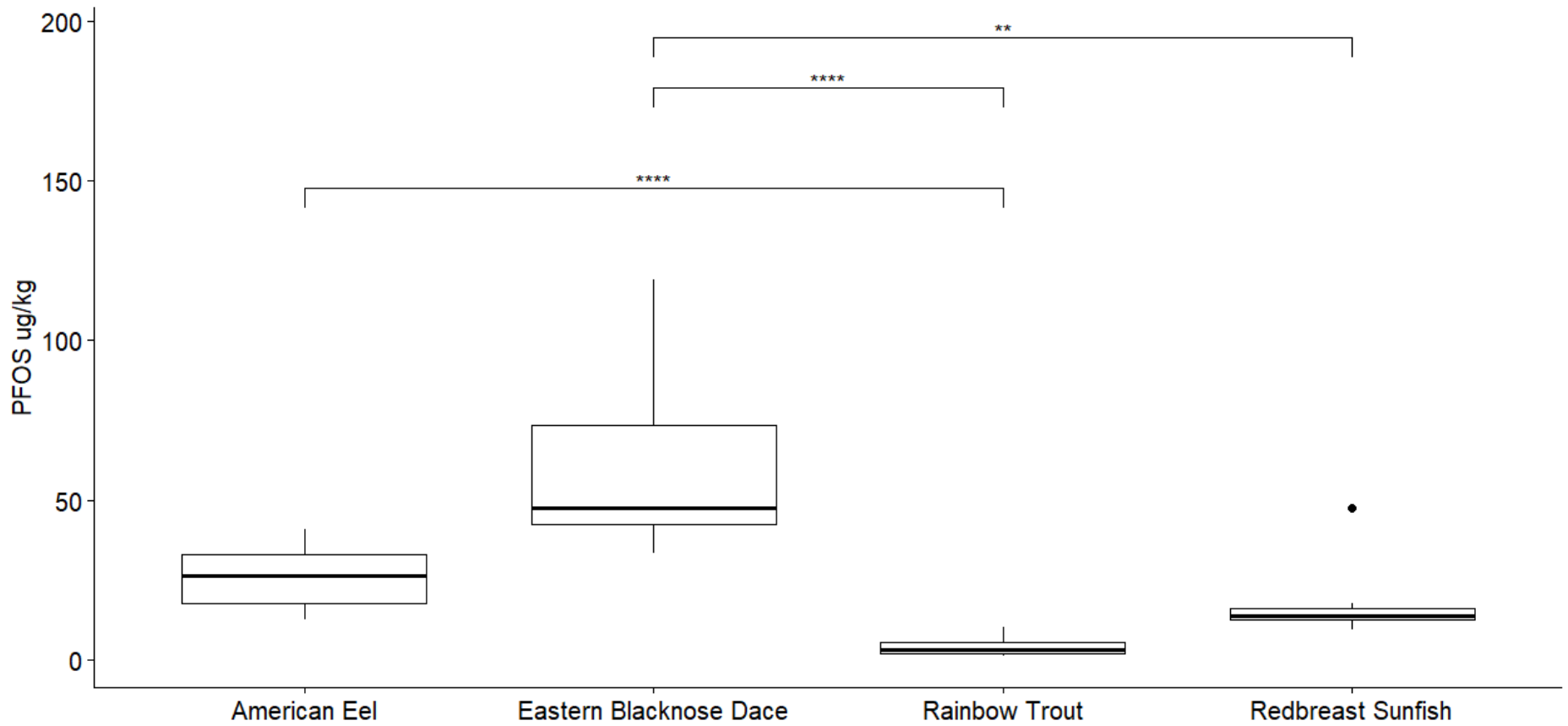


Figure 2. Median PFOS concentrations for rainbow trout were significantly lower than all other species except white sucker at Shurts Road. Kruskal-Wallis test at a significance of $p \leq 0.05$, and Dunn's multiple comparison for paired differences. Connecting bars indicate significant differences in pairs, and asterisks indicate magnitude of Dunn's test p-value. Statistical significance is indicated by asterisks between species, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$.

