Digital Imaging Group

20th June 2014

Working at the High End

Processing RAW files in

Adobe Camera Raw (ACR)

(and a little about high pixel count cameras later)

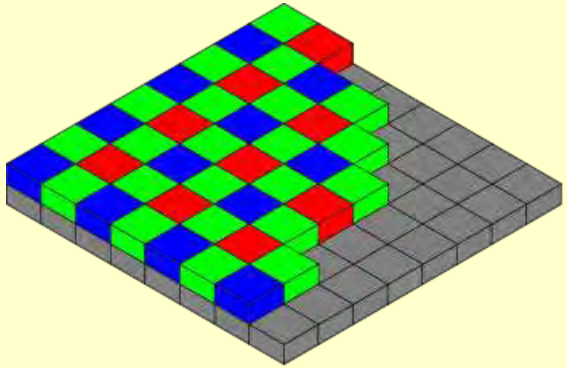
What is RAW?

The RAW file captures information as recorded by the sensor (about 50Mb on Nikon D800).

A jpeg file is the processed and compressed version of raw data (about 1.3Mb for basic D800 jpeg).

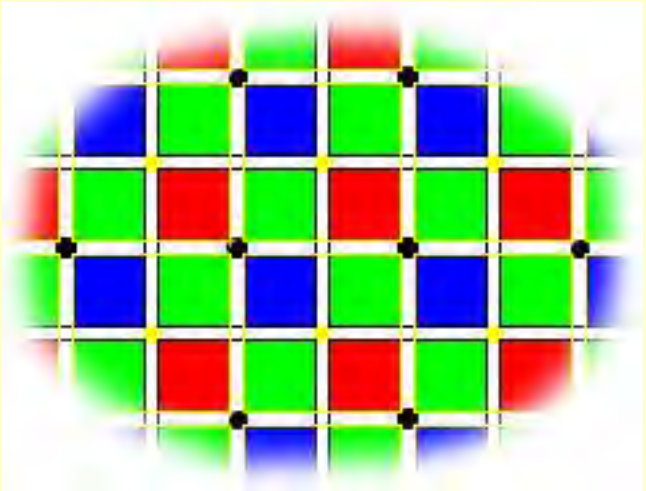
A lot of information is lost in the conversion.

The sensor pixels collect light behind a Bayer filter

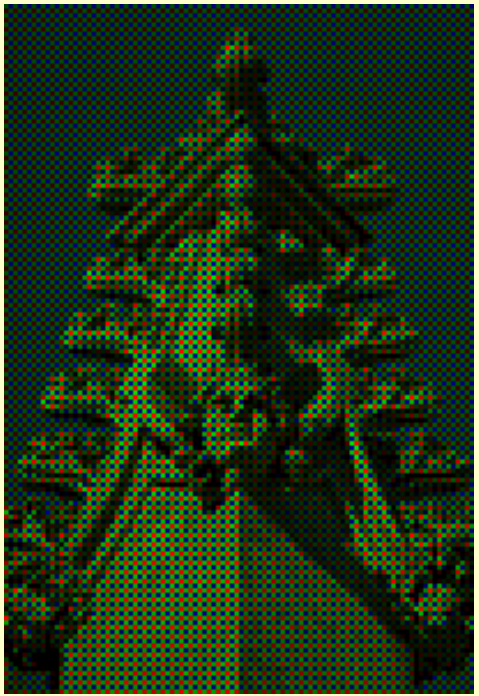


Square groups of 4 pixels define the colour at the centre of each group

Extra resolution is obtained from black square groupings and yellow square groupings offset by one sensor element each way

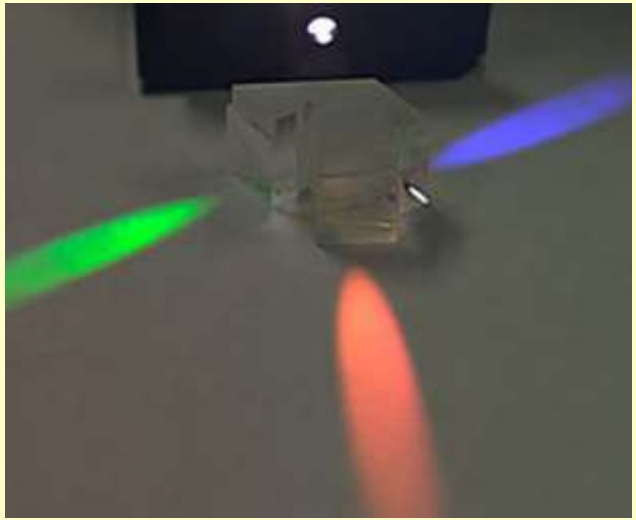


The picture as seen by sensor behind a Bayer filter



Picture after processing in RAW converter

An aside



Not all digital cameras use Bayer filters
In 3 ccd camcorders trichroic prisms split light onto three sensors.

Advantages:

Better low light sensitivity as almost no light is lost in prism
Full colour information at each pixel point, no interpolation, better resolution relative to pixel count.
Colour separation better than with Bayer filter.

Why use RAW?

All of sensor information is available to process,
not just the jpeg subset

RAW files > 16,000 light levels for each colour (14 bit mode)
JPEGs 256 light levels

Highlight and shadow information often lost in JPEGs

sRGB colour space used by JPEGs - limited colour rendition and grading
Adobe colour spaces available via RAW - much finer colour rendition and grading

Colour space, white balance, sharpness, contrast and level of compression are all set by the camera for JPEGs.

The first four of these can be adjusted in the RAW conversion software (Camera Raw in Photoshop, Lightroom or Elements) to give a much better initial image to start manipulation in Photoshop (or Elements / Lightroom).

The camera settings for colour temperature and tint are recorded in the RAW file to provide a starting point.

