

# Color Management

A brief, high-level overview of this tool's components and processes, and it's benefits for digital photographers.

Missouri Nature and Environment Photographers  
(MoNEP)

Presented during April & May 2008 meetings by Ted Moreno

# Color Management – Part 1

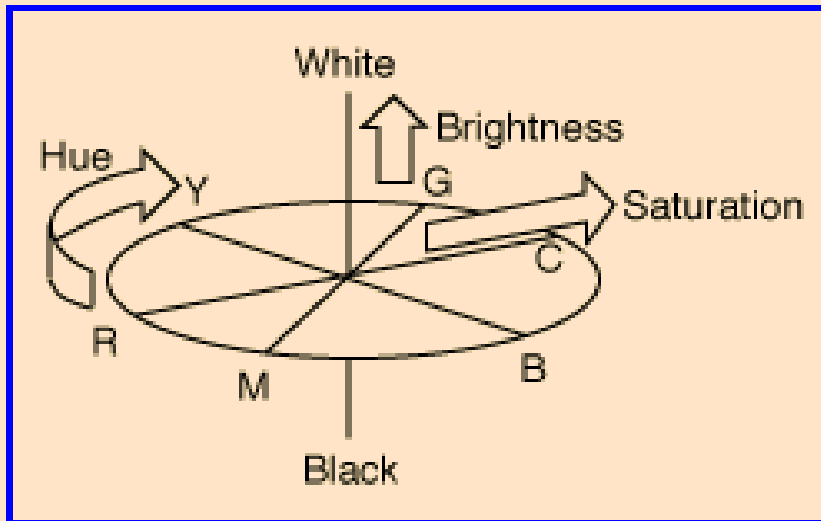
- Color Management – What is it?!
- Two “Basics”
  - Color Space
  - Gamut
- Color Management – Why do it?!
- Color Management Software/Equipment



# Color Management – *What is it?!*

- A systematic approach for controlling the color rendering capabilities of the devices used in digital photography.
- Core Elements
  - Color Management Module (CMM)
  - Device Profiles
  - Profile Connection Space (PCS)
  - Rendering Intents

# Attributes of Color Space



The three essential parameters hue, saturation, and brightness can be thought of as defining a color space.

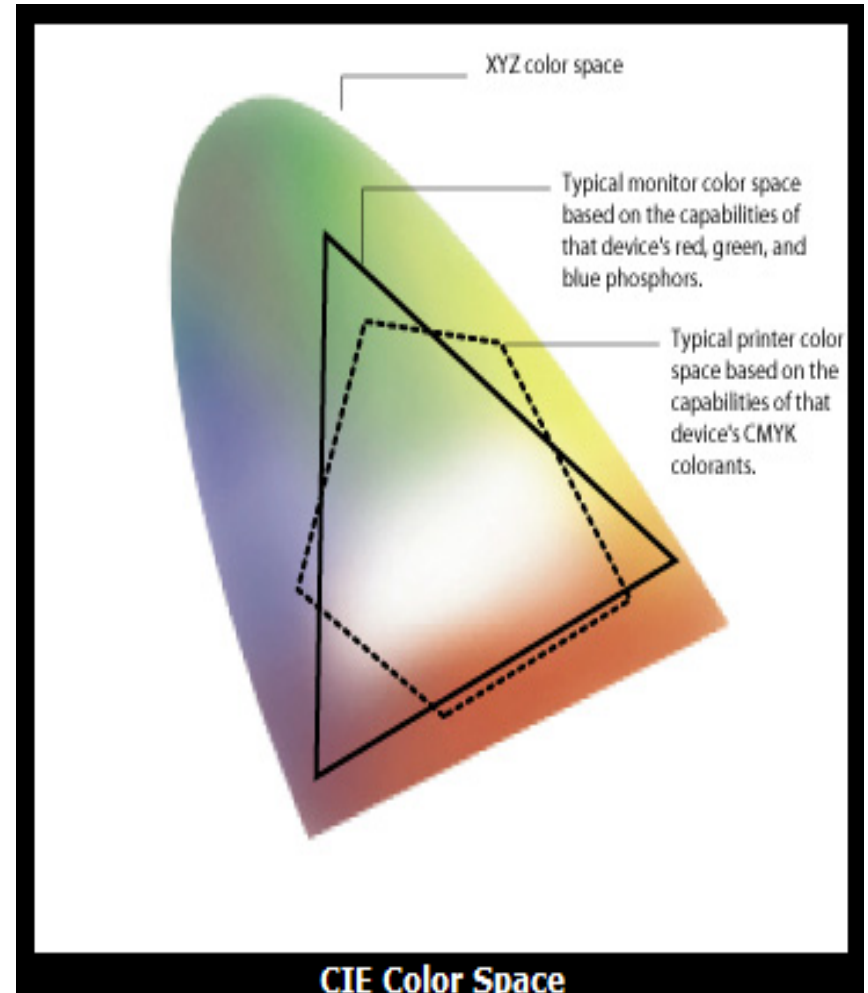
- **Hue** – A color’s “color”. The attribute of a color by which its predominate wavelength is perceived
- **Saturation** – A color’s purity. The extent to which the dominant wavelength seems too be contaminated by other wavelengths.
- **Brightness** – A color’s intensity. The lightness in comparison to an absolute white reference.