New Hampton Road

Kruskal-Wallis, $\chi^2(3) = 40.91, p = <0.0001, n = 50$

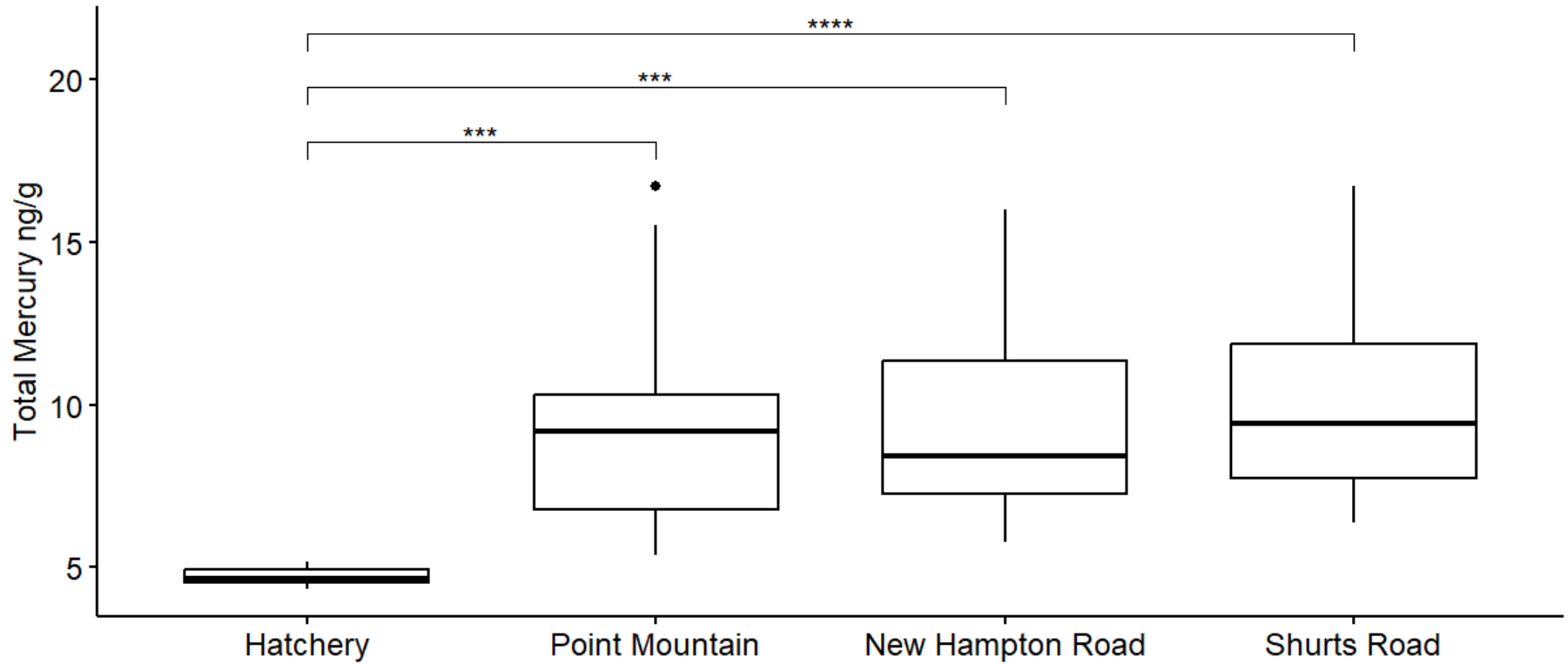


pwc: **Dunn test**; p.adjust: **Bonferroni**

Figure 3. Median PFOS concentrations for rainbow trout were significantly lower than all other species at New Hampton Road. Kruskal-Wallis test at a significance of $p \leq 0.05$, and Dunn's multiple comparison for paired differences. Connecting bars indicate significant differences in pairs, and asterisks indicate magnitude of Dunn's test p-value. Statistical significance is indicated by asterisks between species, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$.

