Getting the Colour Right

An Introduction to Colour Management

What We’ll Talk About

- What problem am I solving?
- So what IS colour management?
- How do I do it?

Has This Ever Happened To You?

So what’s going on?

What we have here is a “Failure To Communicate”

Colour

What you remember seeing

What your camera actually recorded

What your monitor displays

What your printer outputs

So what is Colour Management?

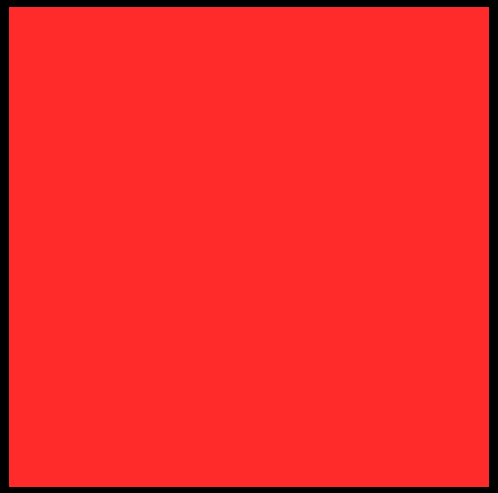
- It is a way to adjust your equipment to ensure you get consistent colour from your camera, on your monitor and in your prints.
- It involves:
  - Colour Spaces
  - Profiles

It’s All In The Numbers

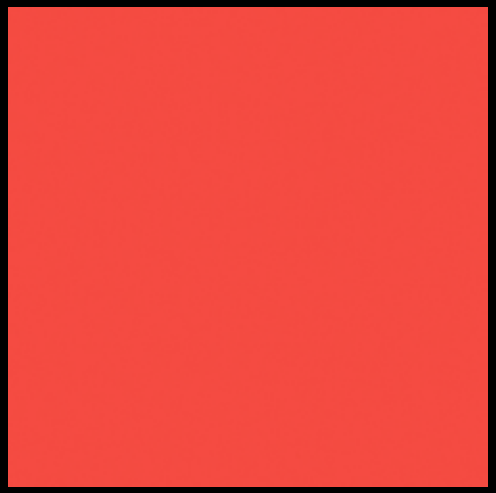
You knew it would be, right?

Here is a nice shade of red

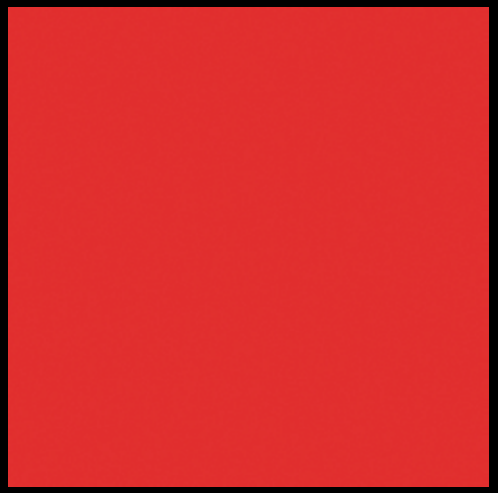
R	G	B
226	47	47



Adobe RGB



Color Match



sRGB

What is a Colour Space?

- An RGB value* can represent 256 x 256 x 256 = 16,777,216 different colours
- But which ones?
- The Colour Space determines which actual colour each RGB value represents
- Like putting 16,777,216 pins into a map of the world…

*The fine print…using an 8-bit file format such as JPEG.

Where do you put the pins to best represent the world?