A complete change from, say, fluorescent to daylight in RAW converter is perfectly possible with no loss of quality but poor results from JPEGs

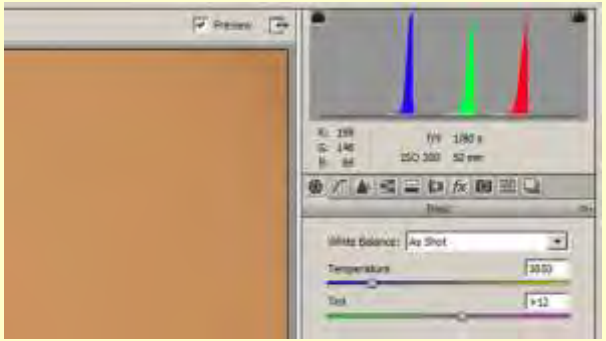
Cameras generally make reasonable choices for white balance but often go awry with fluorescent lighting.

Correct white balance yields amazingly colourful results including from fluorescent.

A grey card, photographed full frame, or, more easily, an Expodisc can be used to set white balance.

White balance settings for colour temperature and tint can be extracted in Camera Raw from the white balance photos.

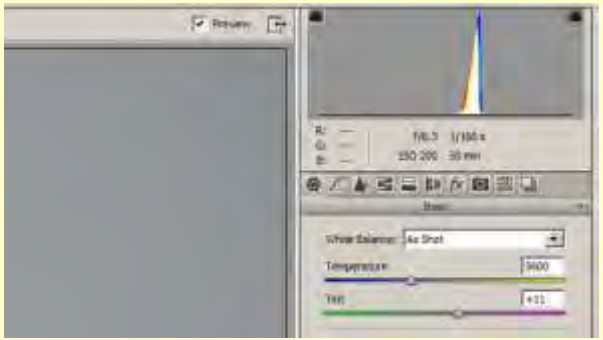
These can be used for future RAW processing for the same lighting conditions.



White balance settings for fluorescent lighting

Colour temperature: 3,850ºK

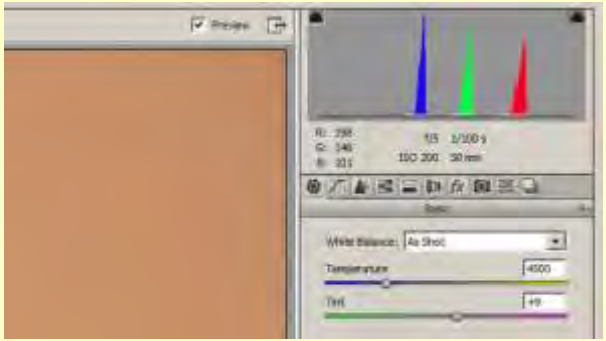
Tint: +12



White balance settings for overcast lighting, midday June

Colour temperature: 5,600ºK

Tint: +11



White balance settings for 12watt TCP LED lighting

Colour temperature: 4,500ºK

Tint: +9

If the camera slips up on white balance
shots like these can give a good starting point.

Three points to remember in using Camera Raw:

1. *All the changes are reversible while you are in Camera Raw.*
2. *Nearly all operations affect the whole frame.*
3. *You can jump to a previous stage using snapshots.*

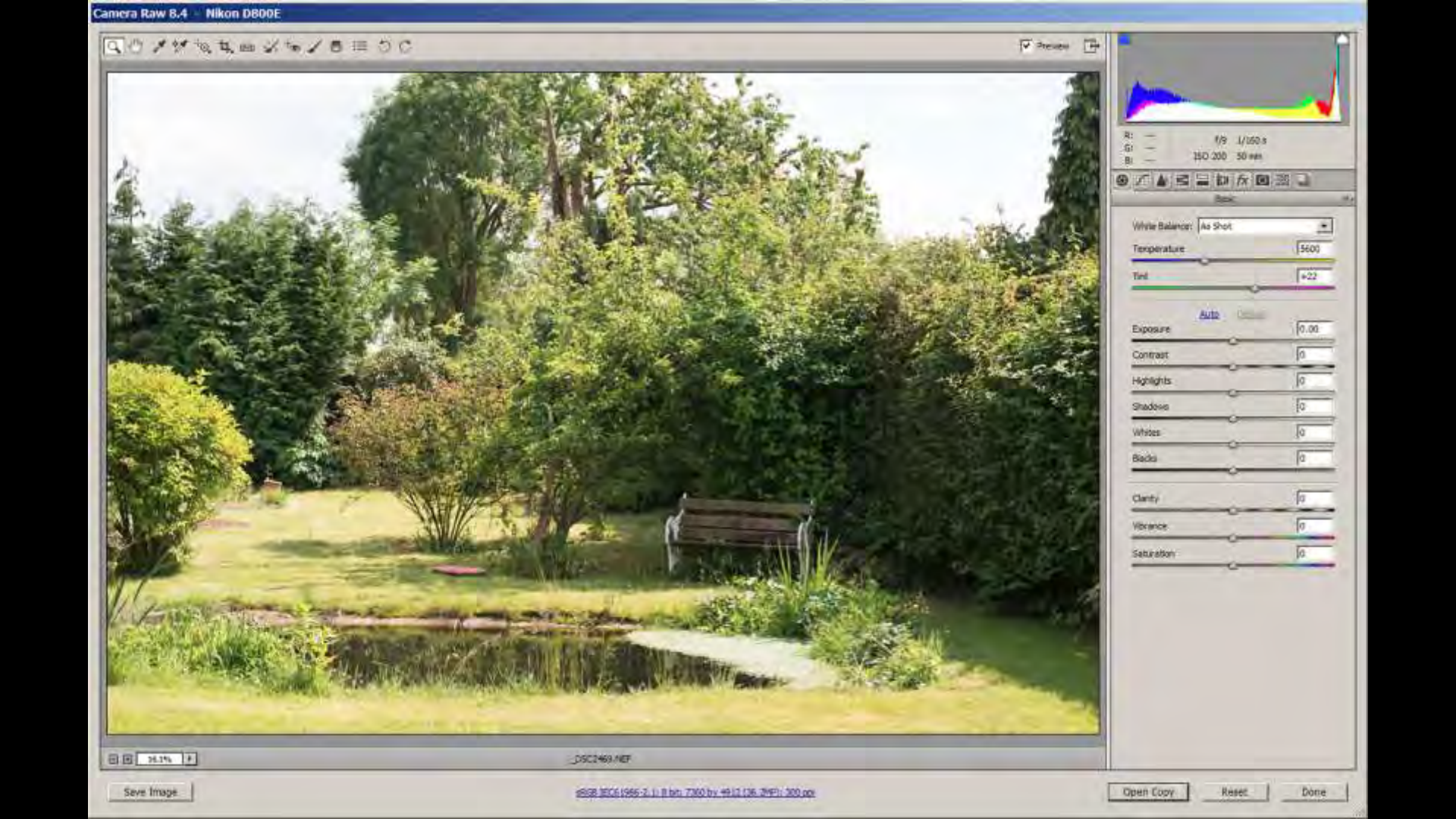
PhotoShop allows 16 bit processing once you leave Camera Raw,
but a few functions are disabled in CS6, and rather more in Elements.