# Type of Color Spaces

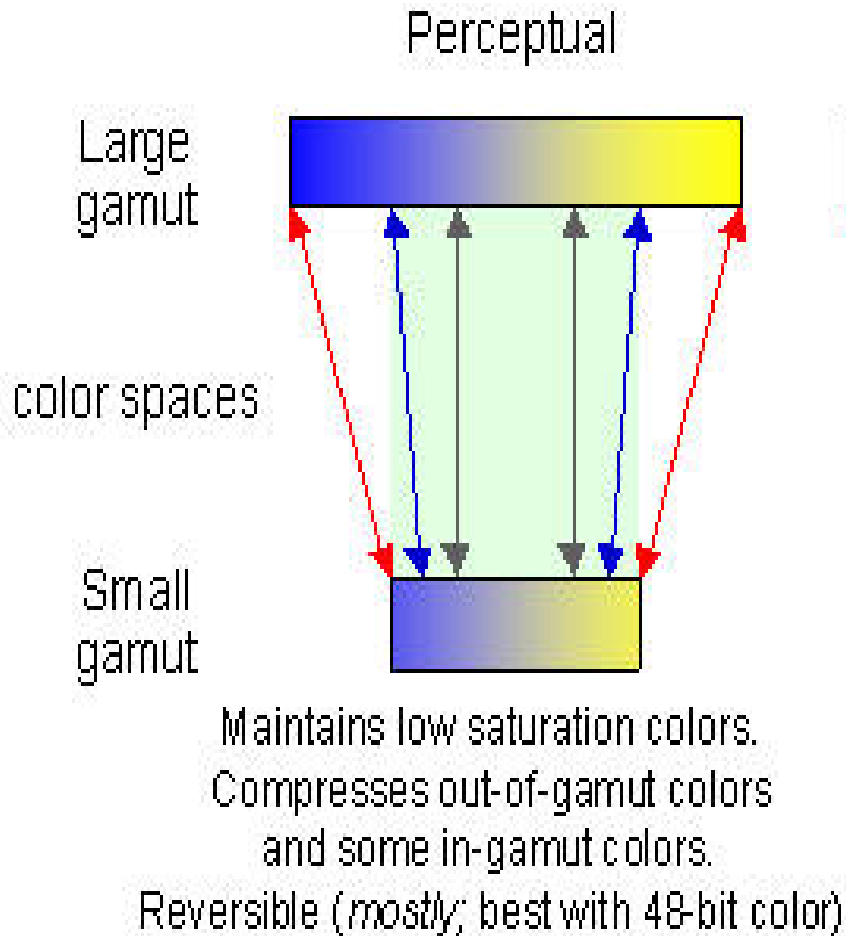
- Device Dependent Color Space – Where the color produced is dependent upon the:
  - parameters used; and
  - color reproduction capabilities of the equipment being used.
- Device Independent Color Space – Where a set parameters will produce the same color regardless of the equipment used.

# Color Space Gamut

- The gamut of a color space is the total set of colors that can be represented within that color space.
- Each device has a unique gamut which is dictated by the characteristics of the device.
  - Desktop devices, used in digital photography, have a relatively small gamut.



# Gamut Mapping



- When the gamut of the “source” and “destination” color spaces differ, gamut mapping must be performed.
- Those colors that can not be represented in the “destination” color space need to be altered to colors that can be represented; using a rendering intent.