Rainbow Trout

Kruskal-Wallis, $\chi^2(3) = 24.48, p = <0.0001, n = 55$



pwc: **Dunn test**; p.adjust: **Bonferroni**

Figure 4. Boxplot of the total mercury concentration (ng/g) for rainbow trout collected from multiple sites on the Musconetcong River and our control site (Pequest Trout Hatchery) across three sampling visits and pooled. An unnamed tributary (Shurts Road Spring) was excluded from analysis due to low sample size (N=2). Black horizontal bars inside each box indicate the median. The top and bottom of the box represent the first and third quartiles. Differences in site means were tested by a Kruskal-Wallis rank sum test followed by a Dunn's test of multiple comparisons using $\alpha = 0.05$. Statistical significance is indicated by asterisks between sites as adjusted p values: *p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001.

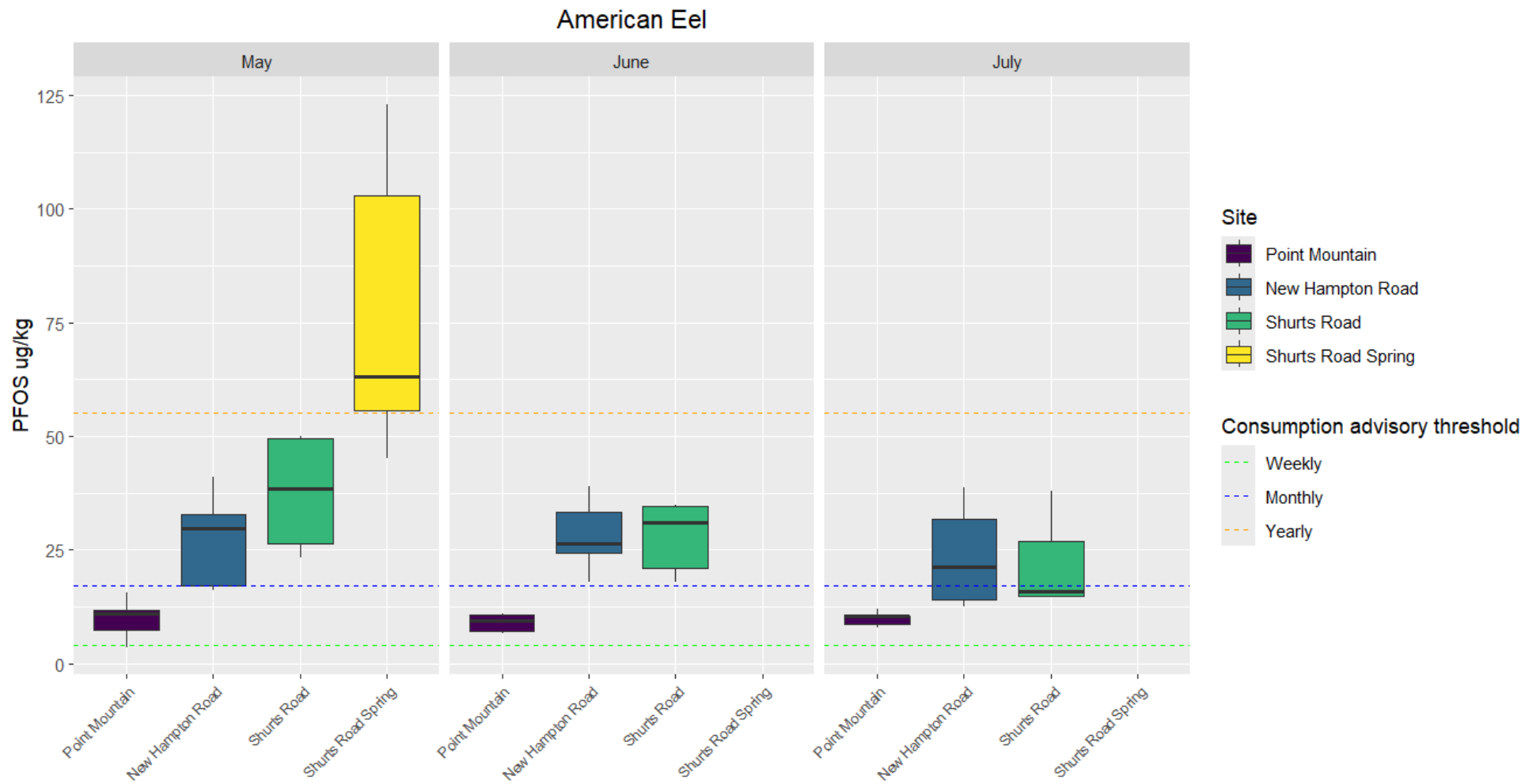


Figure 5. Mean concentration of PFOS in American eel fillets for each sampling event, including advisory thresholds for weekly and monthly consumption recommendations.