To start processing the photo I drag the RAW file onto the Photoshop icon,

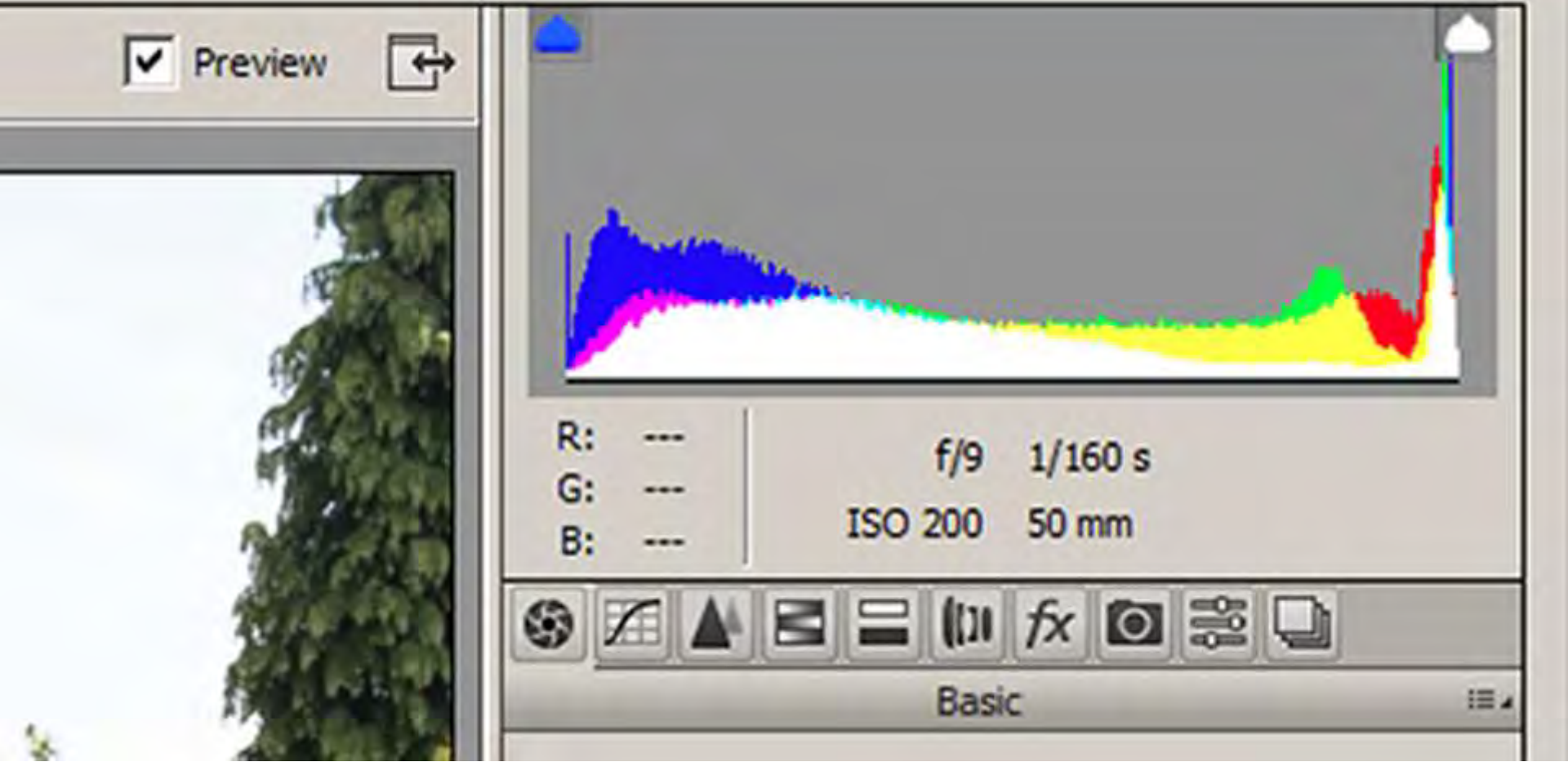
or into Photoshop if it is already open.

