RED OR GREEN FOR NIGHT VISION LIGHTING?

Where good night vision is vital—tramping, hunting, night photography, astronomy, scientific field work, security and military operations—the user ideally needs a headlamp or flashlight that incorporates white light and a lower intensity red or green light.

Why is this?

The light-sensitive layer of cells at the back of the eye is called the retina. This layer is comprised of two types of cells: rods and cones.

The cone cells can be thought of as a high-quality video camera while the rod cells are more like a low-resolution black-and-white webcam.

The cones require a large amount light to operate. They work well during daylight but have limited receptivity at night. The rod cells serve the opposite function. They incorporate rhodopsin, a light-sensitive protein that activates the rod cells and allows you to see at night. Exposure to bright light quickly breaks down the rhodopsin and temporarily blinds the rod cells.

Night vision does not start working immediately after the lights go out. It takes about thirty minutes for the rod cell to produce enough rhodopsin to activate.

Using a low intensity red light or green light helps preserve your night vision. It shortens the recovery time once you turn off white light illumination and leaves the eye’s night vision ready once the low intensity light is turned off.

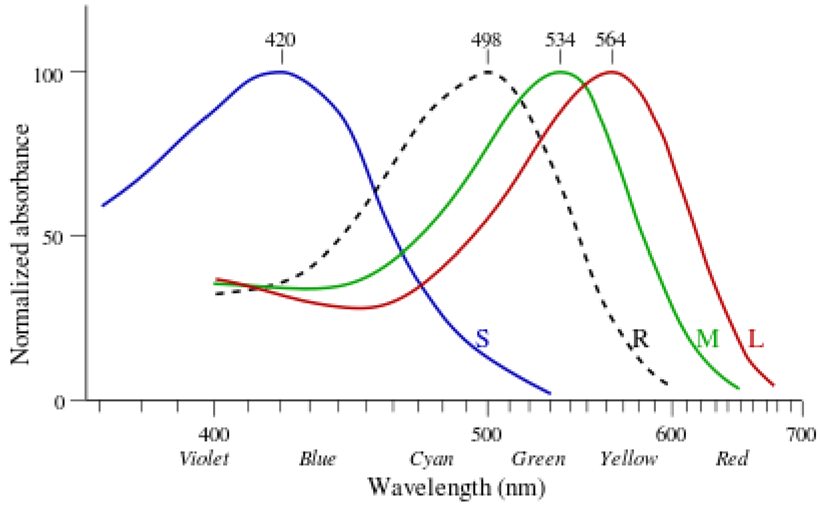
Is red or green better?

This is somewhat of a matter of opinion. Both are much better than white light. It is generally considered that red breaks down rhodopsin more slowly and, if preserving night vision is the main objective, red is better.

But green light penetrates a little better, and shows more detail. It may be preferred for distance vision, and for close up clarity, such as reading instruments or maps. Green is more commonly used in military situations, where it is claimed to be less detectable by night vision equipment.

Here's Wikipedia's explanation of the science:

> All photoreceptor cells in the eye contain molecules of photoreceptor protein which is a combination of the protein photopsin in color vision cells, rhodopsin in night vision cells, and retinal (a small photorector molecule). Retinal undergoes an irreversible change in shape when it absorbs light; this change causes an alteration in the shape of the protein which surrounds the retinal, and that alteration then induces the physiological process which results in vision.
>
> The retinal must diffuse from the vision cell, out of the eye, and circulate via the blood to the liver where it is regenerated. In bright light conditions, most of the retinal is not in the photoreceptors, but is outside of the eye. It takes about 45 minutes of dark for all of the photoreceptor proteins to be recharged with active retinal, but most of the night vision adaptation occurs within the first five minutes in the dark. Adaptation results in maximum sensitivity to light. In dark conditions only the rod cells have enough sensitivity to respond and to trigger vision.



Normalised absorption spectra of the three human photopsins and of human rhodopsin (dashed).

Rhodopsin in the human rods is insensitive to the longer red wavelengths, so traditionally many people use red light to help preserve night vision. Red light only slowly depletes the rhodopsin stores in the rods, and instead is viewed by the red sensitive cone cells.