# Color Management – *Why do it?!*

## ➤ Benefits

- Predictable & Consistent Color Reproduction
- Compatibility
- Simplified Work Flow

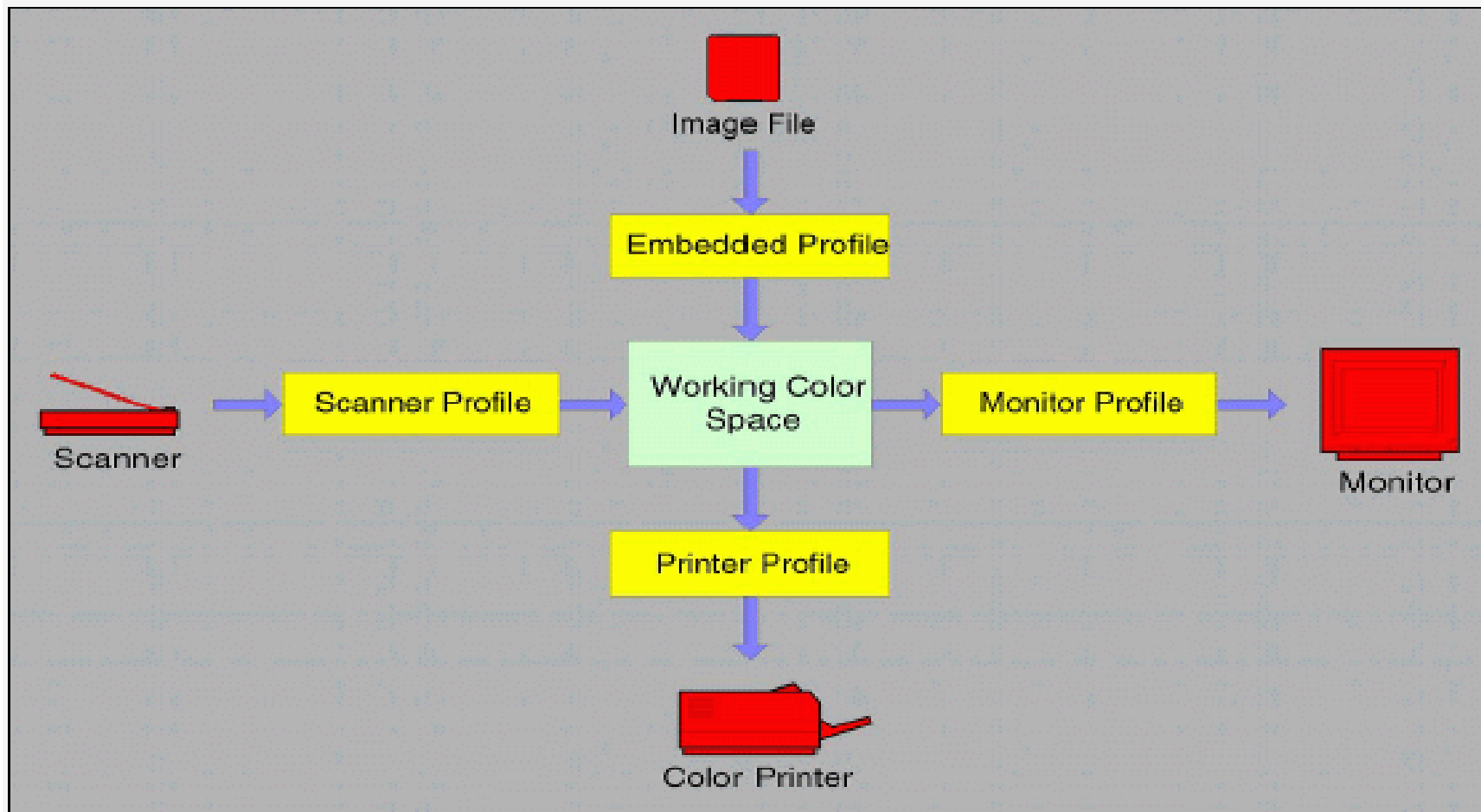
## ➤ WYSIWYG Myth



# CMM Software & Equipment

- Colorimeter
  - Monitor
  - Print
- Targets
  - Camera Profiling
  - Flat Bed (print) Scanner
  - Film Scanner
- Software
  - Monitor Calibrating & Profiling
  - Camera Profiling
  - Scanner Profiling
  - Print Profiling

# Desired Result



# Color Management – Part 2

- **Creating Device Profiles**
  - Monitors Calibrating & Profiling
  - Flat Bed & Film Scanner Profiling
  - Camera Profiling
  - **Printer Profiling** – for each Ink/Paper/Resolution combination
- **Integrating Color Management into Your Work Flow**



