You can’t always get what you want

What is gamut?
Every color system (monitor, desktop printer, copier, offset press, etc.) has its own unique color gamut. Color gamut means the range of colors and tones achievable by an imaging system.

The color gamut of a computer screen is determined by the purity and brightness of its red, green and blue pixels. The color gamut of a printing device is determined by the hue, saturation and lightness of its cyan, magenta, yellow and black inks and the brightness, and other characteristics, of the paper or substrate on which they are printed.

Successful designers work within the available color gamut—or accept some loss of color in the final output. For example, if you view your design in RGB without CMYK soft proofing, chances are you will be disappointed when it prints. Likewise, don’t expect the same color gamut on newsprint as you can get on commercial offset paper.

RGB vs. CMYK
Computer monitors typically have larger color gamuts than printing devices, especially in deep blues and blacks. This means the printed result will often be less dramatic than the original RGB image viewed on screen. To see in advance how an RGB image will look when printed in CMYK, use the Photoshop® Proof Colors option select View > Proof Colors or click Command + Y (Mac) or Control + Y (Windows). Colors outside the printable gamut will display with less saturation, similar to how they will print on press. Proof accuracy depends on the quality of your monitor profile as well as your default CMYK Working Space and default Rendering Intent.

CMYK vs. CMYK
Not all printing systems have the same color gamut. For example, a typical commercial offset press running to GRACoL® specifications has a much wider color gamut than a newspaper press, due to the brighter white of commercial paper and the higher ink densities it can support. Other factors affecting printed gamut may include paper weight, opacity, coating, gloss, absorbency and other surface characteristics.

Expanded-gamut printing
When extra gamut is essential, and the extra cost is justified, printed gamut can sometimes be expanded using extra inks and/or higher ink densities than normal 4-color printing. Just remember, extended-gamut printing is more expensive and skill-intensive than regular CMYK printing. If you don’t have the extra budget, make sure your design looks good in the printable color space (for example, GRACoL or SWOP®).

This poster was produced using one of many possible expanded-gamut techniques. A second cyan plate permitted expanded-gamut techniques. A second cyan plate permitted expanded-gamut techniques. A second cyan plate permitted expanded-gamut techniques. A second cyan plate permitted up to 200% cyan in the richest blue areas.

For more information about this poster or others in the series, as well as free downloads and resources, visit www.idealliance.org/2012deerposters.
Getting it right the first time

Working accurately in RGB

Thanks to ICC color management and printing specifications like GRACoL®, SWOP®, creative users can control the color of their own work—even view on their monitor how an RGB image will print on press—provided they follow a few guidelines:

• Use standardized Adobe Color Settings
• Synchronize Adobe® Creative Suite® color settings in Bridge.
• Use a good quality monitor
• Create a custom ICC profile of the monitor
• Remember RGB images will look more saturated on the monitor than when printed in CMYK.
• Always embed the profile when saving an image or document.

RGB workflow

Most creative retouching, color correction and image editing has switched from CMYK to RGB. Photography works in red, green and blue light, so it’s simply more logical to edit photos in RGB. Photoshop® tools and filters are more powerful in RGB than CMYK. Creative edits are more valuable because they are more easily repurpose.

Another advantage of working in RGB is that it allows the printer to optimize the CMYK conversion to suit their own particular printing process. Although some printers still ask for CMYK files, increasingly printers are requesting files in RGB.

Displaying RGB as CMYK

The one significant concern with an RGB workflow is that a computer monitor can display a wider range of colors, or color gamut, than most printing processes can reproduce. To see how an RGB image will look in Photoshop when it’s printed in CMYK and to avoid surprises, select View > Proof Colors or click Command + Y (Mac) or Control + Y (Windows). Colors outside the printable gamut will display with less saturation. To highlight out-of-gamut colors, use View > Gamut Warning.

Controlling color in Adobe Creative Suite

The main thing you need to know about Adobe Color Settings is to set your CMYK Working Space to your intended printing condition (GRACoL or SWOP). Recommended Adobe Color Settings files (.acs files) and full installation instructions can be downloaded free from www.idealliance.org/2012deerposters.

