

Summary of Data

Water quality sampling occurred at six sites within the Lake Glenville watershed on 05/20/24. All sites were located as close as possible to sites sampled in previous monitoring years; the location for the Glenville Creek sample was again sampled downstream at its standard location. Although no rain was occurring at the time of the 05/20/24 sampling, the area received 0.4 inches of rain in the preceding days from 05/18/24 – 05/19/24 (Figure 1). Stream flows were a bit elevated compared to normal base flow, but not high enough to be close to flood levels. The suite of parameters sampled included water temperature, dissolved oxygen (DO), pH, specific conductivity, turbidity, fecal coliform, ammonia, nitrite/nitrate, phosphate, and alkalinity.

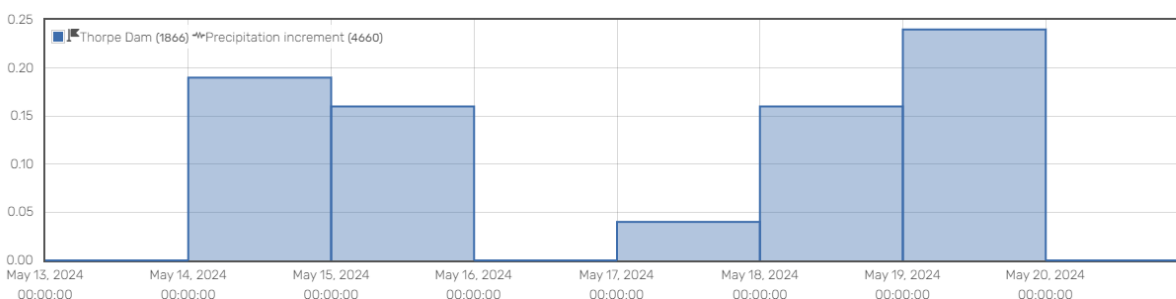


Figure 1. Precipitation for the week preceding sampling.

Turbidity was less than or equal to 2 NTU for all sites. The state standard for North Carolina streams that carry the Trout Waters (Tr) designation is that turbidity shall not exceed 10 NTU. Pine Creek, Mill Creek, Norton Creek, Hurricane Creek, and Cedar Creek all carry the Tr classification. Glenville Creek is too small to be classified under this system. The regional Volunteer Water Information Network (VWIN) mean is 11.4 NTU.

Dissolved oxygen is the amount of oxygen dissolved in water. The concentration of dissolved oxygen in surface water is affected by temperature and has both a seasonal and a daily cycle. Cold water can hold more dissolved oxygen than warm water. In winter and early spring, when the water temperature is low, the dissolved oxygen concentration is high. In summer and fall, when the water temperature is high, the dissolved oxygen concentration is often lower. Dissolved oxygen is important for ecological health as most aquatic organisms need oxygen to survive and grow. Some species, such as trout and stoneflies, require high DO levels (>6 mg/L) for survival, and trout show improved reproductive health when DO levels are above 10 mg/L. Dissolved oxygen concentrations for the sampling event ranged between 8.2 mg/L in Glenville Creek and 9.0 mg/L in Cedar Creek.

An increase in observed acidity was a concern over the course of a few samplings in both the tributaries to Lake Glenville and the lake itself. However, during the most recent tributary samplings pH values have trended toward the regional VWIN mean (7.1). As has been stated previously, acidic waters are not uncommon for high elevation streams in the area. Depths to bedrock are shallow with thin soils and rock types do not have a mineralogy that buffers groundwater as it moves through the ground and reemerges in the streams. However, there are

anthropogenic sources which can increase the acidity in streams to levels which are unhealthy for trout (below 5.0). High elevation areas of eastern Tennessee and Western North Carolina receive elevated rates of atmospheric acid deposition in comparison with other areas on the east coast, resulting in increased episodic stream acidification events, adding to the acidification of soil and surface waters. Episodic stream acidification occurs when heavy rain downpours bring increased acidic deposition to soils and water bodies, resulting in periods of increased stream flow and decreased water pH.

The issue of acidity is complicated by the fact that rain is, on average, much more acidic in the summer than in the winter. Continued monitoring of acidity will help increase awareness of any potential problems. It is important to note that although the effects of the issue are felt locally, it originates at a regional, continental scale and is not a “stand-alone” problem. It relates intimately to energy, land use, urban, transport, and other socioeconomic issues. On 05/20/24 pH values ranged from 6.8 to 7.5 continuing the trend of improvement from what has been observed previously.

Ammonia concentrations were low and more in line with those previously observed at all the sampled locations. Ammonia values ranged from 0.05 mg/L to 0.11 mg/L; with Hurricane and Norton Creeks exceeding the Regional VWIN mean of 0.09 mg/L. Ammonia is produced by bacterial decomposition of organic matter that accumulates in stream sediment, therefore we would expect to see higher ammonia values following rainfall events (like on 05/19/24) where those sediments are being mobilized and transported.

As a sort of side note, an observant reader will likely have noticed that Glenville Creek is a frequent outlier among all the sites. The drainage area of Glenville Creek (198 acres) is 12% the size of Lake Glenville’s next smallest subwatershed (Hurricane Creek: 1578 acres) and 3% the size of the lake’s largest subwatershed (Norton Creek: 6161 acres). This small drainage area makes the hydrologic and chemical regime of Glenville Creek much different than the other subwatersheds.

Nitrite/Nitrate-Nitrogen concentrations were very low, ranging between 0.1 mg/L and 0.2 mg/L, well below the regional VWIN average of 0.5 mg/L. Phosphorous concentrations were also low and ranged from 0.02 mg/L to 0.09 mg/L, with Norton Creek matching the regional VWIN mean of 0.09 mg/L. Grass fertilizers and livestock are a frequent source of phosphorous. Once in the stream and lake system, rainfall can disturb the sediments, resulting in internal loading of previously deposited phosphorous.