# Creating Device Profile

## Monitor Calibrating & Profiling

- This process will calibrate your monitor and describe/characterize its ability to display color
- Preparation
  - Turn on & warm up monitor
  - Create proper viewing environment
  - Check current settings
  - Clean monitor screen
  - Install colorimeter
  - Remove any other monitor calibration software
  - Familiarize yourself with monitor controls



# Creating Device Profile

## Monitor Calibrating & Profiling (continued)

- While each color management program package has its own proprietary process, in general, the following steps will be taken; after launching the software and selecting “create monitor profile” from within the Main Menu:
  - Select display type (CRT vs. LCD)
  - Set monitor’s white point
  - Measure lightest black
  - Measure darkest black
  - Set brightness
  - Measure color patches
  - Select Profile Gamma
  - Name and Save the newly created monitor profile



# Creating Device Profile

## Flat Bed or Film Scanner Profiling

- This process describes/characterizes your scanner's ability to accurately capture color; by comparing the scanned color values verses the target's known color values.
  - reflective target for flat bed scanner; or
  - transparency target for film scanner.
- Known values of targets are contained in the reference file which are supplied with each target; as part of the color management program package.



# Creating Device Profile

## Flat Bed or Film Scanner Profiling (continued)

- While each color management program package has its own proprietary process, in general, the following steps will be taken; after launching the software and selecting “create scanner profile” from within the Main Menu:
  - Select target
  - Position target
  - Scan the target
  - Verify the target
  - Select reference file
  - Resolve, if necessary, cropping error
  - Name and Save the newly created scanner profile

# Creating Device Profile

## Camera Profiling

- This process describes/characterizes your camera's ability to accurately capture color.
  - Best suited for controlled lighting situations in a studio setting
- Steps
  - Place reflective target ... provided with color management program package ... in a central location of the scene and capture image; which includes more than just the target.
  - Open digital image in a graphic application (e.g., Photoshop) and crop to the edges of the target, and Name and Save digital file.
    - If digital image shot in RAW format, may need to save as a TIFF formatted file.
  - Use color management software's "load image" functionality to retrieve digital file and treat as a scanned digital image.

# Creating Device Profile

## Camera Profiling (continued)

### ➤ Alternative to Camera Profiling

- Set camera's color space to Adobe RGB 1998
- Create custom White Balance for each new lighting situation before image capture
  - Numerous devices/targets are available for this purpose (e.g., expodisc)
- Apply an Adobe Photoshop plug-in ... which used to compensate of digital camera bias when rendering color (e.g., Full Spectrum RGB) ... to the digital file; immediately upon opening file.



# Creating Device Profile

Printer Profiling – for each Ink/Paper/Resolution combination

- This process describes/characterizes your printer's ability to accurately reproduce color.
  - A separate profile is required for each unique combination of ink, paper stock and output resolution.
- Once created, advanced users can edit printer profiles; in order to improve print quality.



# Creating Device Profile

Printer Profiling – for each Ink/Paper/Resolution combination (continued)

- While each color management program package has its own proprietary process, in general, the following steps will be taken; after launching the software and selecting “create printer profile” from within the Main Menu:
  - Specify Printer Information.
  - Measure color patterns on the previously created print of the target; using colorimeter.
  - Verify the measurements.
  - Select reference file.
  - Name and Save newly created printer profile; for that unique combination of ink, paper and output resolution