Utilizing printing standards

Creative users can take advantage of color management best practices and standardized printing specifications by:

• Setting the Adobe CMYK working space to GRACoL or SWOP
• Previewing in Photoshop RGB images as CMYK (Mac: Command + Y, PC: Ctrl + Y)
• Proofing only on GRACoL or SWOP Certified Proofing Systems
• Demanding an IDEAlliance ISO 12647-7 Color Control Wedge 2009 on every proof, download free from www.idealliance.org/2012deerposters
• Viewing proofs and press sheets under ISO 3664:2008 D50 lighting conditions
• Working with an IDEAlliance G7 Master qualified proof or print provider

Delivering files

The preferred delivery format from InDesign is PDF/X-4:2010. For more information on creating and preflighting PDF files go to www.gwg.org. Individual images saved from Photoshop must have the correct embedded profile. This will happen automatically with the recommended IDEAlliance .acs files.

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Getting what you need

**GRACoL® and SWOP®**

GRACoL and SWOP are North American de-facto standard proof and print specifications representing how good printing should appear to the eye. GRACoL defines how a typical sheet-fed commercial press should look. SWOP defines an ideal Web Offset publication press. Both are based on G7.

Accurate, predictable color printing is one of the most difficult manufacturing tasks imaginable. Even with today’s advanced printing technologies, reproducing your design exactly the way you visualized it may not be easy, or even possible. To ensure a positive result, everyone involved from creation to output must aim for the same target print condition, such as GRACoL or SWOP.

**G7 methodology**

G7 is a methodology that helps printers simulate the appearance of GRACoL and SWOP on a printing device when using ISO-standard ink and paper. If you select GRACoL or SWOP as the target at the creative stage, the printed result is more likely to meet your expectations.

**Realistic expectations**

In printing, there’s no such thing as a perfect match due to the many variables in every printing process. A realistic goal isn’t an exact match but an acceptable approximation of the proof. Remember:

- Good printing should look close to the proof in the most important colors, but will always have some small differences.
- The closer the match you ask for between proof and press, the more the printing will cost.
- If the proof and press are printed on different types of paper, the image will be affected by that difference.
- Comparisons should only be made under standard ISO 3664:2009 D50 viewing conditions.

**Realistic tolerances**

The images above show some idea of what typically acceptable tolerances mean in visual terms. All the samples were considered acceptable because they conveyed the desired intent, even though they don’t match each other entirely.

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How good is good enough?

When judging print quality, remember you are evaluating the overall effectiveness of the printed product. Don’t be too distracted by small color differences. Good printing should simulate the proof well enough that the desired impression is conveyed to the end consumer, remembering that the consumer will never see the proof. If you hold the proof directly adjacent to the press sheet you will be setting expectations that cannot be maintained throughout the press run.

For more information about this poster or others in the series, as well as free downloads and resources, visit [www.idealliance.org](http://www.idealliance.org/2012deerposters).
The color contract

Color contract proofing

The first thing we need to do is distinguish between a content proof, which is not color-accurate, and a contract proof, which is. In this poster we are talking only about the contract proof. A contract proof is just what it says—a contract between the print buyer and the printer, so it is vital that it demonstrates as accurately as possible how an image will look when printed. If you make a nice print on your personal ink-jet printer that expresses your creative intent but doesn’t show how the press will print, you haven’t made a contract proof. At best you’ve made a color guide that a retoucher or color corrector can follow when altering your file so it prints as closely as possible to your vision. Remember the cost of those alterations is not included in a normal printing quote.

Certified proofing systems

Most of today’s offset presses are optimized to simulate the appearance of a predefined CMYK color space such as SWOP® or GRACoL® or other regional specifications. GRACoL and SWOP certified proofing systems are tested by IDEAlliance to fall within close visual tolerances of each other.

Note: There is no such thing as a G7® proof but any proof made to GRACoL or SWOP specifications is, by default, G7-compliant.

Measuring proof quality

Just because a proofing system is certified doesn’t mean it is operating correctly, or that the proof it produces is certified. Even a certified proofing system can drift out of tolerance.

To verify a proofing system, measurements are taken with a spectrophotometer on a standard IT8.7/4 CMYK target and compared to a reference specification such as GRACoL or SWOP. Proofing accuracy is expressed in average and peak Delta E.

To verify an individual proof, measurements are taken on the IDEAlliance ISO 12647-7 Color Control Wedge 2009 (download free from www.idealliance.org/2012/deeposters), which should be included on the edge of every proof. If you receive a proof without an IDEAlliance ISO 12647-7 Color Control Wedge 2009, ask for it to be made again.