Under state rules, fecal coliform in fresh waters “shall not exceed a geometric mean of 200 colony forming units (CFU)/100 mL based upon at least five consecutive samples examined during any 30-day period, nor exceed 400 CFU/100 mL in more than 20 percent of the samples examined during such period.”. As such, any single sample is difficult to compare to the state standard, but as a rule of thumb low numbers are good and numbers exceeding 200 CFU/100 mL are bad. However, violations of the state standard are expected during heavy rainfall events and

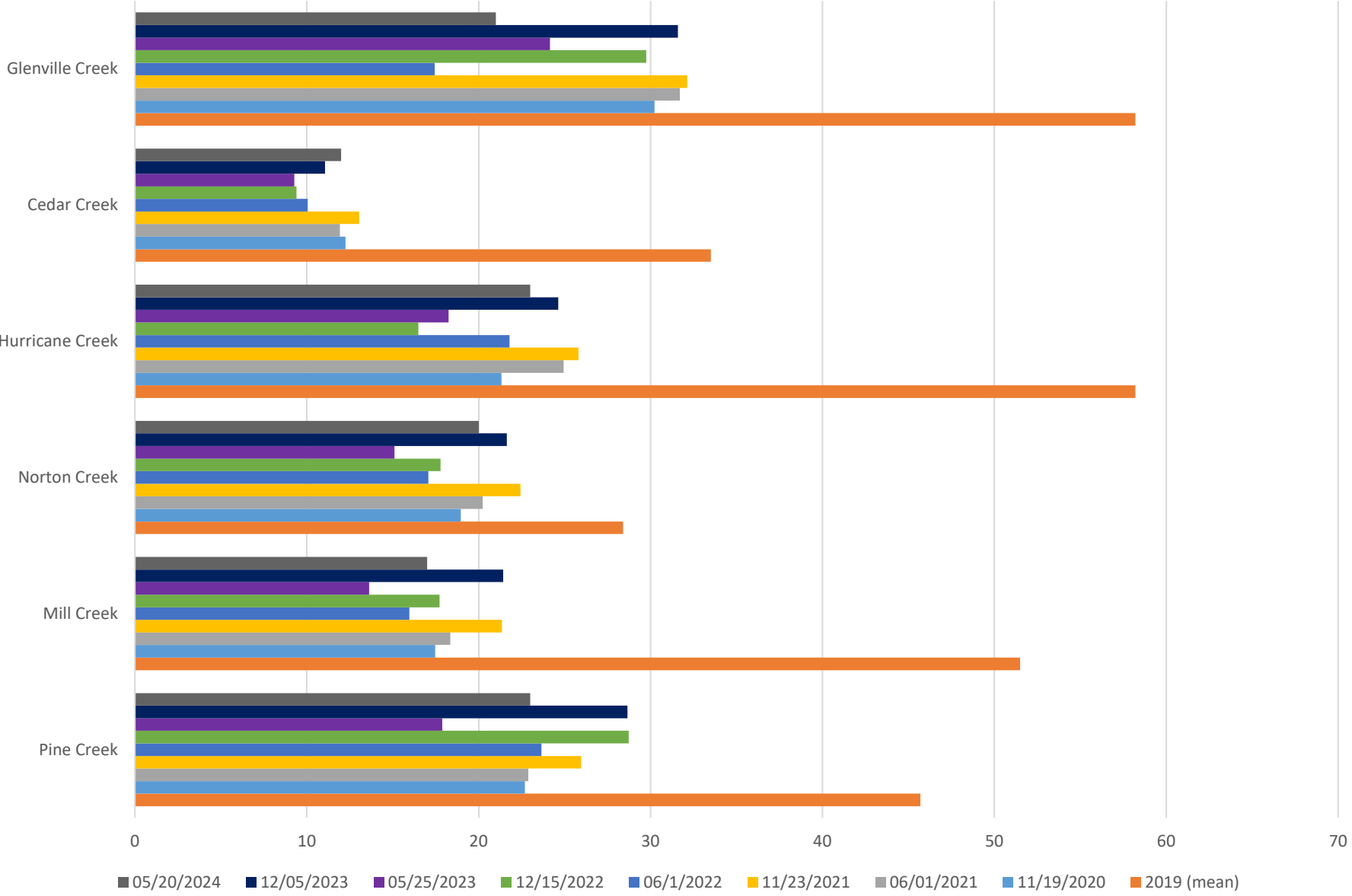
may be caused by uncontrollable nonpoint source pollution. Nonpoint source pollution comes from contaminants that end up on the ground naturally or from human activity. Rainwater and snowmelt pick up these contaminants as it washes over yards, sidewalks, driveways, parking lots, and fields and deposits them into lakes and streams as nonpoint source pollution. Common sources of nonpoint source pollution in the Lake Glenville watershed could include:

- animal production operations and feedlots;
- agricultural activities;
- stream bank and shoreline erosion;
- timber harvesting;
- land development;
- on-site sewage disposal units;
- atmospheric deposition.

Fecal coliform concentrations ranged from 13 CFU/100 mL in Cedar Creek to 160 CFU/100 mL in Norton Creek. Pine Creek had a concentration of 130 CFU/100mL.