Two things to keep in mind

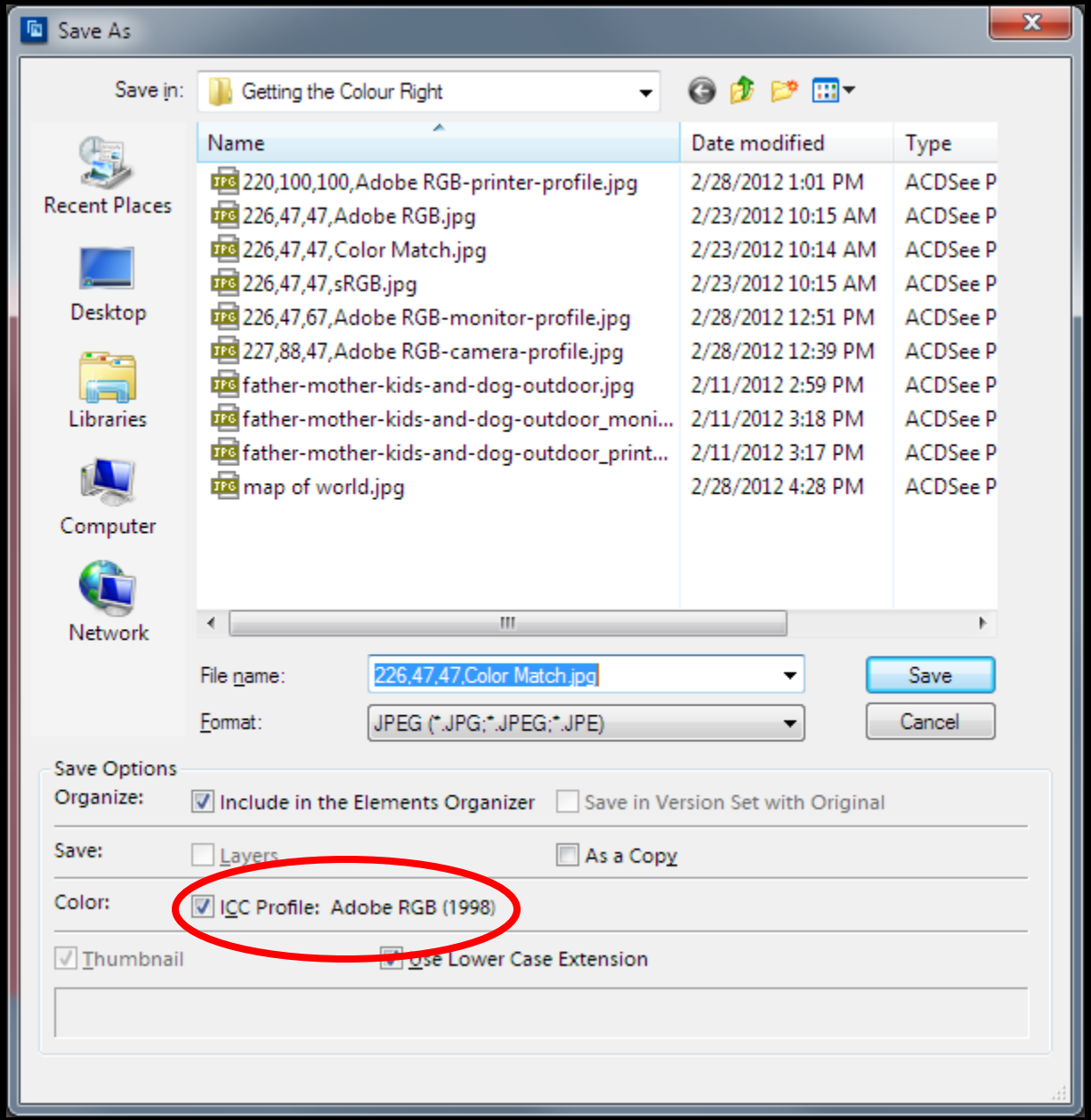
- There are “holes” inside every colour space
  - The more “pins” you have (i.e. the more bits you have in your RGB numbers) the smaller the holes will be
- There are colours “outside” every colour space
  - Having more “pins” won’t help
- These are OUT OF GAMUT colours