Note: There’s no such thing as a certified GRACoL or SWOP proof. IDEAlliance does not certify individual proofs to GRACoL or SWOP.

Soft proofing

Soft proofing provides a viable alternative to hard-copy proofing by simulating the printed result on a calibrated and profiled monitor screen. The most common use of soft proofing is simulating a printed result on screen in an application like Adobe Photoshop®. Remote soft proofing takes this a step further by allowing instant color approval without the need to ship physical proofs from one location to another. When adjusted properly, a soft proofing system can be just as accurate as a hard-copy proof, but its effectiveness depends, among other things, on ambient lighting. The ideal soft proofing system uses controlled lighting alongside the monitor to illuminate the hard-copy sample; see image below. For more information about this poster or others in the series, as well as free downloads and resources, visit www.idealliance.org/2012/deeposters.

Soft proof

A properly calibrated and profiled monitor (image at left) can simulate a printed result with a high degree of accuracy, but the comparison must be made under carefully controlled lighting. Here the print is viewed in a D50 viewing booth dimmed to match the brightness of the monitor, and the monitor has been calibrated to match the precise color of the booth.

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The 5th color in 4-color printing

Paper is one of the most overlooked variables in printing. How a printed image looks is directly affected by the color, brightness, finish, coating, opacity, weight and absorbency of the paper on which it’s printed. To help define consistent printed appearance, specifications like GRACoL® and SWOP® recommend a specific paper color and brightness. The closer your printing substrate is to the proofing paper color, the better it will simulate a standard proof. Remember, paper color directly affects image color.

Different substrates

If your job is printed on a substrate with different color or brightness than the proofing substrate (also called a color cast or paper shade), the press sheet will not look like the proof. For example, if the white press stock has a blue shade, the print will look blue compared to the proof. And if the press stock has a yellow shade, the press sheet will look yellower than the proof, see images below. Differences in paper color or brightness will tend to be more noticeable in lighter tones and clean, pastel colors.

Caution: If you ask for GRACoL printing but specify a non-GRACoL stock, the printed piece will not simulate a normal GRACoL proof due to the substrate differences.

Designing for multiple purposes

Oftentimes a basic design or image will be repurposed many times on different media or processes, like a magazine, a newspaper, a billboard and the Internet. While each process may have its unique color capabilities, the goal should be to get the most common visual appearance possible. The easiest way to ensure this is to keep your work in RGB and let the printer convert to CMYK for each individual process.

Understanding UV

Many of today’s papers are enhanced with Optical Brightening Additives, or OBAs, to make them appear brighter. OBAs typically consist of materials which fluoresce under UV wavelengths. This causes issues in color measurement and color management. For example, UV-based additives fade upon exposure to light, in some cases causing paper to change color after just a few days. This affects the color of the printed piece.

Ironically, printed images typically look very similar on brightened and non-brightened papers when viewed apart from each other, even though they look different adjacent to each other.

The selection of paper is a crucial factor in accurate color reproduction.

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Lighting affects color

Standard lighting — D50
In order to see the same color we all have to view it under the same viewing conditions. Simply changing the lighting can change the appearance of an object or print. This is why standardized lighting is so vital.

The standard for lighting in graphic arts and photography is D50 as defined in ISO 3664:2009. D50 consists of a spectral power distribution curve based on average daylight (white band in graph). Everyone who views originals, proofs and prints under D50 lighting, apparent errors caused by incorrect lighting would be minimized.

Metameric failure
Metameric failure is when two images match under one light source but not under another. An example would be a press sheet that simulates the proof in the press console but not under office lighting. This often causes unjustified rejection of otherwise good printing. To minimize metameric failures, color decisions should only be made in standard D50 lighting by individuals who have passed a color deficiency test.

Standard color vision
We all see color differently—some more differently than others. In extreme cases, this is known as color blindness. Standard color vision is defined by the CIE (International Commission on Illumination) and can be tested. People making color decisions should be tested for color deficiencies.

Getting standardized
D50 viewing booths are available from several manufacturers including GTI (www.gti-lite.com) and JUST Normlicht (www.justnormlicht.com). Full-size D50 booths are used in pressroom and prepress areas. Smaller desktop booths can be dimmed to match the brightness of an adjacent soft-proofing monitor. Individual D50 tubes can be used as room lighting—a great idea for customer lounges and conference rooms where proofs or press sheets may sometimes be compared.

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