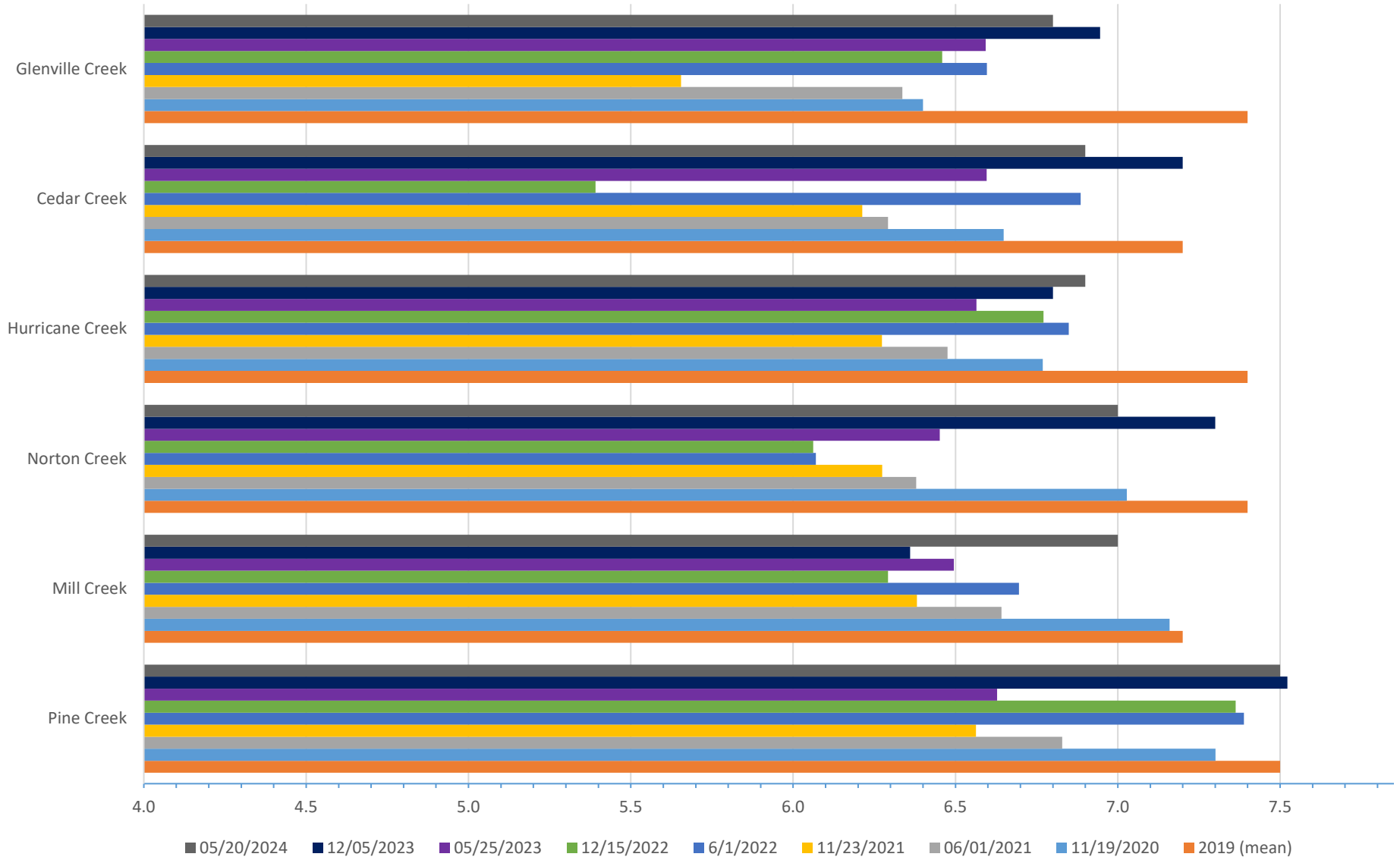
Specific Conductivity ($\mu\text{S}/\text{cm}$)

Regional VWIN mean 60 ($\mu\text{S}/\text{cm}$)- (used to compare results against typical regional values)