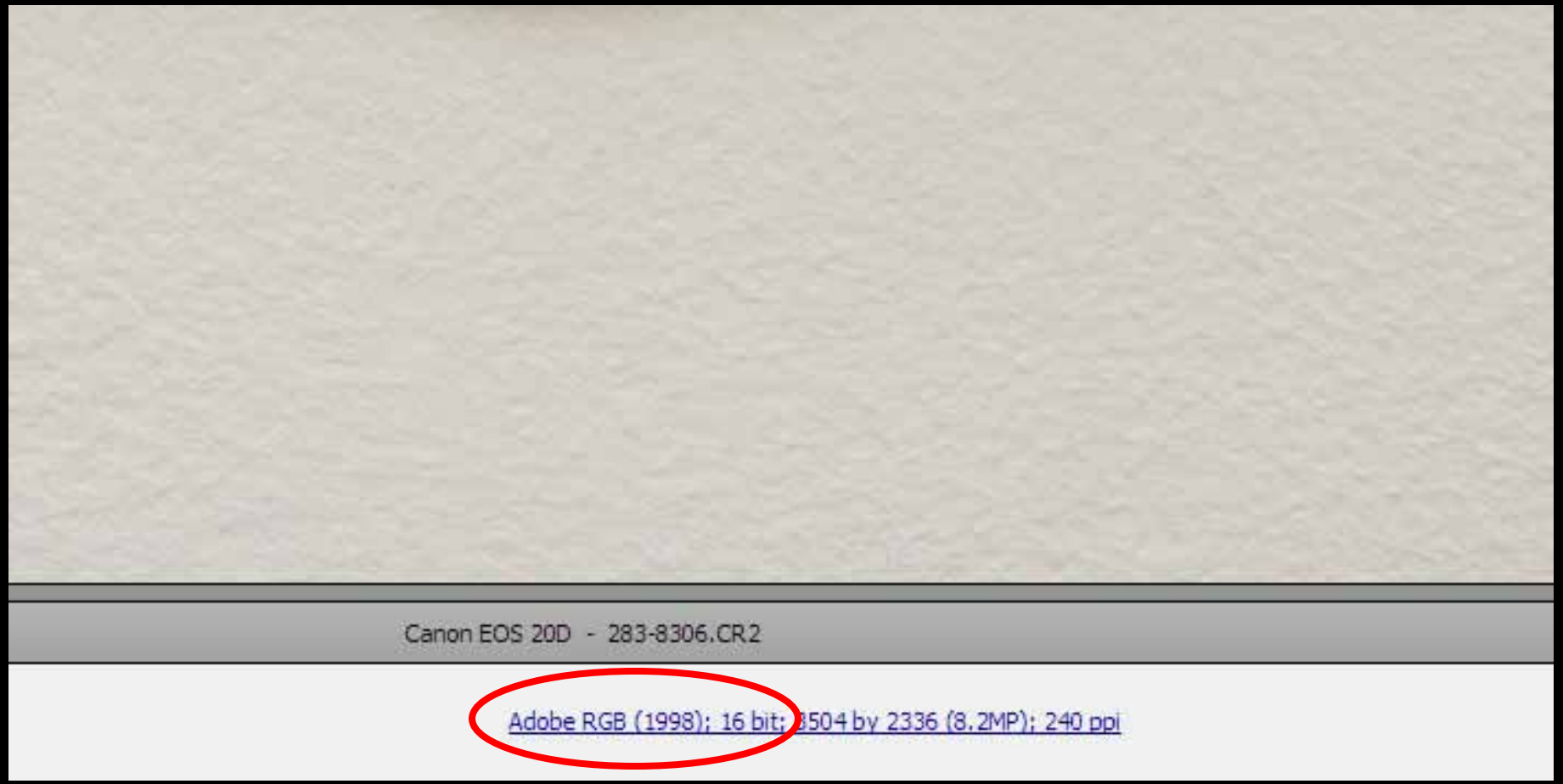
The important point is...

- Every image file needs to indicate which colour space it is “in”
  - Must be “tagged” or “colour tagged” or “colour managed”

The Good News/Bad News

- Good: Every digital camera adds the tag
- Bad: Some applications will strip out the colour tag
- When you save your files, be sure not to lose the colour tag