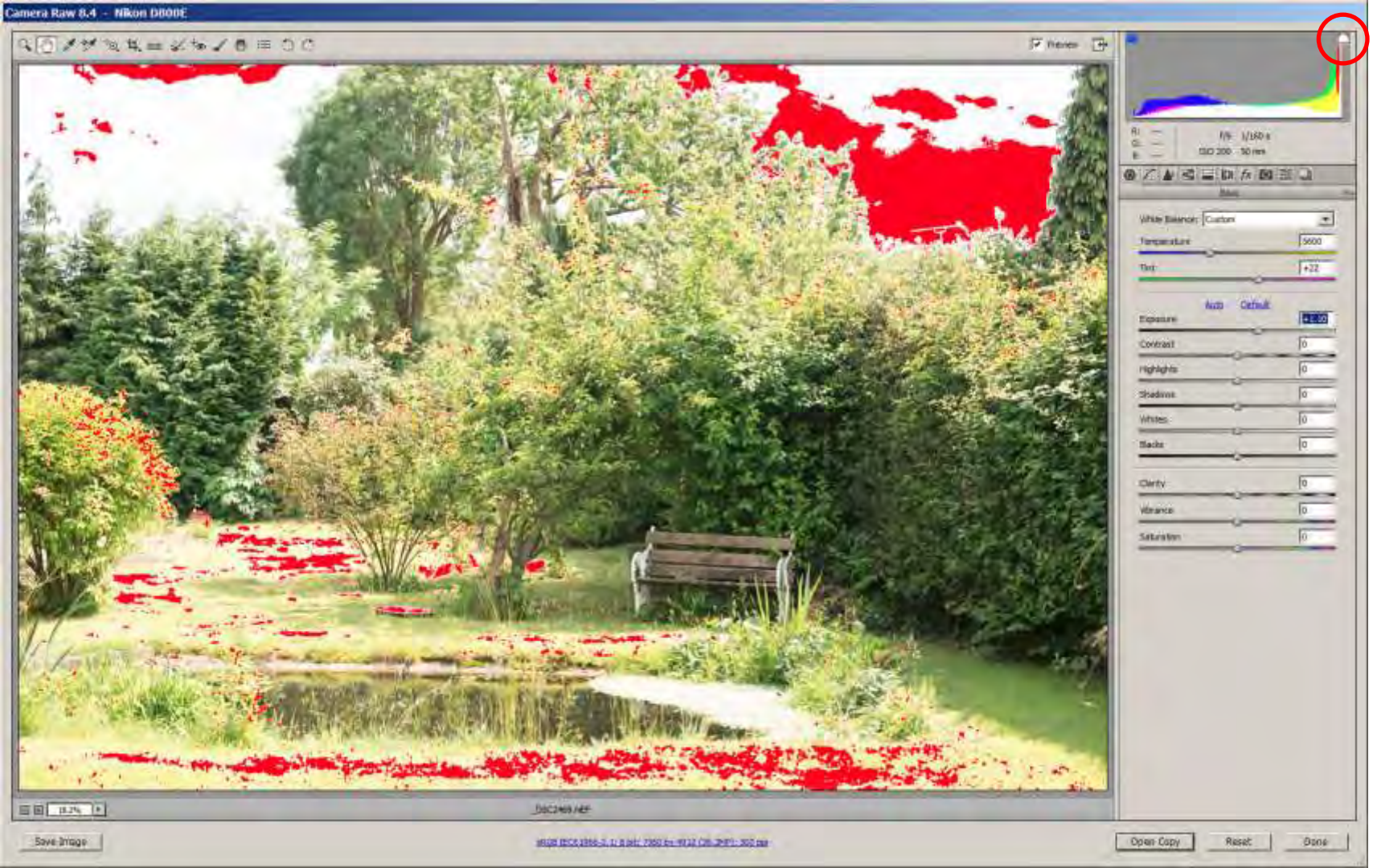
RAW files automatically open in ACR.

Here is the opening screen:


Camera Raw 8.4 - Nikon D800E
Preview
R:
G:
B:
f/9 1/160 s
ISO 200 50 mm
Basic
White Balance: As Shot
Temperature 5600
Tint +22
Auto Default
Exposure 0.00
Contrast 0
Highlights 0
Shadows 0
Whites 0
Blacks 0
Clarity 0
Vibrance 0
Saturation 0
16.1%
_DSC2469.NEF
Save Image
Open Copy
Reset
Done