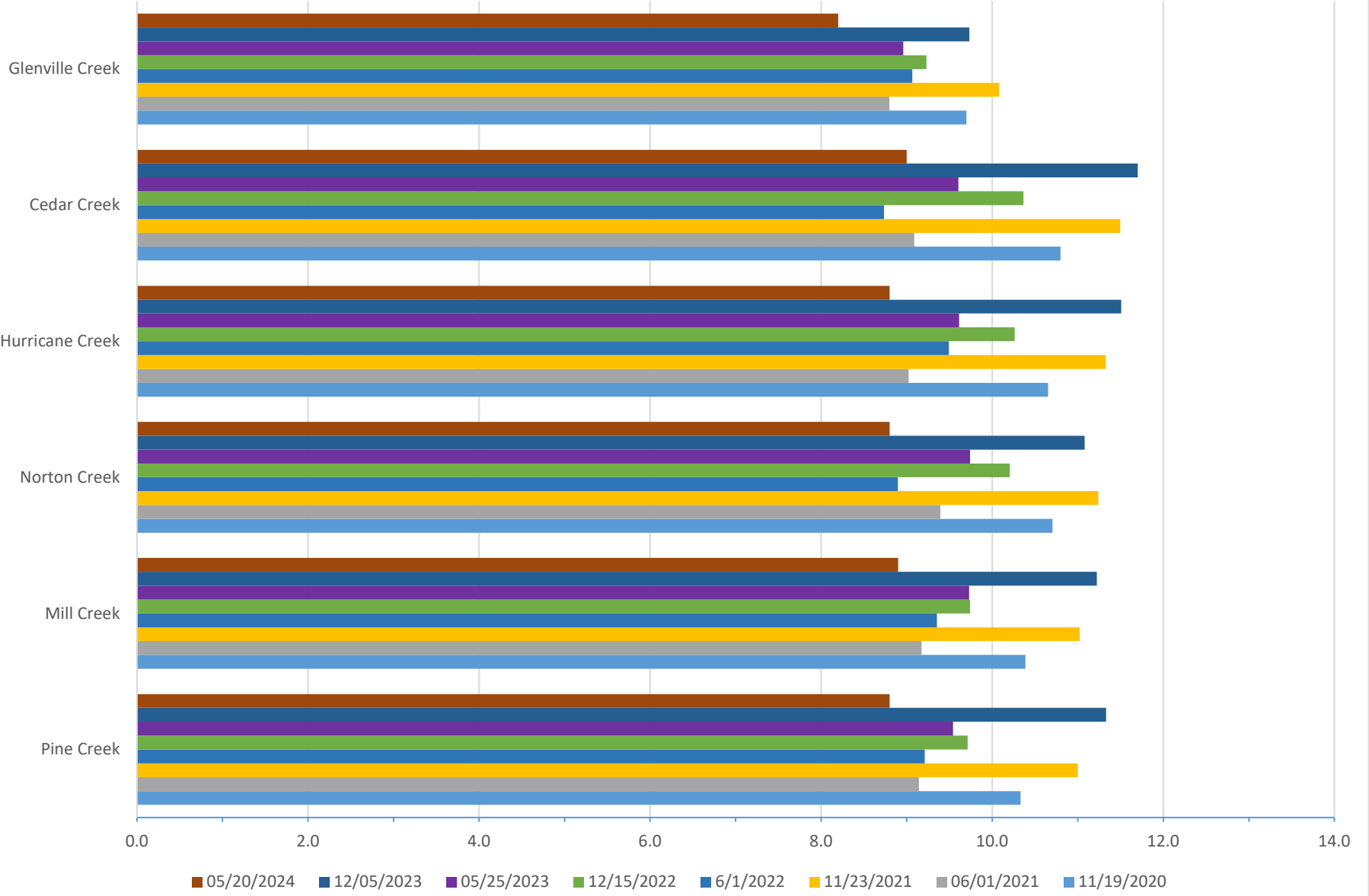
pH

Regional VWIN mean pH 7.1 - (used to compare results against typical regional values)



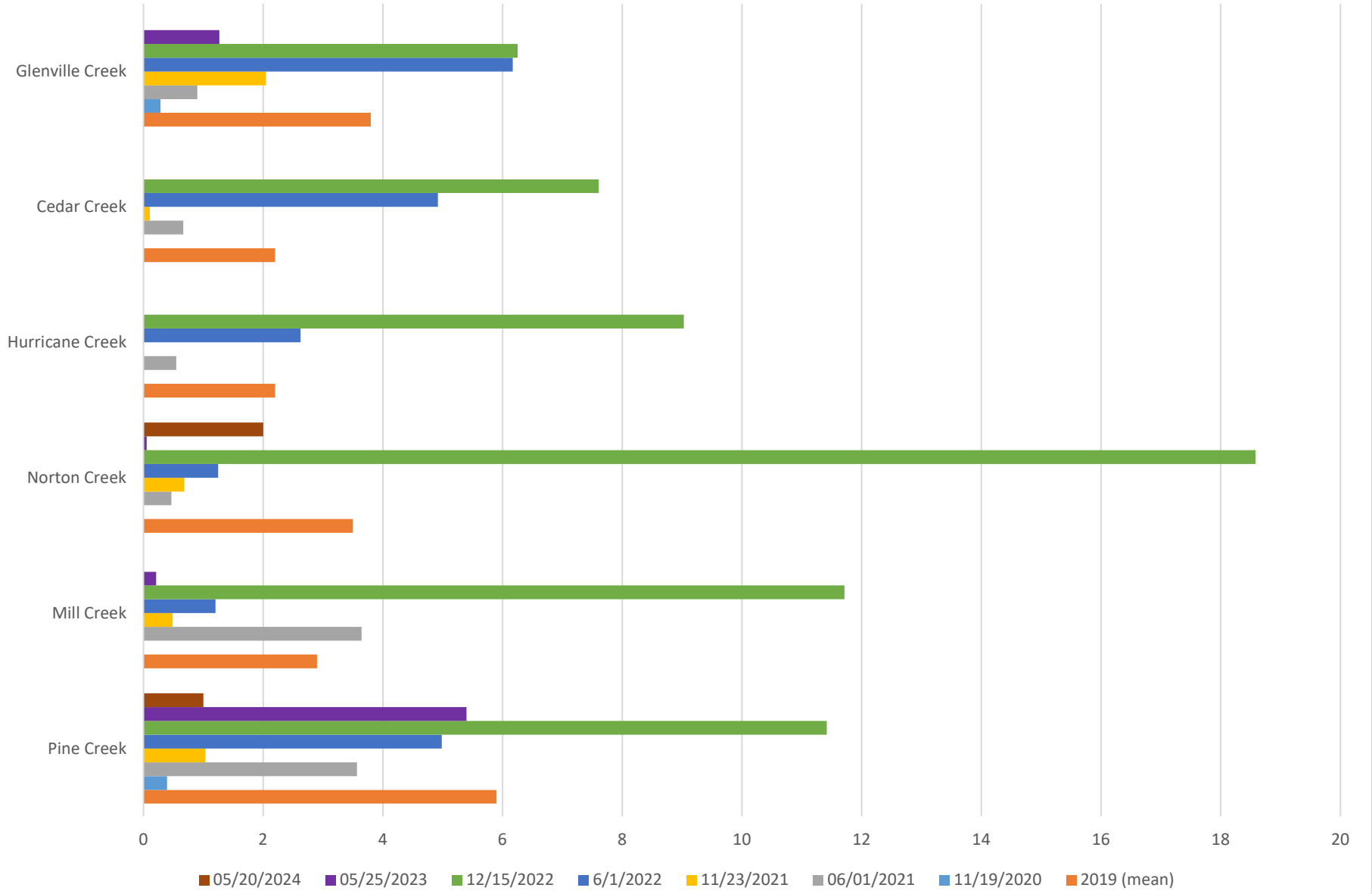
Dissolved Oxygen (mg/L)