Save As
Save in:
Getting the Colour Right
Recent Places
Desktop
Libraries
Computer
Network
Name
Date modified
Type
220,100,100,Adobe RGB-printer-profile.jpg 2/28/2012 1:01 PM ACDSee P
226,47,47,Adobe RGB.jpg 2/23/2012 10:15 AM ACDSee P
226,47,47,Color Match.jpg 2/23/2012 10:14 AM ACDSee P
226,47,47,sRGB.jpg 2/23/2012 10:15 AM ACDSee P
226,47,67,Adobe RGB-monitor-profile.jpg 2/28/2012 12:51 PM ACDSee P
227,88,47,Adobe RGB-camera-profile.jpg 2/28/2012 12:39 PM ACDSee P
father-mother-kids-and-dog-outdoor.jpg 2/11/2012 2:59 PM ACDSee P
father-mother-kids-and-dog-outdoor_moni... 2/11/2012 3:18 PM ACDSee P
father-mother-kids-and-dog-outdoor_print... 2/11/2012 3:17 PM ACDSee P
map of world.jpg 2/28/2012 4:28 PM ACDSee P
File name:
226,47,47,Color Match.jpg
Format:
JPEG (*.JPG;*.JPEG;*.JPE)
Save
Cancel
Save Options
Organize:
Include in the Elements Organizer
Save in Version Set with Original
Save:
Layers
As a Copy
Color:
ICC Profile: Adobe RGB (1998)
Thumbnail
Use Lower Case Extension


Canon EOS 20D - 283-8306.CR2
Adobe RGB (1998); 16 bit; 3504 by 2336 (8.2MP); 240 ppi

So what are “Profiles”?

What colour does it see?

- Even though your camera or software produces a colour managed file, how do you know that the colour values are right?
- Every piece of equipment responds to or produces colours somewhat differently.
- Same number, different colours.

What does your camera see?

RGB 226, 47, 47

RGB 227, 88, 47
(green shifted)

What does your monitor display?

RGB 226, 47, 47

RGB 227, 47, 67
(blue shifted)

Printers can only print certain colours!

RGB 226, 47, 47

RGB 220, 100, 100
(loss of saturation)

Profiles to the rescue!

Let me see your profile

- A profile is a file in your computer that describes the colour behaviour of a specific piece of equipment under specific conditions.
- Camera – under certain lighting
- Monitor – brightness and contrast
- Printer – ink and paper

Profiling a Camera

- Custom white balance
  - Shoot a reference neutral object (e.g. a commercial gray card) and your camera creates a camera-internal "profile" (or custom white balance).
- Commercial multi-coloured targets and software,
  - e.g. ColorChecker Passport, US$99.
  - Shoot a RAW shot of the ColorChecker Passport target
  - Convert the RAW file to DNG format
  - Process that DNG file with the supplied software which produces a profile in your computer.
  - Select that profile for all the RAW files shot under the same lighting conditions.

Profiling a monitor

- You can do it by eye
  - For Macintosh, **Display Calibrator Assistant Utility**.
  - For Windows 7, **Display Color Calibration**.
- See notes for the procedures
- Try to be fully awake, not drunk, not sick and in a good mood when you do this!

Profiling a monitor – a better way

- Use a commercial measuring device and software
  - E.g. X-Rite ColorMunki Photo
- Device measures ambient light
- Device measures and sets brightness, contrast
- Software displays a colour sequence
- Software creates profile, assigns it to the monitor in the operating system

Profiling a printer – DON’T!

- Your printer manufacturer already did it for you
- A set of high-quality factory-generated profiles came with the printer
- Just use the manufacturers ink and choose the correct paper type in the printer driver
- You will get the best colour accuracy your printer is capable of producing on that paper.

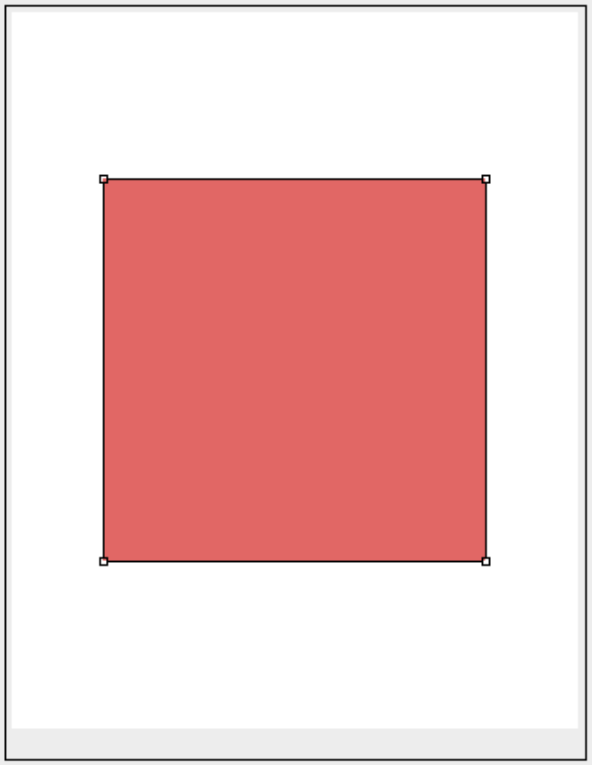
Ah, but...