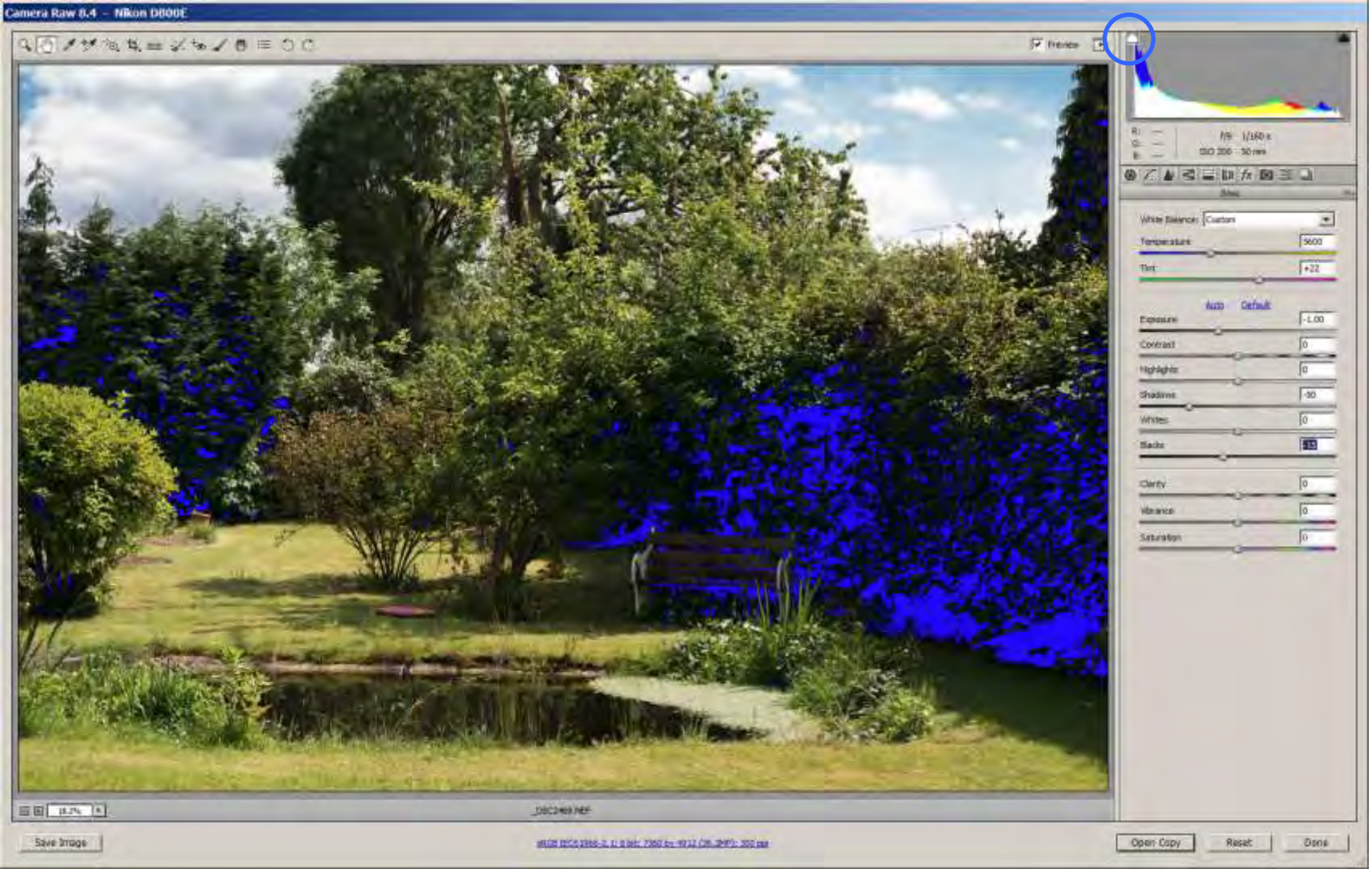
Top right of screen





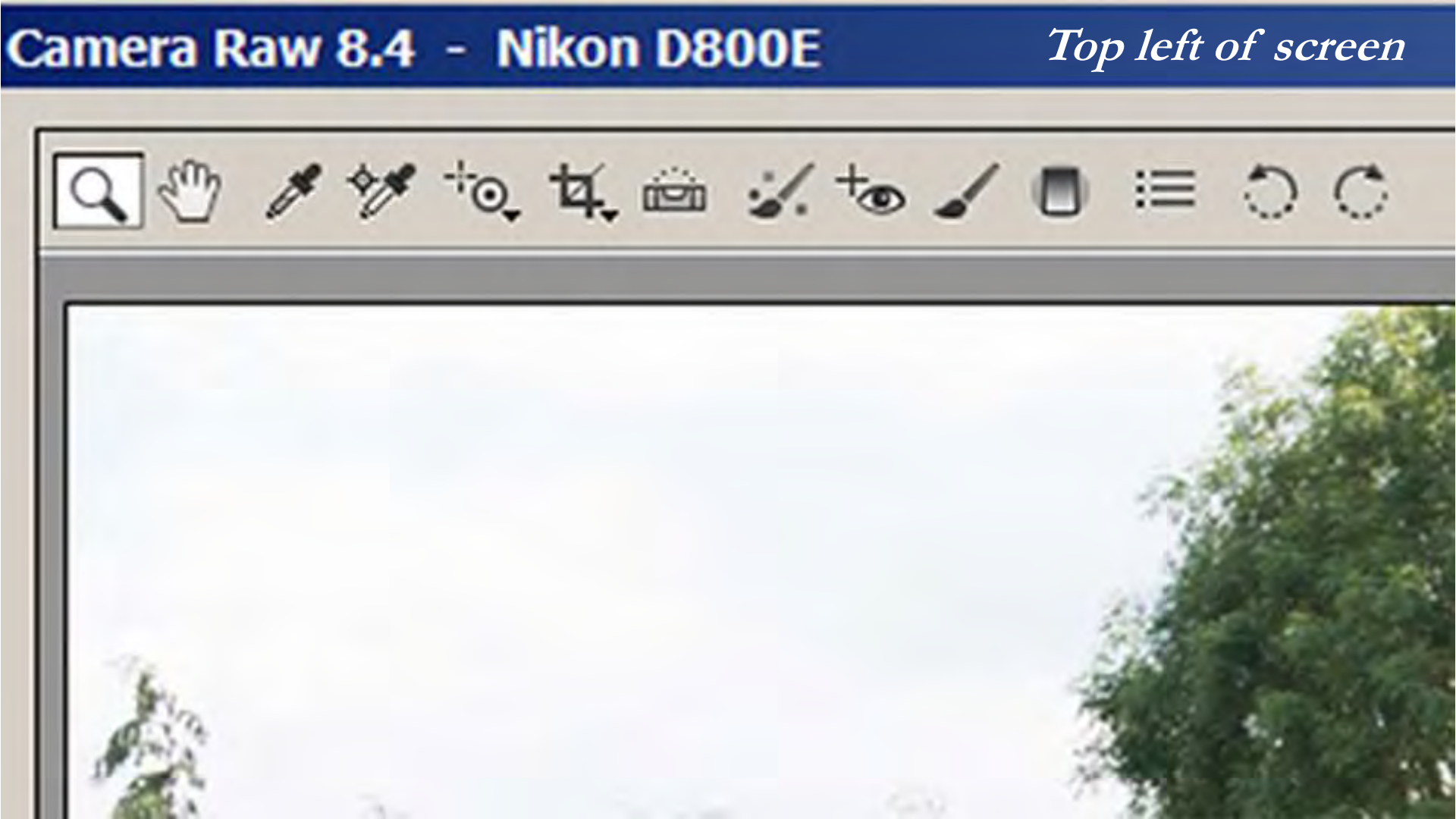
Click to show blown highlights

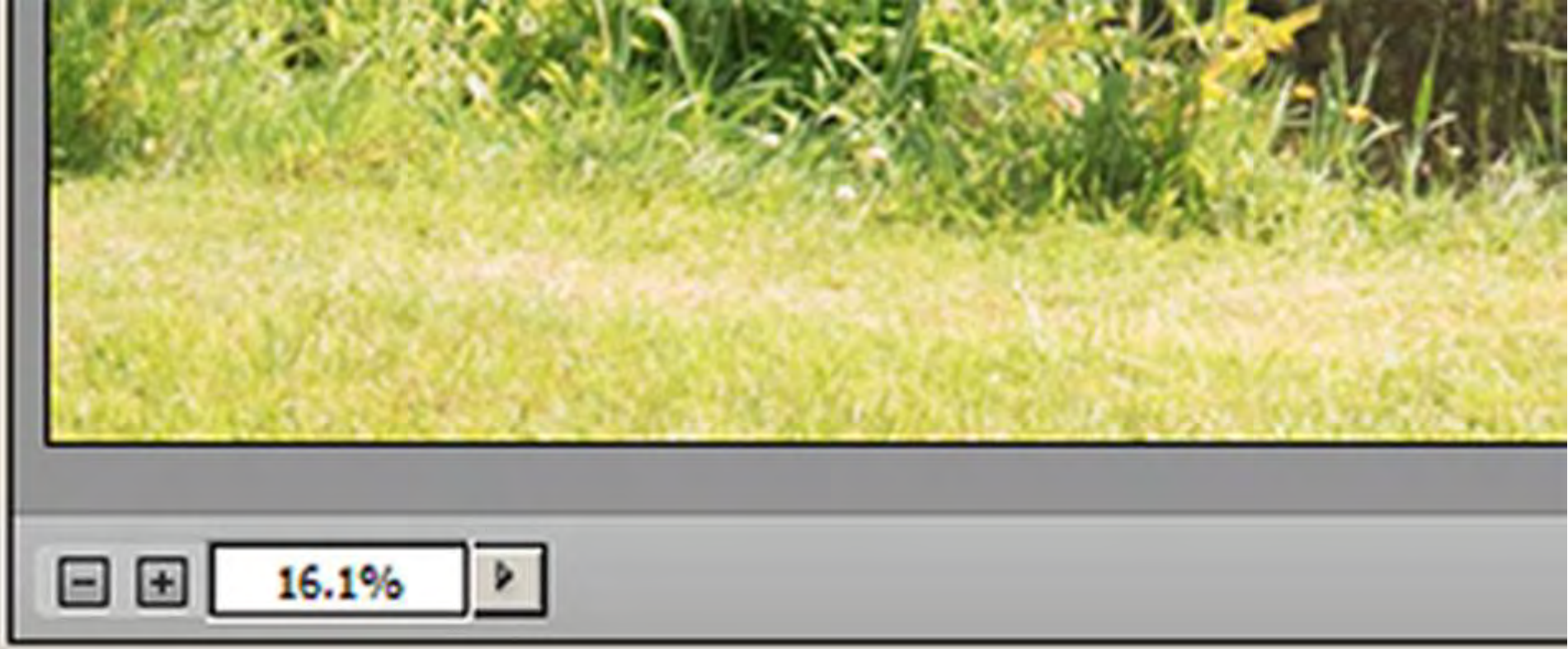
