Factors that affect trout vision

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A recent April spring afternoon left me in a state of pure bliss: I had landed 28 trout during an explosive bite. Rainbows aggressively took the fly launching out of the water and executing five-foot aerials.

I wanted to determine if the nonstop action would be impacted by the color of the fly, so I tested 6 different colors of my Predator Bugger: yellow, olive, burnt orange, white, black, and burgundy.

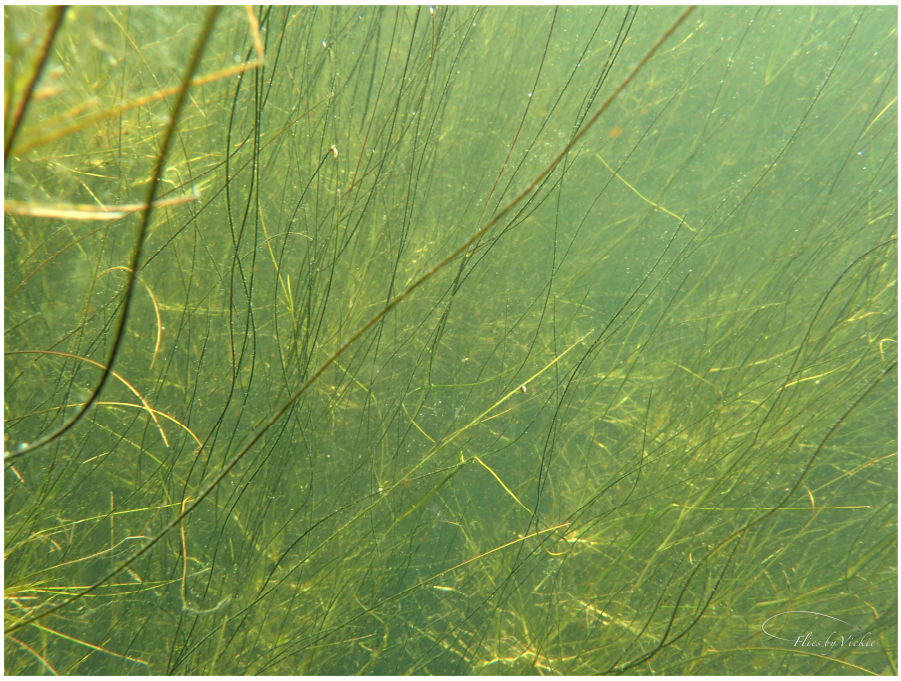
All colors worked equally well! Because the sun's position was directly overhead, the flies were backlit by the bright sun making it impossible for the trout to distinguish fly color. Trout saw a dark silhouette regardless of the fly color. When trout look up towards the surface of the water when the sun is high, any color in the fly box is equally effective.

Anglers start with a simple hook, wrap it with material, and transform into something appearing to be living, breathing, and tasty to trout. However, those colors will be perceived differently depending on the time of day, position of the sun, and the degree of light penetration.

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Like humans, trout vision acuity is relative to the amount of available light. In clear and shallow water, colors will be more recognizable in the top few feet. However, three to six feet down, colors become muted as less light penetrates the water column. Additionally, since water is denser than air, light bends when it hits the water, becomes scattered, and the colors shift. Less color is distinguishable the deeper the fly sinks due to the absorption of light and the filtering out of color wavelengths by the water.

