

Seeing Colors Correctly on the Web

Color Managed Browsers and Properly Prepared Images

(Modified 08-17-2014)

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There are two considerations here:

- How can you prepare your own images to be seen as accurately as possible by the widest audience on the web?
- How can you see other people's images on the web as accurately as possible?

The first consideration involves making the best choice about the color space for your derivative JPEG (color spaces are explained below), converting it properly and embedding (tagging with) the color profile that specifies that color space. The second consideration, seeing other people's images accurately, depends on using a web browser that is properly color managed (and hoping they have prepared them correctly), and having a properly calibrated and profiled monitor.

Color management is the basis for accurately reproducing the colors in an image on a monitor or projector or in a print. It works by an image carrying a profile that specifies its color space (gamut) and on that profile being used by an output device such as a web browser, monitor or printer. I'll just deal with web viewing here.

I'm not an expert on color management, or anything else. Everything I know, I've been forced to learn, and have done so the hard way. But I've tried to figure out what I need to know to view and present images as correctly as possible. I'm only hoping to offer here some reasonably current information that can be understood and utilized. There is a lot about this stuff on the web, all of it is complex and much is outdated. If you want to get a headache, just do a web search on color management in browsers and click on a few articles.

For background, here's a one-paragraph digression on this profile and color space stuff. Color space is the gamut (range of colors) that can exist in an image. There are basically three that concern digital darkroom users. The narrowest gamut is sRGB. It is commonly used because until recently monitors could only display that range of colors, so it is the most general choice for web audiences. (It is also unfortunately the default working space for Photoshop, and not the best choice for general digital darkroom use. It can be changed in Edit > Color Settings.) The next wider gamut is Adobe RGB. It more closely matches the gamut of photo quality inkjet printers and is considered a good working space for Photoshop and other image editors. The largest gamut is ProPhoto RGB, which more closely matches the colors most digital cameras can capture in a RAW file, and is an alternative to Adobe

RGB as an editing working space for advanced users, although there are some pitfalls outside the scope of this discussion.

The first consideration is to prepare your images to be seen as accurately as possible by the widest audience, with a range of browsers and monitors in the wild that will be all over the place. To accommodate this range as best you can, you should **convert your images to the sRGB color space (which is the lowest common denominator for monitors) and embed (tag with) that profile. The worst thing you can do is to post images in the wider Adobe RGB or ProPhoto RGB gamut and not embed the profile.**

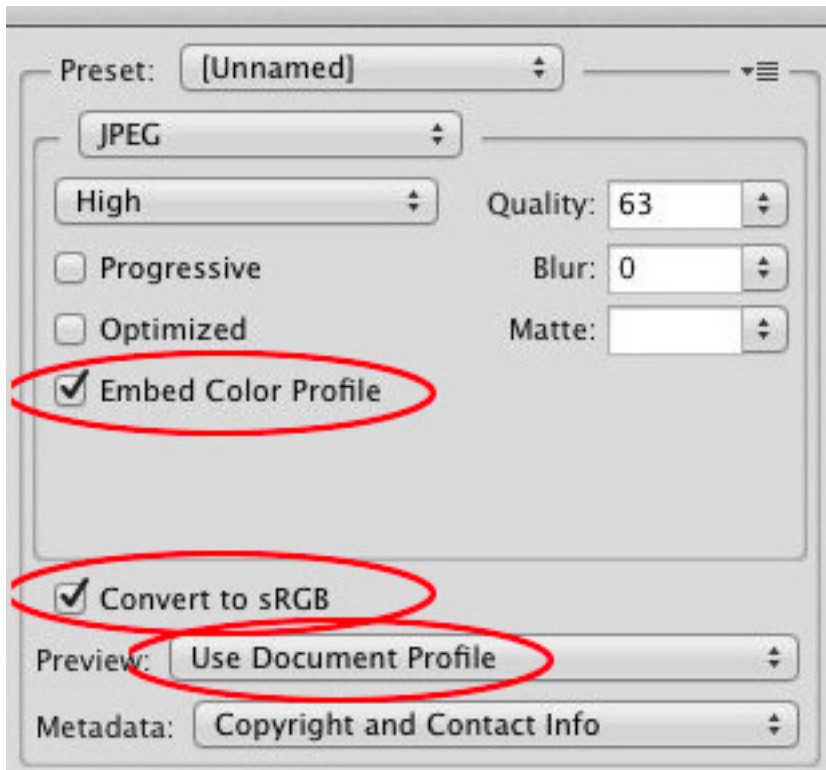
That is because an untagged image will be displayed in the monitor's color gamut. Most of your general web audience will have monitors and laptops that can only display the sRGB color gamut, and for those people, an untagged image will be displayed in the limited color gamut of the monitor. In other words, it will effectively be converted to sRGB even if it was originally Adobe RGB or ProPhoto RGB. But wide-gamut monitors are increasingly becoming affordable and more widely used. Those viewers will see incorrect colors if you don't convert to sRGB and embed the profile. And those are likely the more sophisticated viewers whom you would like to see your images correctly. And you might like to them to be seen correctly in coming years, as wide-gamut monitors become increasingly common.