NC Trout Water designation standard ≥ 6 mg/L



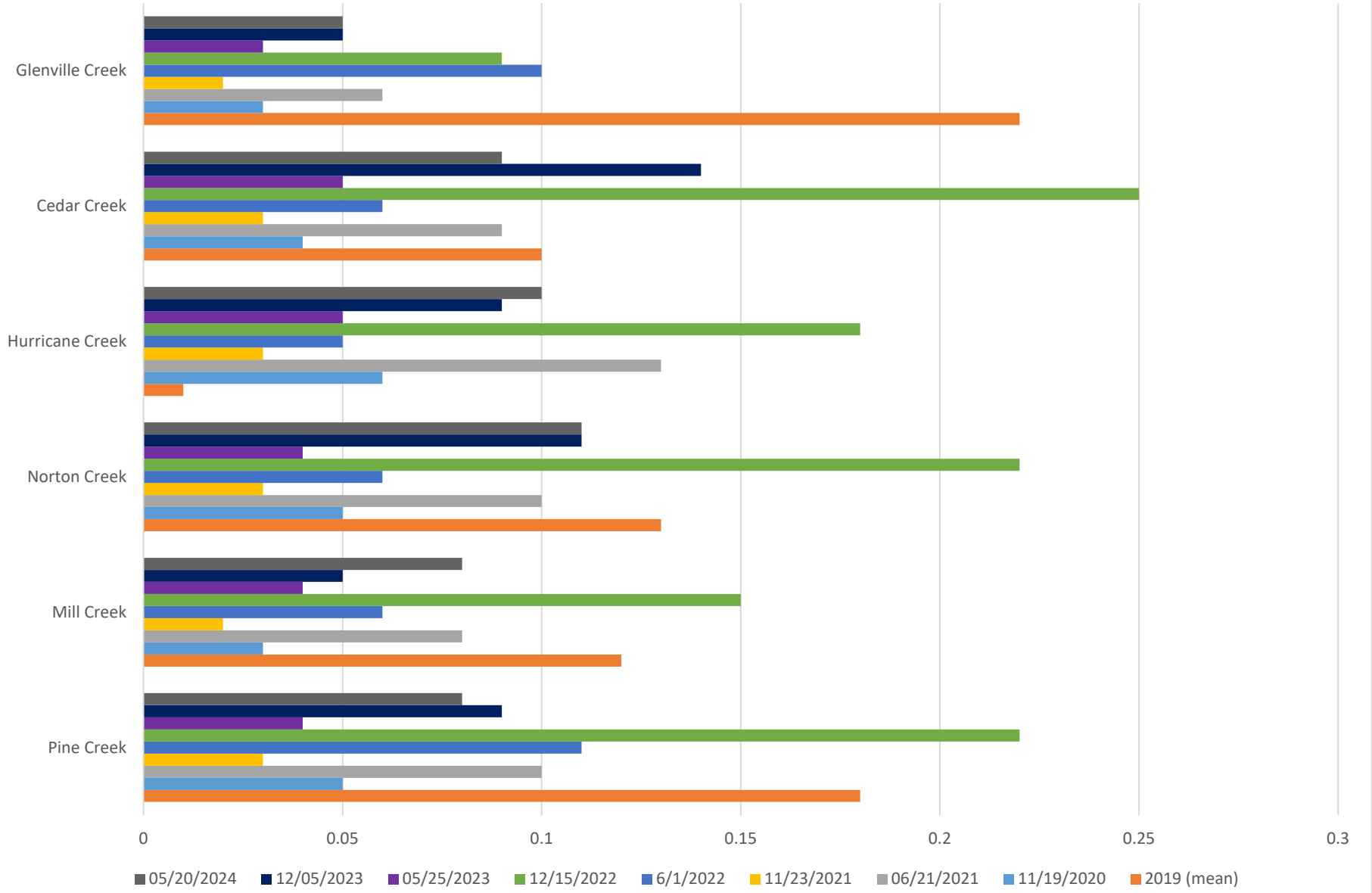
Turbidity (NTU)

Regional VWIN mean 6.2 NTU - (used to compare results against typical regional values)



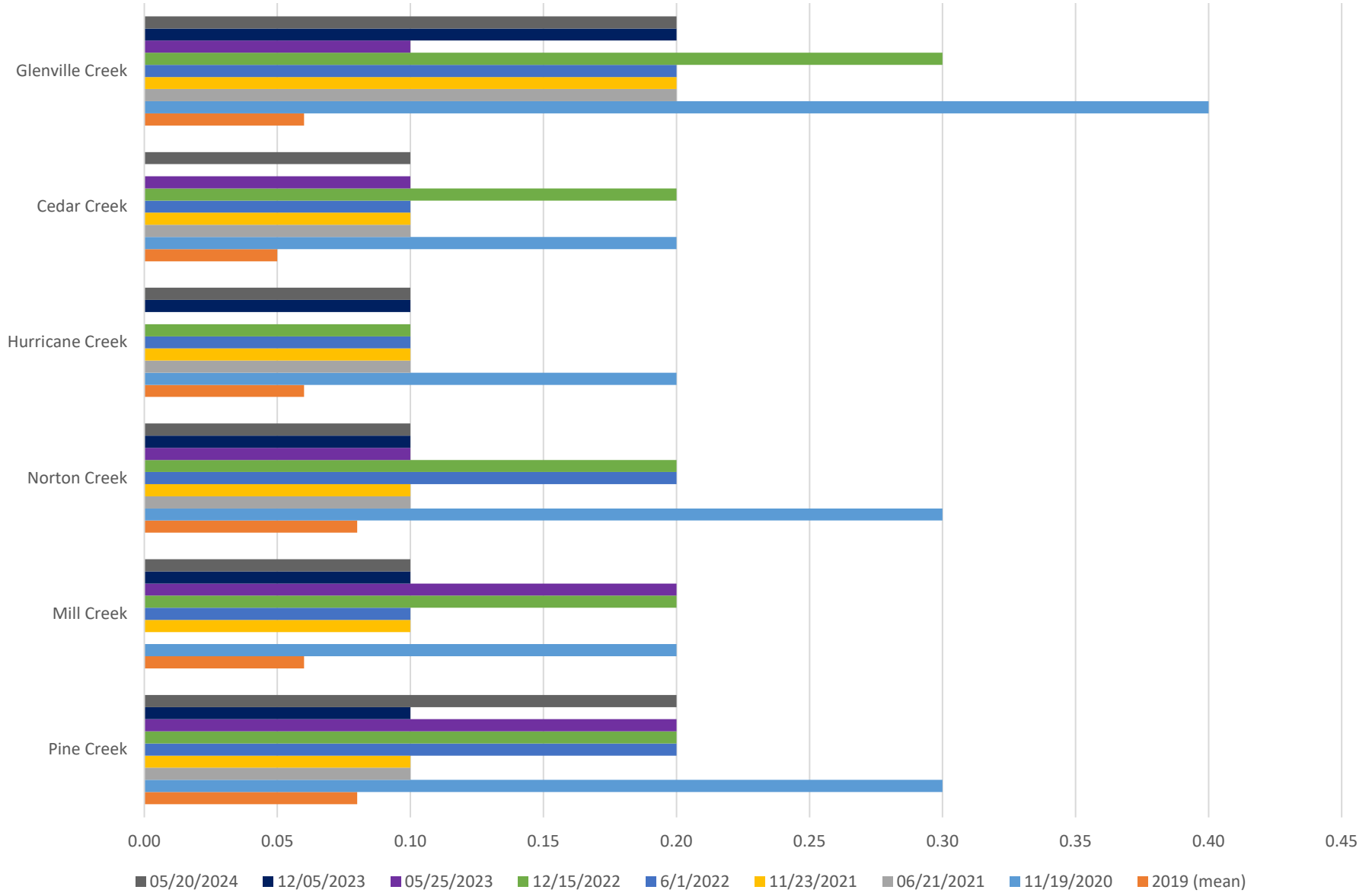
Ammonia (mg/L)

