

What SBCA EXPLAINER:

# What's wrong with phosphorus?

- Phosphorus is a plant fertilizer.
- Algae is a plant.
- Pristine streams have very little phosphorus.
- Treated wastewater contains phosphorus.
- Discharging treated wastewater with phosphorus into pristine streams with very little phosphorus will fertilize new and excessive algae growth.
- This has already happened on some pristine streams in the Hill Country, including the Blanco and South San Gabriel Rivers.

## Phosphorus numbers at a glance:

All measurements shown are in micrograms per liter (mcg/L, or  $\mu\text{g/L}$ ):

**10** mcg/L — level of **naturally occurring phosphorus** in pristine streams

**15** mcg/L — level at which **excessive algae starts growing** in pristine streams

**20** mcg/L — level to which phosphorus in wastewater **can be reduced using newest technology**

**50** mcg/L — limit for phosphorus **recommended by judges** for Liberty Hill's new wastewater permit

**150** mcg/L — limit for phosphorus **proposed by TCEQ** for Liberty Hill's **new permit**

**500** mcg/L — limit for phosphorus **included by TCEQ** in Liberty Hill's **current permit**

**Note: TCEQ measures phosphorus in milligrams per liter (m/L): 1 microgram = 0.001 milligram**

For example, the amount of naturally occurring phosphorus in pristine streams can be stated as 10 micrograms per liter or as 0.01 milligrams per liter. Most water quality scientists use micrograms to measure phosphorus. TCEQ's use of milligrams to measure phosphorus can minimize the problem of phosphorus pollution in pristine streams, since these measurements will be expressed in decimal point values (0.001, 0.01, 0.1), which can also cause confusion. The use of micrograms allows phosphorus measurements to be expressed in whole numbers (1, 10, 100), which can prevent confusion.

## How much phosphorus is too much?

Any amount of extra phosphorus added to a pristine stream can be too much.

**10 micrograms per liter** — This is the upper range of the amount of naturally occurring phosphorus that's found in pristine streams throughout the Hill Country. Scientists have measured even lower phosphorus levels on some rivers and creeks. While these streams have small amounts of seasonal algae when their flow stagnates during dry periods, they run clean and clear for most of the year. One of the scientific definitions for what qualifies as a pristine stream is that it's a stream with 10 mcg/L or less of naturally occurring phosphorus.

**15-20 micrograms per liter** — New algae will start growing in pristine streams when the amount of phosphorus rises to this level, according to extensive measurements by water quality scientists.

Adding even more phosphorus will cause even more algae. The city of Liberty Hill's treatment plant is currently discharging treated wastewater into the South San Gabriel

River, which is a pristine stream. Miles of the river have been coated with excessive algae almost continuously since Liberty Hill began discharging under the current permit that it received from TCEQ. Algae has continued to grow on the river even when Liberty Hill was able to temporarily reduce the amount of phosphorus in its discharged wastewater to 50 milligrams per liter.

## What's the best phosphorus limit for treated wastewater?

The amount of phosphorus that can remain in wastewater after treatment should be limited to the amount that naturally occurs in the stream receiving the discharge, or to the level at which excessive algae would start growing.

**10 micrograms per liter** — Because no new phosphorus should be added to pristine streams, this is the only limit that will be truly protective. When TCEQ issues new discharge permits for wastewater plants on pristine streams, it should include a phosphorus limit of 10 mcg/L.

**20 micrograms per liter** — A few wastewater treatment plants have already been built on pristine streams. Since the newest treatment equipment can reduce phosphorus levels to 20 mcg/L, this is a realistic limit for existing wastewater treatment plants on pristine streams.

## What phosphorus limits have been required or proposed for pristine streams?

**20 micrograms per liter** micrograms per liter — This is the phosphorus limit that local landowners on the South San Gabriel River have asked TCEQ to include in Liberty Hill's new discharge permit.

**50 micrograms per liter** — This is the phosphorus limit that administrative law judges who reviewed Liberty Hill's new discharge permit have recommended. This is 5 times the amount of naturally occurring phosphorus in the South San Gabriel.

**150 micrograms per liter** — This is the lowest phosphorus limit that TCEQ has included in any approved or draft wastewater discharge permit. It's the limit that TCEQ's staff wants to include in Liberty Hill's new permit. It's 15 times the amount of naturally occurring phosphorus in the South San Gabriel.

**500 micrograms per liter** — This is the phosphorus limit that TCEQ included in Liberty Hill's current discharge permit. This is 50 times the amount of naturally occurring phosphorus in the South San Gabriel.

**No limit** — TCEQ has set no phosphorus limit for most wastewater treatment plants currently operating on pristine streams in the Hill Country.

## Why is 150 mcg/L the lowest phosphorus limit that TCEQ has set for pristine streams?

TCEQ has not provided a scientific explanation for why a phosphorus limit of 150 mcg/L is sufficient to protect pristine streams from excessive algae.

However, TCEQ has included the 150 mcg/L limit in several permits that it has approved or drafted for permits on pristine streams in the Texas Hill Country:

- Belterra (2008) — approved permit on Onion Creek
- Liberty Hill (2016) — approved permit on South San Gabriel River (150 mcg/L limit was included for Phase 4)
- Dripping Springs (2019) — approved permit on Onion Creek
- Long Branch (2021) — draft permit on Barton Creek (application withdrawn)
- Liberty Hill (2021) — draft of new permit (pending)

- Diamante Ranch (2022) — draft permit on Upper Cibiolo Creek (pending)

While TCEQ has included the 150 mcg/L phosphorus limit in approved permits for Belterra and Dripping Springs, neither has actually begun discharging wastewater. (Both are using land application to dispose of their treated wastewater.) Thus, TCEQ has no real-world evidence that a 150 mcg/L phosphorus limit will prevent excessive algae on pristine streams.

According to the judges who reviewed the new permit that TCEQ has proposed for Liberty Hill, a TCEQ scientist “testified that she could not have set a lower phosphorus limit because [150 micrograms per liter] was recommended by her supervisor and he would not have approved a lower limit.”

According to a later document by TCEQ, “no evidence” was presented to the judges who reviewed the Liberty Hill permit that a phosphorus limit of 150 mcg/L would not “significantly improve conditions downstream of [Liberty Hill's] discharge point.”

This is true — a new limit of 150 mcg/L would be an improvement over the existing limit of 500 mcg/L. But is it enough to eliminate excessive algae on the South San Gabriel? According to all of the available science, it is not.

***For more information, please contact Brian Zabcik, SBCA Advocacy Director, at [brian@savebartoncreek.org](mailto:brian@savebartoncreek.org)***