(has white border when on)



Click to show lost shadow detail in blue

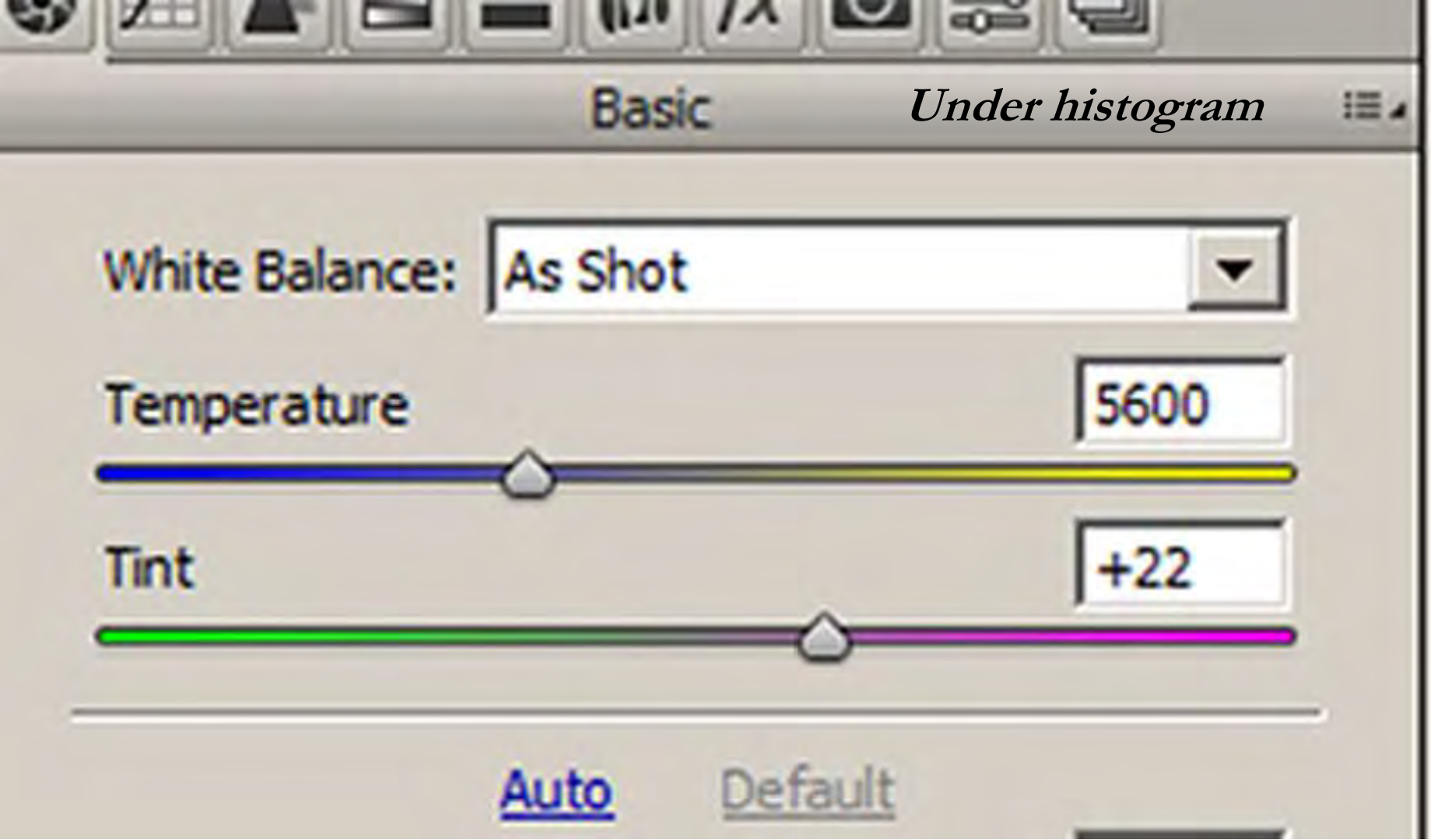
(has white border when on)