Regional VWIN mean 0.09 mg/L - (used to compare results against typical regional values)



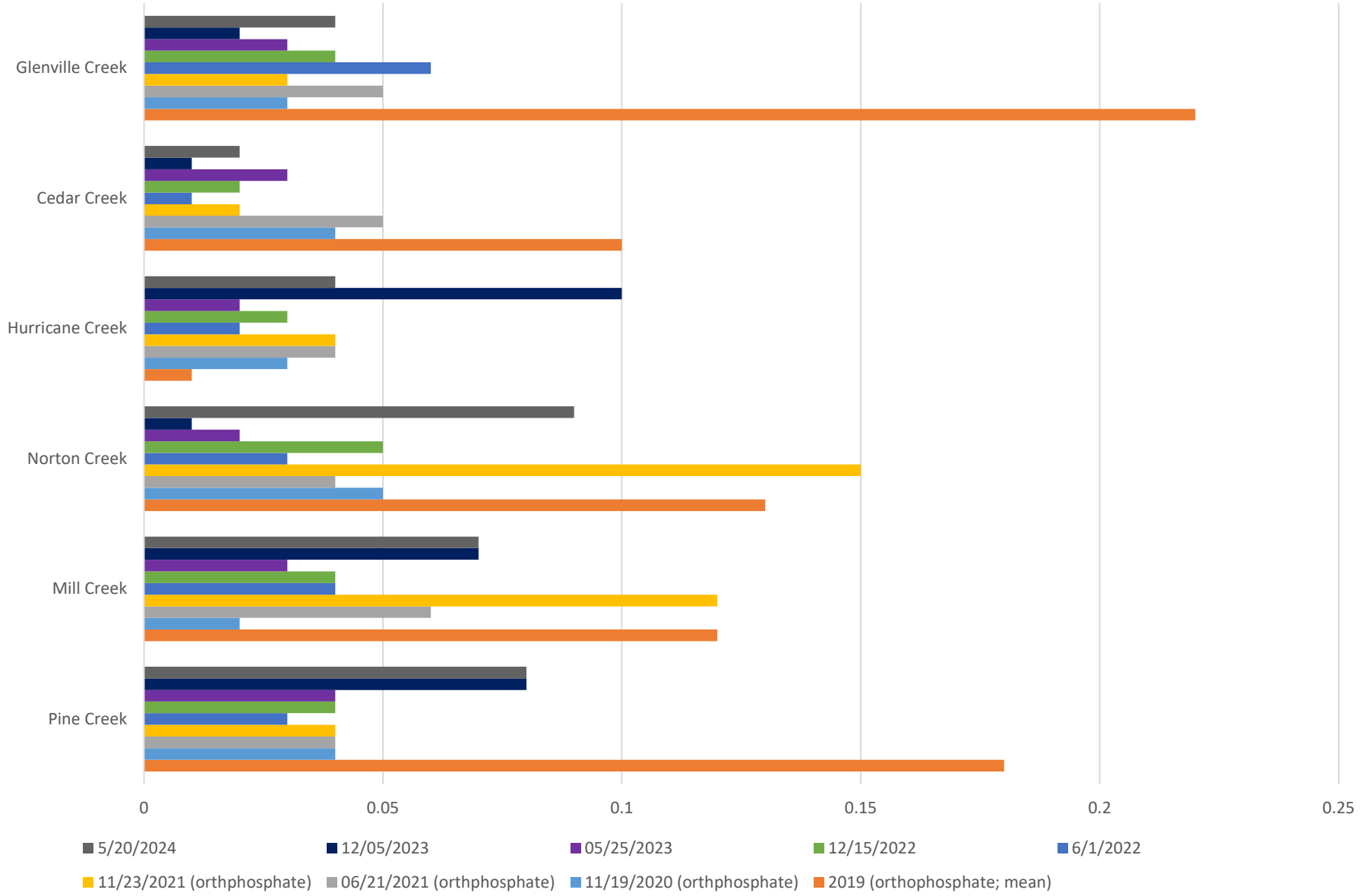
Nitrite/Nitrate-Nitrogen (mg/L)

Regional VWIN mean 0.5 mg/L - (used to compare results against typical regional values)