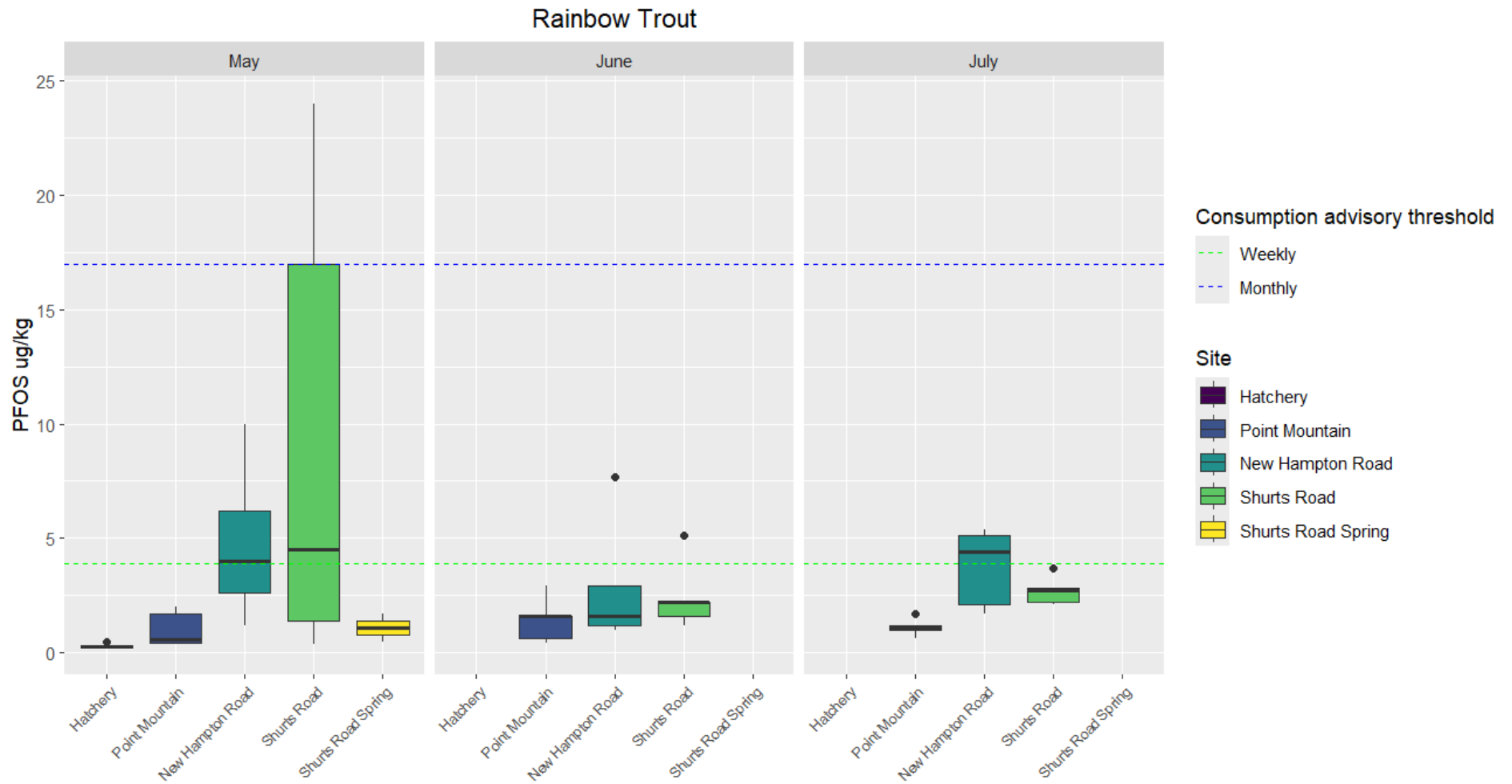


Figure 6. Mean concentration of PFOS in rainbow trout fillets for each sampling event, including advisory thresholds for weekly and monthly consumption recommendations.