- You do want to use 3rd party paper or ink
- You need to install an appropriate custom profile
- Or make your own
  - E.g. X-Rite ColorMunki Photo
- Software prints out colour patches
- Device measures the printed patches
- Software creates a profile and saves it in the operating system
  - Mac OSX: Macintosh HD > Library > ColorSync > Profiles
  - Windows: \Windows\system32\spool\drivers\color

Using a custom printer profile

- The printer profile can be handled by the printing application (e.g. Photoshop)
  - Application Manages Colour
- Or by the printer driver
  - Printer Manages Colour
- Either is OK, but...
  - you don't want BOTH the application and the driver to manage colours when you're printing.

8.5 ins x 11 ins



Match Print Colors
Gamut Warning
Show Paper White

Printer: HP Officejet Pro K550 Series

Copies: 1

Print Settings...

Position
Center Image
Top: 2.43
Left: 1.347

Scaled Print Size
Scale to Fit Media
Scale: 100%
Height: 5.555
Width: 5.555
Print Resolution: 72 PPI

Bounding Box

Units: inches

Color Management

Document
(Profile: Adobe RGB (1998))
Proof
(Profile: N/A)

Color Handling:
Photoshop Manages Colors

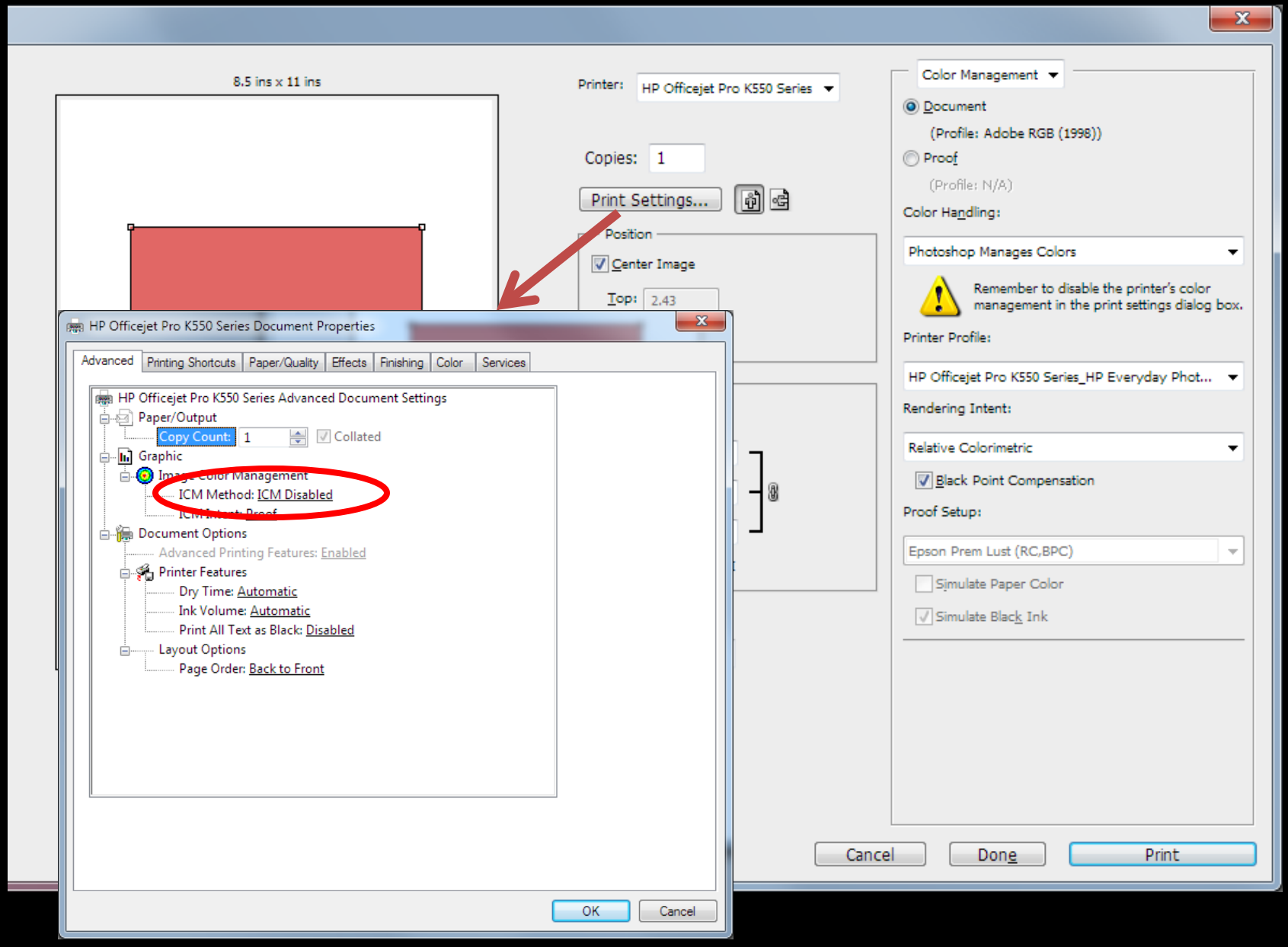
Remember to disable the printer's color management in the print settings dialog box.