No browser knows how to handle images without a profile, so the colors cannot be displayed correctly. Even though an untagged image looks good on your closed system, posting it to the wide world would be like speaking French to people who never heard of France.

So how to convert and tag an image? I'll describe it for Photoshop and Lightroom, but it's easy in any decent image editor. If you prepare an image for the web the hard way, from Photoshop, doing all the steps yourself (flatten, convert to 8 bit, resize, sharpen and convert to sRGB) be sure you use Convert to Profile, NOT Assign Profile. It's in the Edit menu: Edit > Convert to Profile. Assign Profile is the adjacent menu item and is for specialized uses. If you don't understand what it's for, don't use it. Of course, if your Photoshop working space is sRGB, you don't need to convert. But unless you have a web-only output there are advantages to working in Adobe RGB or ProPhoto RGB, in order to retain the range of colors that can be printed or the even greater range that your camera can capture.

Converting to sRGB will reduce the gamut (color range) of the image. That will result in some alteration of color, but converting will preserve the appearance as much as possible. You won't see a major change in the image's appearance. And what change there is will be small compared to the range of "viewing experiences" among your audience.

The *easy* way to prepare an image for web output is to use Save for Web from Photoshop. Specify JPEG and the size, and then make sure you check BOTH to convert to sRGB and to embed the profile. To see the colors accurately, choose Use Document Profile for Preview.



Or from Lightroom, use the Export menu, set the desired parameters, and under Color Space select sRGB. The profile will be automatically embedded. And you can save the parameters as a preset. In both these cases, you don't need to flatten, convert to a different bit depth or profile or resize – they will be done for you on a derivative JPEG and your master file will not be changed.

The second consideration, how you see an image on the web, depends on your monitor and your web browser. I'll deal with the monitor in a separate article. Let's assume that the image being viewed has been properly prepared for the web and that your monitor is decently calibrated and profiled. (Don't take that for granted.)

If your browser is color managed it will send an image to the monitor using the color space embedded in the image, and the monitor's calibration profile will be used to present the colors as accurately as possible within the limits of your calibration. If no color space is embedded in an image there is no way a browser can know how to present the image. The best scenario is for a browser to assume an untagged image is in the sRGB space, which is the most common case. To my knowledge as of this writing, *only* Firefox does that, and *only* if you change a setting

from the default, as described below. If an untagged image isn't in sRGB color space, it can't be presented accurately by any browser.

Here is a summary of the possible situations:

sRGB and tagged – the best you can do

sRGB but untagged – only Firefox with a change to default settings will show it correctly

Adobe RGB and tagged – only a wide-gamut monitor can show it correctly

other color spaces and tagged – colors won't be seen correctly

other color spaces but untagged – it can't be displayed correctly by any browser

So you need a color managed browser in order to see the variety of images on the web as correctly as possible. As of a few years ago many browsers were not color managed. If you have an older operating system and browser, you are more likely to be seeing more images incorrectly. Here's a summary for several browsers, to the best of my current information.

For images *with* an embedded profile:

Opera has no color management and will not display the image properly.

Firefox, Internet Explorer, Safari and Chrome will attempt to display the image properly. But if the image's color space is Adobe RGB, very few monitors can display the gamut properly and if it is ProPhoto RGB, none can.

For images that *do not have* an embedded profile:

Opera has no color management and will not display the image properly.

Firefox *set up as below* will assume it is sRGB and display it properly if that is the case.

Safari and Internet Explorer will not display it properly.