Sunfish (Redbreast Sunfish and Bluegill)

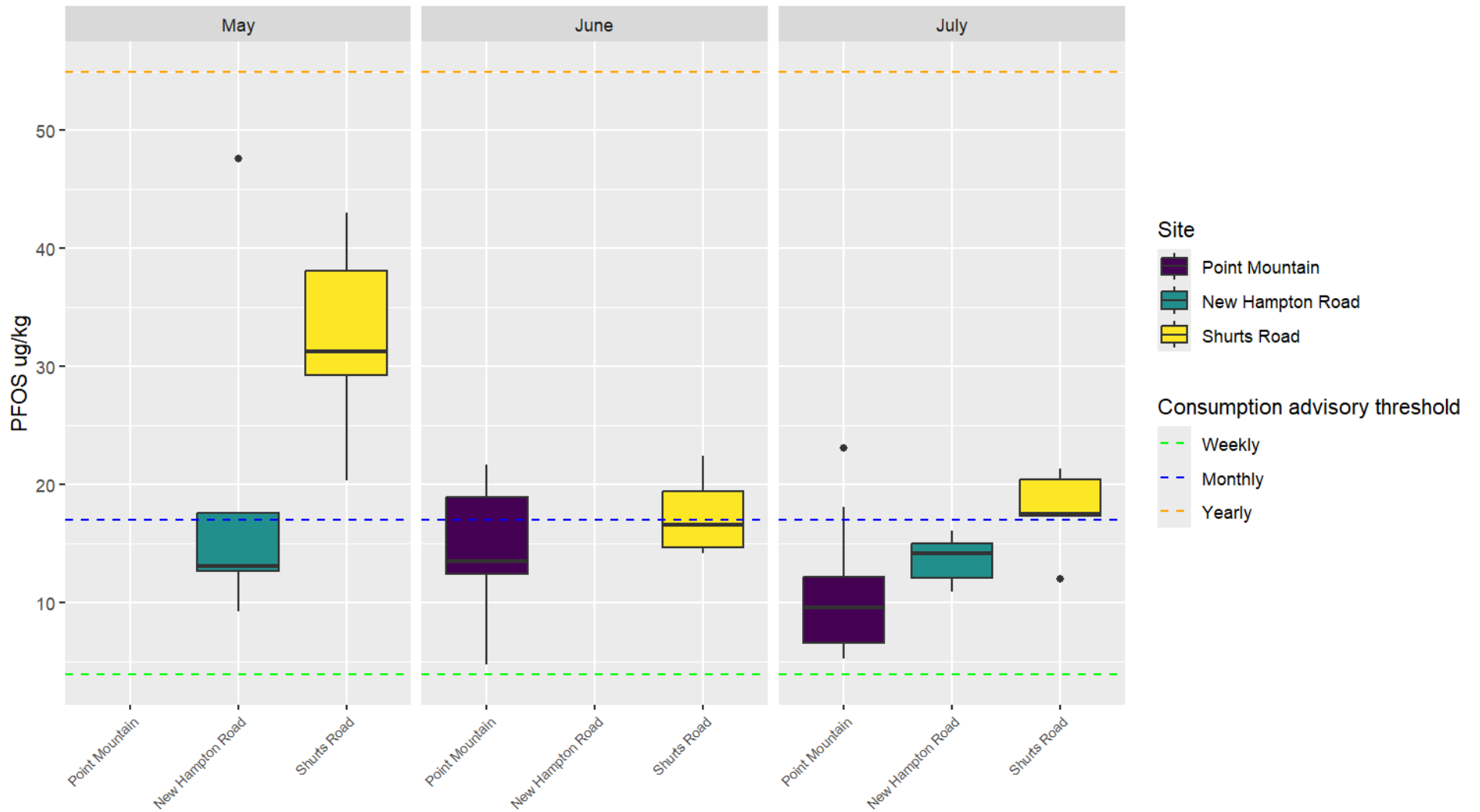


Figure 7. Mean concentration of PFOS in sunfish (redbreast and bluegill) for each sampling event, including advisory thresholds for weekly and monthly consumption recommendations.