Printer Profile:
HP Officejet Pro K550 Series_HP Everyday Phot...

Rendering Intent:
Relative Colorimetric
Black Point Compensation

Proof Setup:
Epson Prem Lust (RC,BPC)
Simulate Paper Color
Simulate Black Ink

Cancel Done Print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Relative Colorimetric
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Proof Setup:
Epson Prem Lust (RC,BPC)
Simulate Paper Color
Simulate Black Ink
Cancel
Done
Print
HP Officejet Pro K550 Series Document Properties
Advanced
Printing Shortcuts
Paper/Quality
Effects
Finishing
Color
Services
HP Officejet Pro K550 Series Advanced Document Settings
Paper/Output
Copy Count: 1
Collated
Graphic
ICM Method: ICM Disabled
Document Options
Advanced Printing Features: Enabled
Printer Features
Dry Time: Automatic
Ink Volume: Automatic
Print All Text as Black: Disabled
Layout Options
Page Order: Back to Front
OK
Cancel

So what’s with these “Rendering Intents”?

Rendering Intents

- Rules for converting between profiles and handling “out-of-gamut” colours
- Perceptual (aka Photographic or Pictures)
  - Preserves visual relationships between colours
  - Might change some colours that were not out-of-gamut to begin with to produce a pleasing result
- Relative Colorimetric (aka Proof)
  - Maps the “white point” relative to the input profile
  - Will not alter colours that are already in-gamut, i.e. more accurate
- Black Point Compensation
  - Maps the “black point” relative to the input profile
  - Will prevent loss of detail in shadow areas at the expense of really dark blacks

Which one do I use?

- There is NO single right rendering intent for all images and profiles.
  - You either need to make some test prints
  - Or use the “Soft Proofing” feature of your application
    - Even this might not provide the best choice
- Some tips:
  - Use BPC, if you have a lot of dark shadow areas
    - Prevents shadow areas being filled in and lose detail.
  - If the image has a very limited number of colours:
    - Relative Colorimetric will generally be more accurate.
  - Test large areas of highly saturated colours such as painted objects, deep blue skies, green fields, etc.
    - Choose the rendering intent that provides the most accurate rendering of those areas.

So what can I expect?

- Generally more accurate colours on screen and in print.
- More consistent and predictable results.
  - What you got last week or last month, you should get today and next week.
- Less waste of ink, paper and time.
- More consistent results if you send your files out for printing.

Resources

- 4-part primer on colour management
  - http://photo.net/learn/digital-photography-workflow/color-management/
  - http://photo.net/learn/digital-photography-workflow/color-management/monitor-profiling/
  - http://photo.net/learn/digital-photography-workflow/color-management/color-settings/
  - http://photo.net/learn/digital-photography-workflow/color-management/printer-profiling/

Thank You!

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