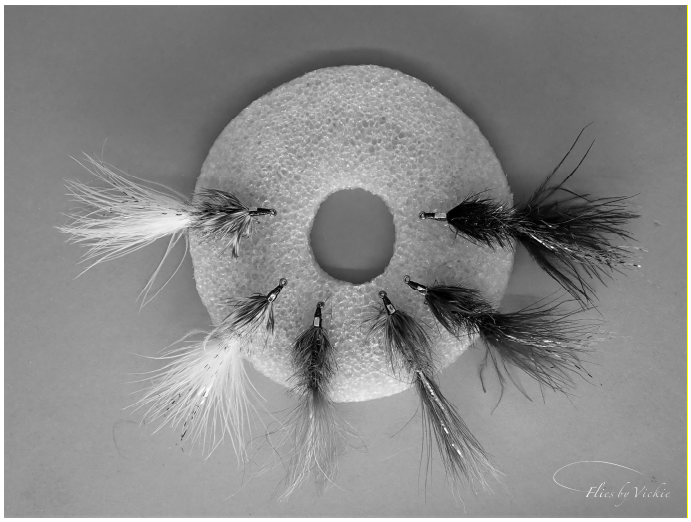
Red and orange (colors with longer wavelengths) are absorbed first. Colors with shorter wavelengths, like violet, blue and green appear as darker silhouettes the deeper the fly sinks.



Colors are visible in clear in shallow water when light is available

At 10 feet, roughly 60 percent of total light will be absorbed. This causes the color of the fly to appear gray and eventually black as the depth of the fly or the trout's distance from the fly increases. To get a better idea of how the colors change in low light, compare my Predator Buggers in color and in black and white:





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Fish caught with Vickie's White Predator Bugger

Since the color white maintains its visibility longest, I use white and yellow flies when fishing deeper during the hot summer months when warm water temperatures and low oxygen levels drive fish to hold deeper.



Vickie's Predator Bugger

Particulates in the water also affect what color the trout will see. Imagine looking through green tinted sunglasses; some colors will appear bolder while others more subdued. For example, a burnt orange fly in green algae stained water will appear orange/brown. Additionally, since there is less light in heavily stained water, darker flies produce a clearer silhouette, are easier to see, and therefore more effective under such conditions.

Trout's Field of Vision

The distance from trout to the fly also affects what they see. For example, when trout hunt close to the surface, their visible viewing window is narrower and more restricted. This narrow viewing angle allows anglers to approach feeding fish much closer. If the angler is outside the range of the trout's visual tight visual window, the trout will not be alerted to the angler's presence.

When fish are deeper in the water column, their field of vision widens. When trout are holding deep, they have a larger viewing window of what is above them, including the angler. This requires long casts to keep the angler outside of the trout's viewing window.

Similarities between Trout and Human Eyes

Humans and trout both have lens-covered eyes with retinas containing rod and cone photoreceptors. Rod cells perceive contrast in low light, cone cells distinguish between colors. The trout's cones are receptive to three primary colors: red, green, and blue – the same as the human eye.

One difference is that trout do not use rods and cones at the same time the way humans do. Trout cones are activated only during the day so trout can see color while the sensitive rods are disengaged to protect them from bright sunlight. At night, the trout's cones disengage and the rods activated to see in the dark. Since trout cannot see color at night, they rely on contrast and key on the silhouette of potential food. The only time trout activate both rods and cones at the same time is for a brief period during dawn and dusk. Perhaps this is

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the reason I have found burnt orange such an effective color at dusk. After the light leaves the water, I will change to darker colored flies that present greater contrast.

Do fish see UV light? Debate continues…

It is an ongoing debate in the scientific and angling communities whether it is beneficial to add UV materials to your fly. Scientific researchers have found that young juvenile fish still in the Parr stage can perceive UV light. As the trout matures their UV sensitivity shifts from ultraviolet to blue. Other researchers say that the ability to see UV light disappears by the time trout are two years old. Still others believe that certain species use UV for only a part of their life cycle. And other researchers counter that trout retain the ability to see UV light into adulthood.

From an angler's perspective, I have tested flies with and without UV materials and have found that those with UV materials consistently produced more hookups that those without. Perhaps trout see UV, perhaps not. Maybe the iridescence of the UV materials contributes to the fly's visibility. The bottom line is that I find flies with UV materials catch more fish. Therefore, all my fly patterns incorporate UV materials.



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