# Creating Device Profile

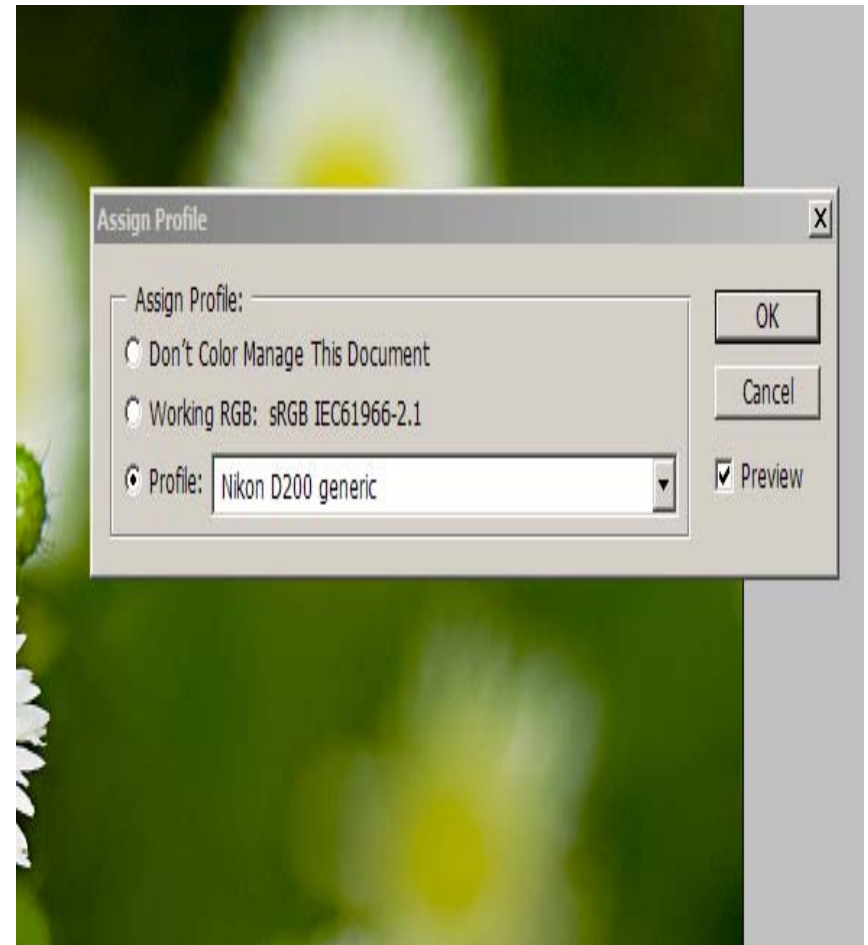
## Miscellaneous

- Profile storage location are operating system specific; most color management software will default to these locations.
  - Macintosh OSIX (or earlier) = System Folder:Color Sync Profiles
  - Macintosh OSX = /Library/ColorSync/Profiles
  - Windows 98/ME = Windows\System\Color
  - Windows 2000 = WINNT\System32\spool\drivers\color
- Give each profile a meaningful name.
- Create new/replacement device profiles at regular intervals or when critical events occur (e.g., scanner lamp is replaced).

# Integrating Color Management Into Your Work Flow

- Assign profile, of your camera <sup>1</sup> or scanner, immediately upon opening your digital image in your graphic application
  - Photoshop command: <Edit><Assign Profile>
  - In Photoshop CS3, can assign camera profile in Camera Raw

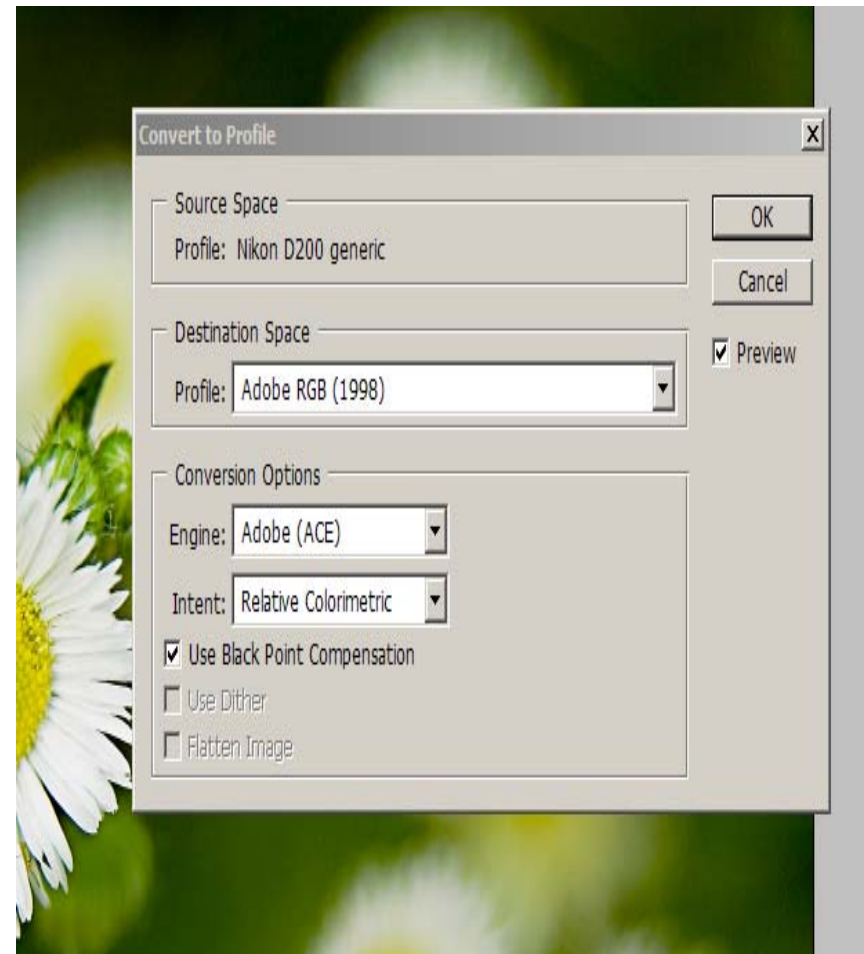
Note 1: Refer to earlier slide in which an alternative to camera profiling was discussed