Chrome – I have no reliable information but I doubt it can handle this situation.

Firefox (free from Mozilla) is a widely trusted browser because you can set it to assume that an untagged image is sRGB, which is the most common case. (Untagged images in other color spaces are beyond hope.). Out of the box (as of this writing) it is set to manage only images with embedded profiles. **So you need to make a simple setting.**

Open Firefox (if you have a version earlier than v15, it should be upgraded) and go to the address bar and type **about:config**.

You'll get a warning; click I'll be careful.

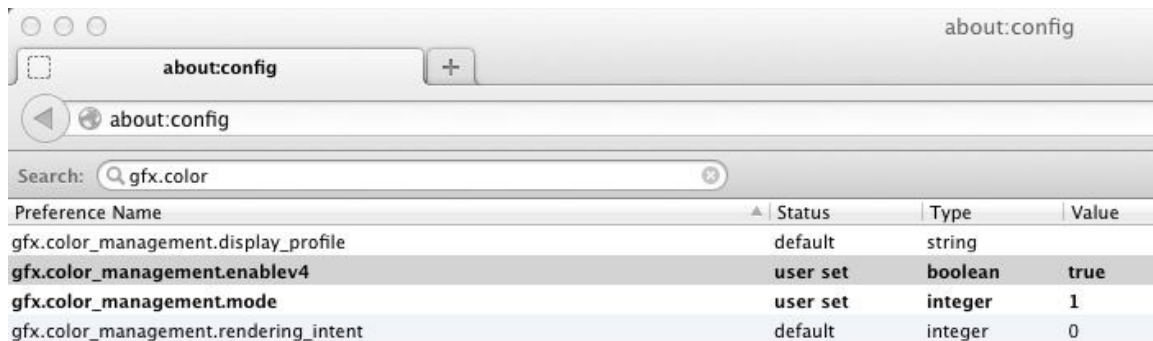
On the Search bar that is now shown just below the URL bar, type **gfx.color** as shown below, to narrow down the long list.

In the list displayed, double click on the words "gfx.color_management.enablev4" to change its value to true, if it isn't.

If the value for `gfx.color_management.mode` is not 1, double click it and put 1 in the box. This will treat images without profiles as sRGB, converting them to the monitor profile.

The other two options are best left at their defaults, as shown.

Then close and restart the browser.