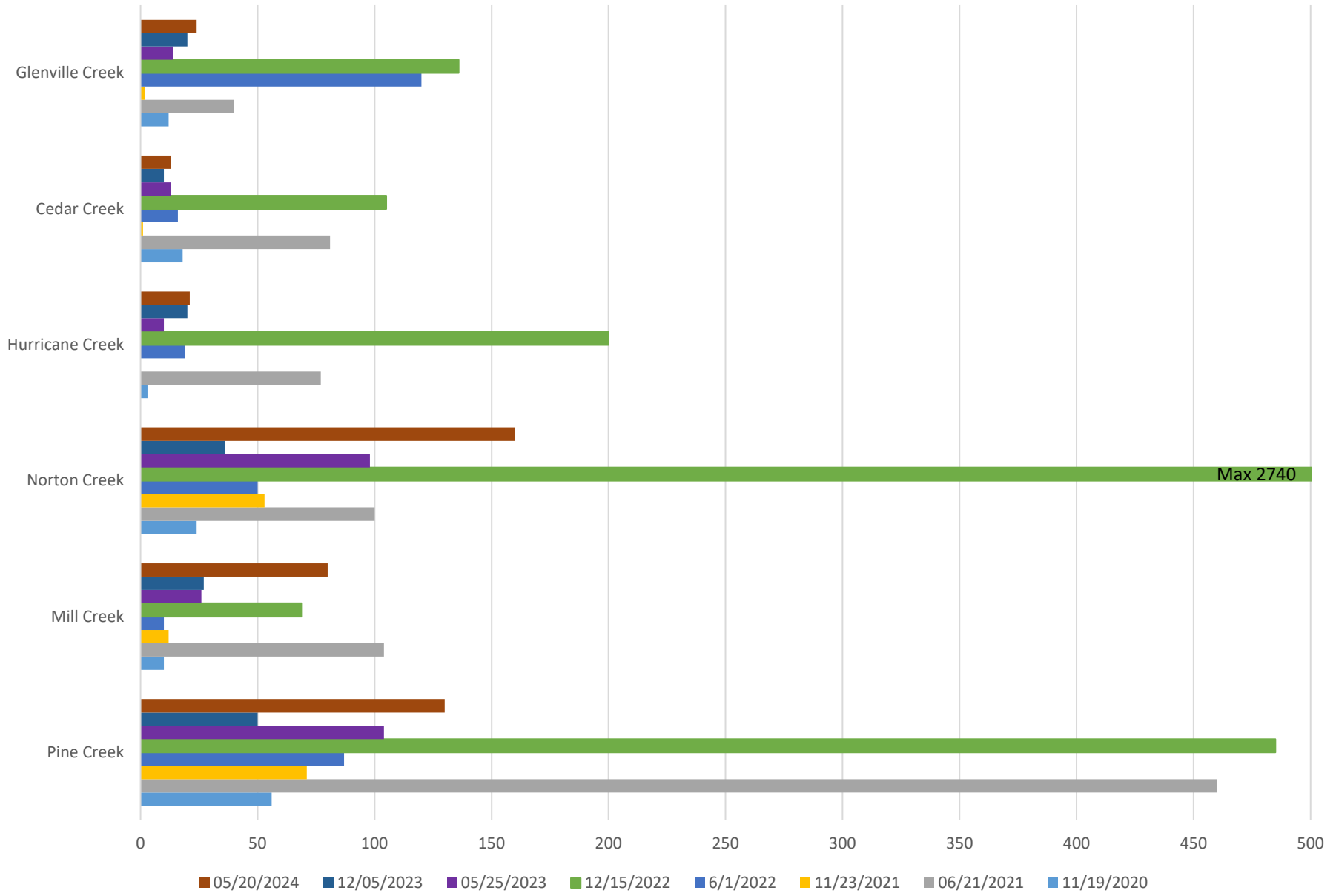


Phosphorus (mg/L)

Regional VWIN mean 0.09mg/L - (used to compare results against typical regional values)

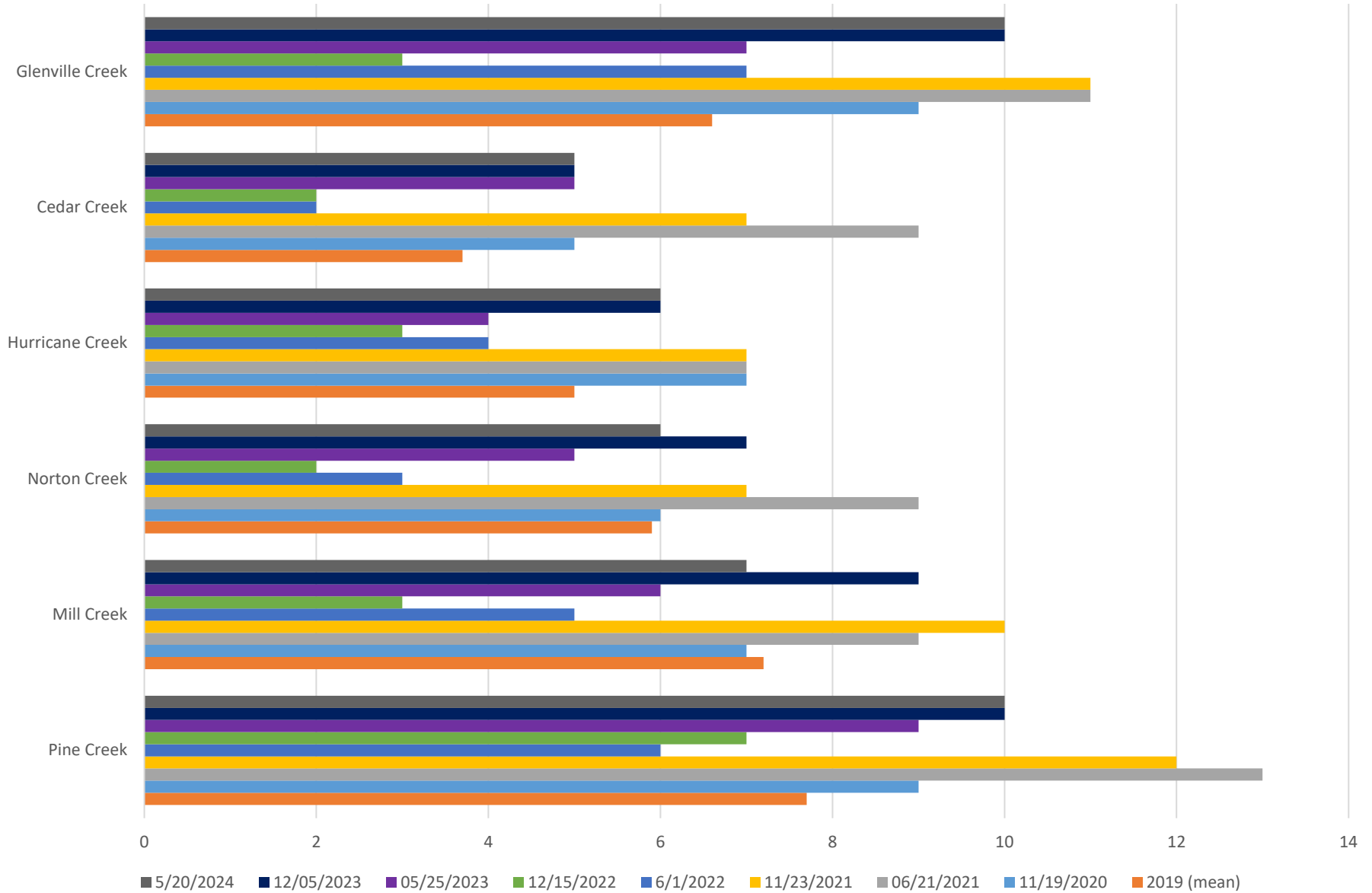


Fecal Coliform (CFU/100 mL)