# Integrating Color Management Into Your Work Flow

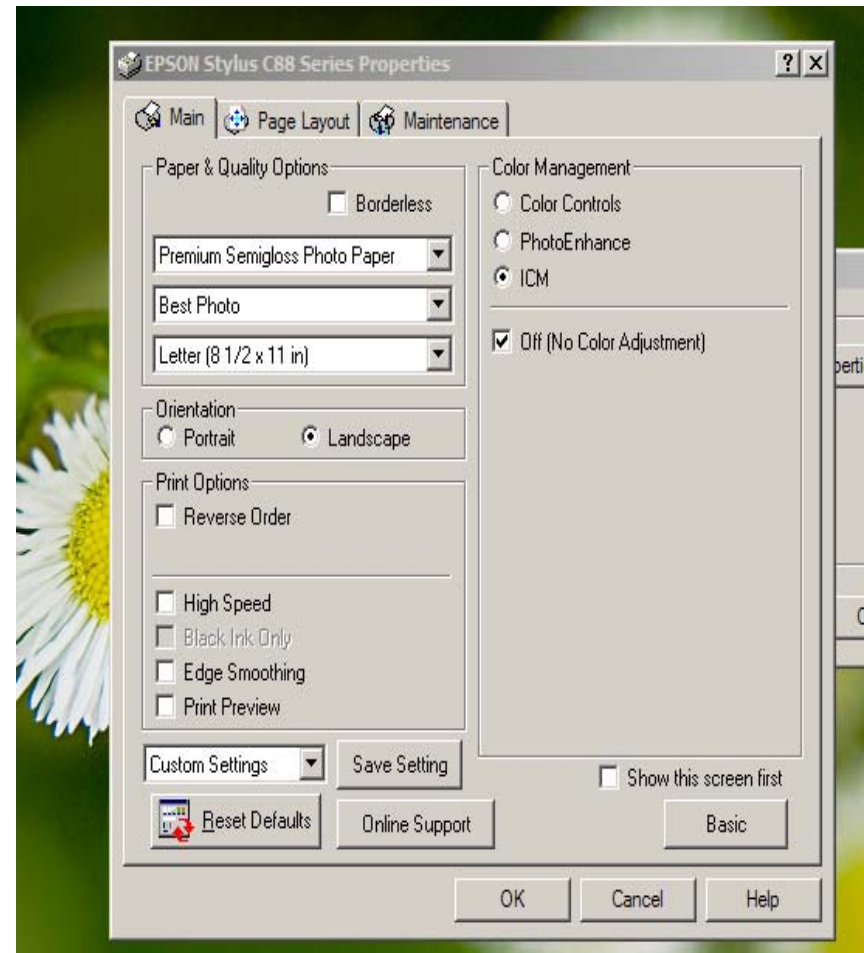
➤ Immediately upon opening your “working” digital file, convert ... in your graphic application ... the profile of your image to Adobe RGB 1998

- Photoshop command: <Edit><Convert To Profile>



# Integrating Color Management Into Your Work Flow

- Prior to printing your digital file:
  - disable any automatic color correction or color management options that may be included in your printer's software; and
  - Printer settings should be the same as those that were used in creating profile of the current ink/paper/resolution combination.



# Integrating Color Management Into Your Work Flow

- When printing, you the following options:
  - Color Handling =  
Let Photoshop Determine Colors
  - Printer Profile =  
select the profile created for ink/paper resolution combination
  - Rendering Intent =  
Perceptual (recommended)
- For Photoshop users, options are set in Print Preview (CS2) or Print (CS3) dialogue boxes.