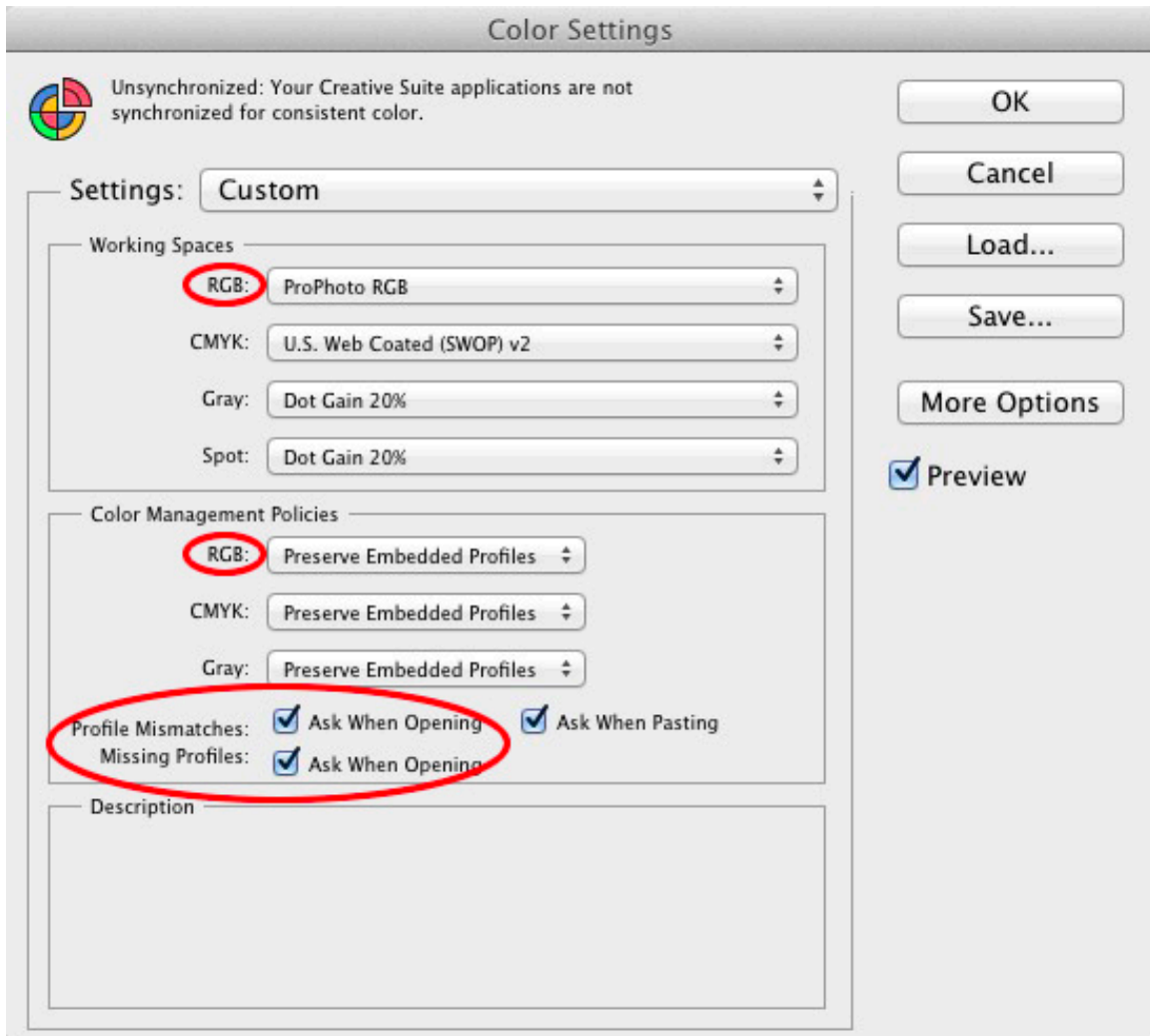


Some other current browsers may have caught up to Firefox by now, but some have claimed to be “color managed” without giving details. With Firefox, I know what I’m getting, both for tagged images and for the most common case of an untagged but sRGB image.

You would think color management would be simpler for browsers to implement. There are a number of reasons why it isn’t, and two or three of them are good. Color management varies with different platforms (Mac and PC) and different operating system versions in each. It is complicated in part by the need to deal with all the elements on a web page, not just pictures, and also by the fact that users can have bad monitor profiles.

If you want to see if an image is being displayed correctly by your browser, open it in Photoshop, *but first you need to make sure Photoshop’s Color Settings are correct*. Viewing an image in a simple image viewer will give you incorrect colors if the image does not have a profile embedded, and may give a poor representation even if it does. And of course you can only see colors and tonalities (degrees of dark and light) within the limits of your monitor quality and its calibration.

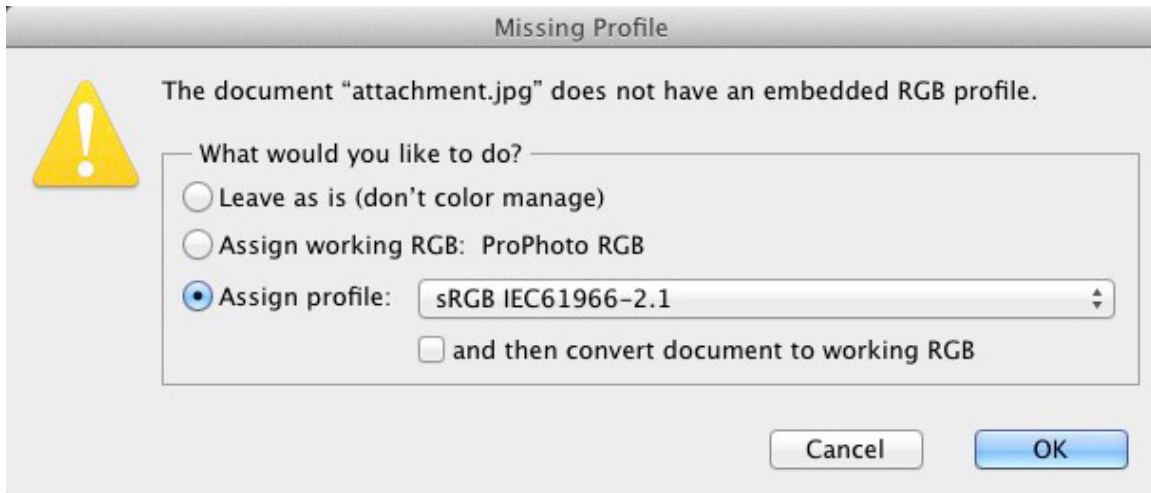
In Photoshop, go to the top menu bar, to Edit > Color Settings. This is one case where you can ignore the More Options and leave those additional items at their defaults. I recommend using sRGB or Adobe RGB as your RGB Working Space unless you understand the pitfalls in ProPhoto. The other three working spaces, CMYK, Gray and Spot, won’t be used in the normal use of Photoshop for the digital darkroom.