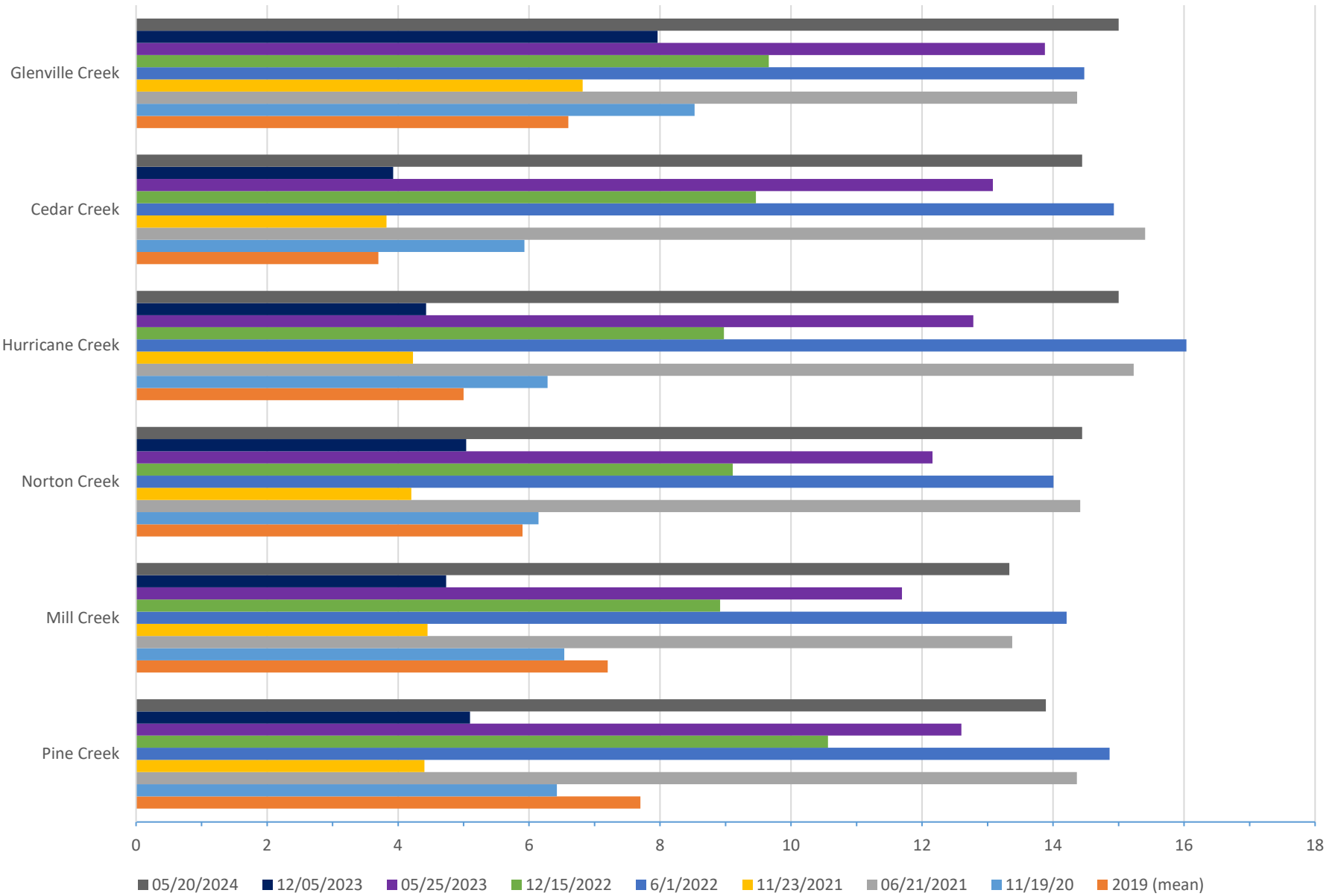


Alkalinity (mg/L as CaCO₃)

Regional VWIN mean 22.3 mg/L - (used to compare results against typical regional values)



Temperature (°C)



Equinox Environmental: Lake Glenville												
			**Regional VWIN mean - used to compare results against typical regional values									
			*Reporting limit									
			NH3	NO2/NO3	Phosphorous	Dissolved Oxygen	Specific Conductivity	pH	Turbidity	Fecal coliform	Temperature	Alk
			mg/L	mg/L	mg/L (as PO4)	mg/L	µS/cm		NTU	CFU	°F	
			0.09**	0.5**	n/a	NC Trout Water	60**	7.1**	6.2**			
			0.02*	0.1*	0.02*	designation standard ≥6 mg/L						
1	Pine Creek	05/20/2024	0.08	0.2	0.08	8.8	23	7.5	1	130	57	10
2	Mill Creek	05/20/2024	0.08	0.1	0.07	8.9	17	7.0	<1	80	56	7
3	Norton Creek	05/20/2024	0.11	0.1	0.09	8.8	20	7.0	2	160	58	6
4	Hurricane Creek	05/20/2024	0.1	0.1	0.04	8.8	23	6.9	<1	21	59	6
5	Cedar Creek	05/20/2024	0.09	0.1	0.02	9.0	12	6.9	<1	13	58	5
6	Glenville Creek	05/20/2024	0.05	0.2	0.04	8.2	21	6.8	<1	24	59	10