There are three choices for the RGB dropdown in the Color Management Policies section: Preserve Embedded Profiles, Convert to Working RGB or Off. You absolutely *do not* want Off selected. Either of the other two are OK as you will be given a choice when you encounter a missing or a mismatched profile; your choice here will only be the default that you will see. The safest choice is Convert to Working RGB, as you will then see the histogram accurately. You can go with Preserve Embedded Profiles if you are just doing a quick fix and re-saving, as that will let you skip the step of converting back to sRGB to re-post, if your working space is not sRGB.

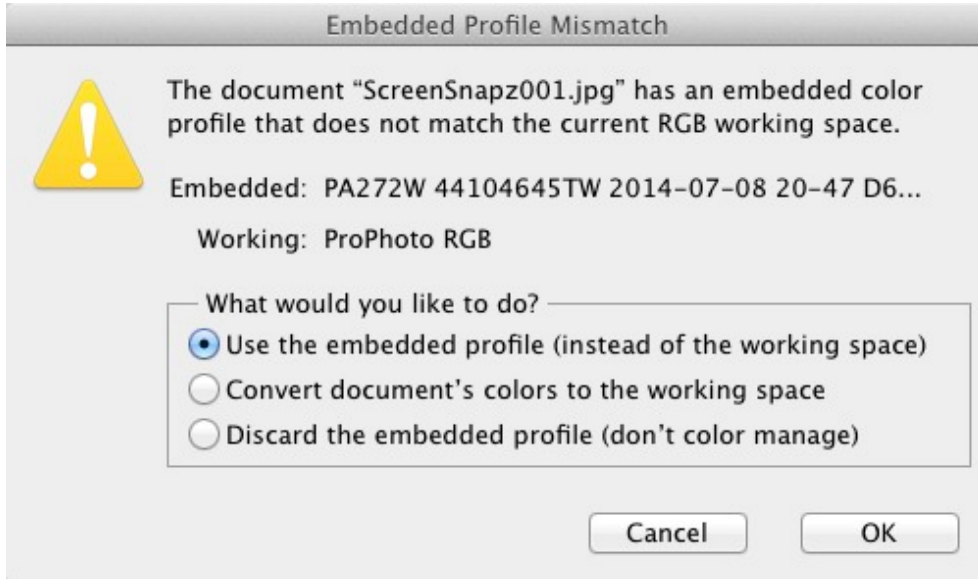
The critical thing is to check the two boxes on the left for Profile Mismatches and Missing Profiles.

If your Color Settings are correct and the image doesn't have a profile embedded, you will get this dialog:



You will see the colors correctly (within the limits of your monitor's calibration and viewing conditions) if you answer either Assign working RGB or Assign Profile and make the correct guess from its dropdown on the right, as to the proper profile. If you want the histogram to be accurate, answer "Assign profile" and make the correct guess. (ESP comes in handy here.)

If the document has a profile but it doesn't match your working space, you will get this:



If you answer "Use the embedded profile" you will see the colors accurately (within the limits of your monitor's calibration and viewing conditions) but the histogram will not be accurate. If you answer "Convert document's colors to the working space" you will see both the colors and histogram accurately. But if you want to re-post it to the web and your working space is not sRGB, you will need to convert it again, back to sRGB, and be sure you assign the profile. Whatever you do, DON'T

choose “Discard the embedded profile (don’t color manage).” All bets are off as to what you will see.

This stuff really isn’t rocket science. All you need to understand about it is how to set things up, and once you have done that, you can quit thinking about it and go back to doing great photography!