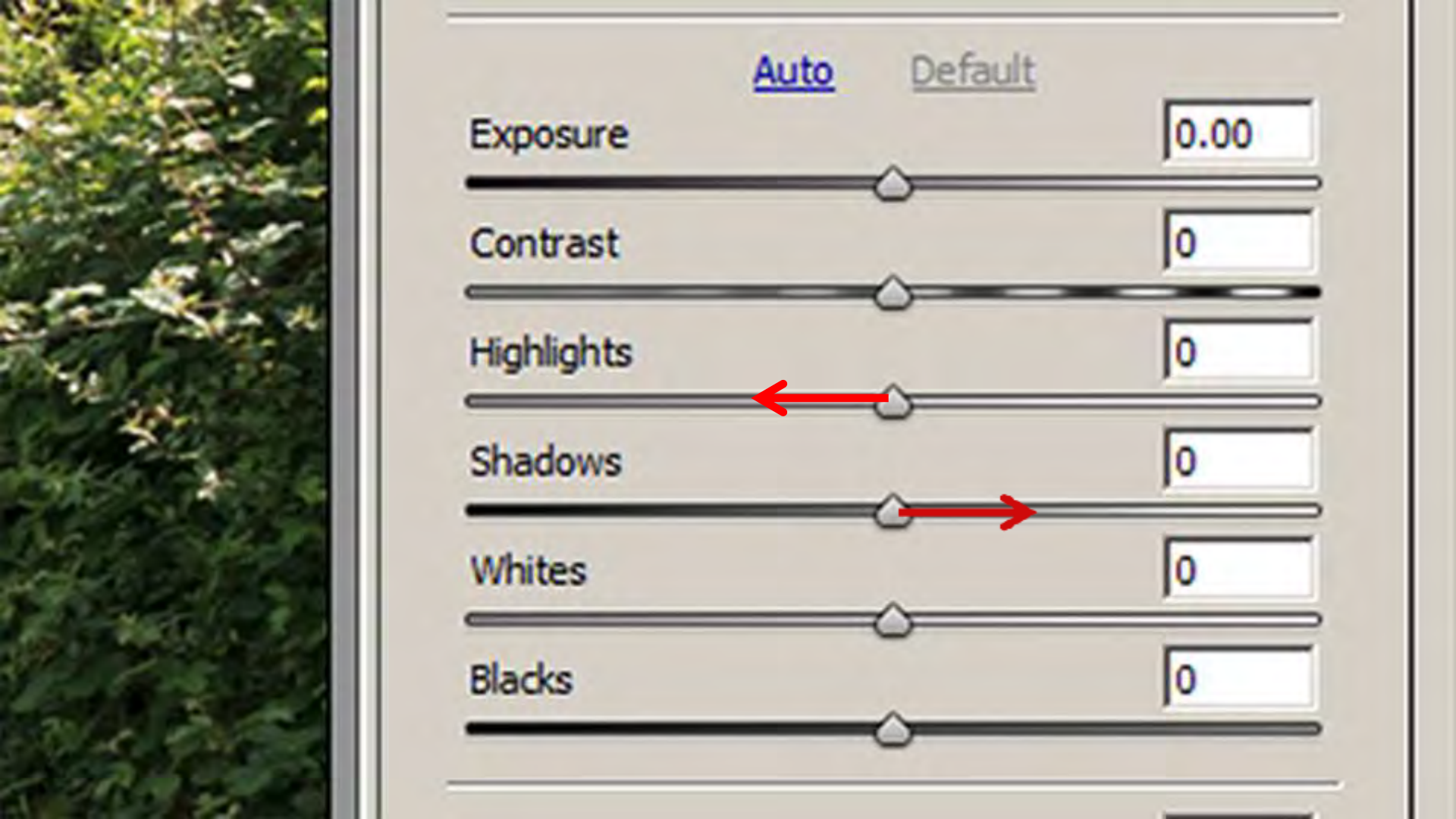

Camera Raw 8.4 - Nikon D800E
Top left of screen

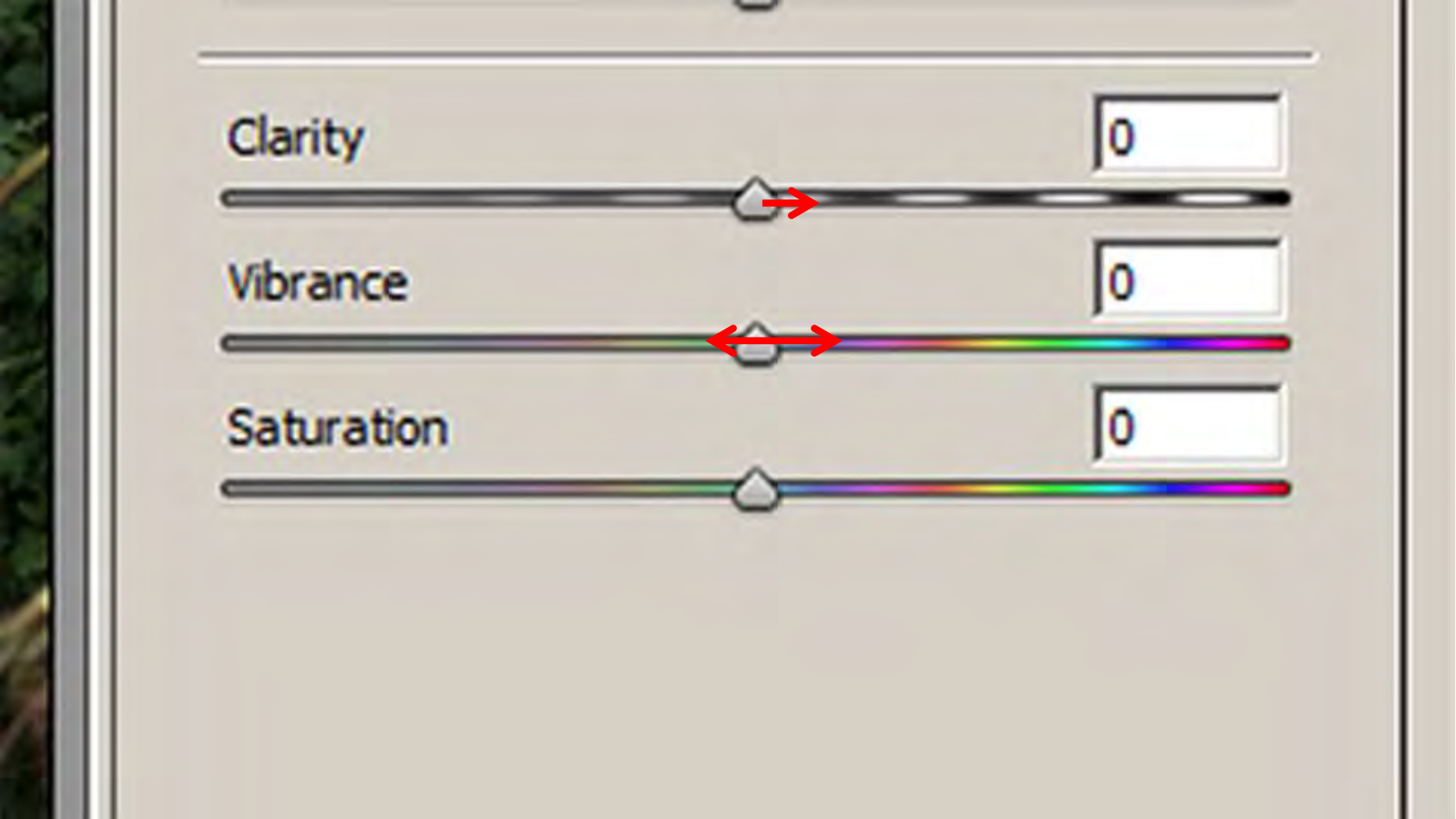


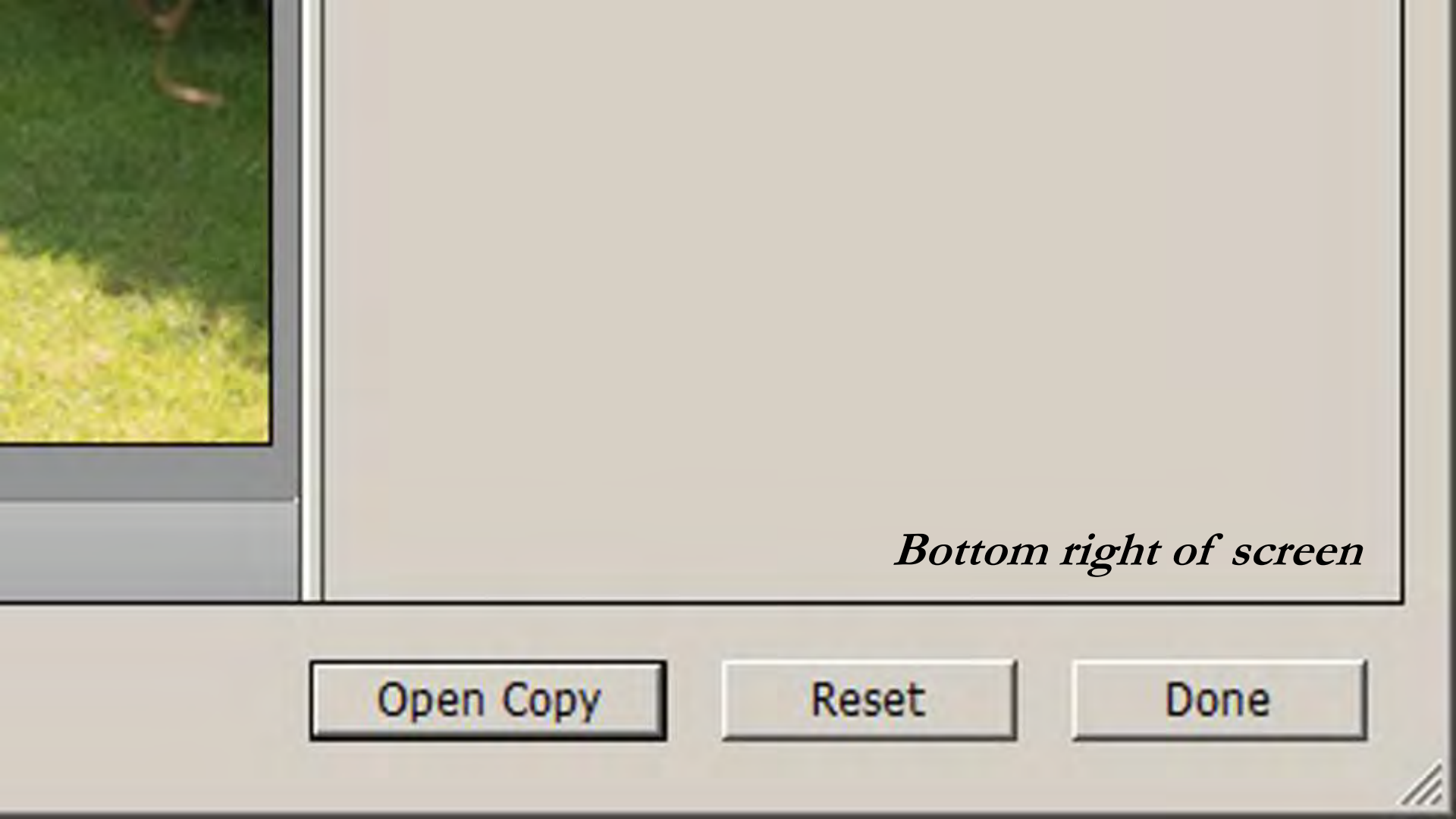
Save Image

Bottom left of screen


Basic
Under histogram
White Balance:
As Shot
Temperature
5600
Tint
+22
Auto
Default


Auto
Default
Exposure
0.00
Contrast
0
Highlights
0
Shadows
0
Whites
0
Blacks
0


Clarity
0
Vibrance
0
Saturation
0


Bottom right of screen
Open Copy
Reset
Done

Tone Curve

Parametric | Point

Highlights 0

Lights 0

Darks 0

Shadows 0

Tone Curve

Parametric | Point

Highlights -80

Lights 0

Darks 0

Shadows 0

Tone Curve

Parametric | Point

Highlights 0

Lights -80

Darks 0

Shadows 0

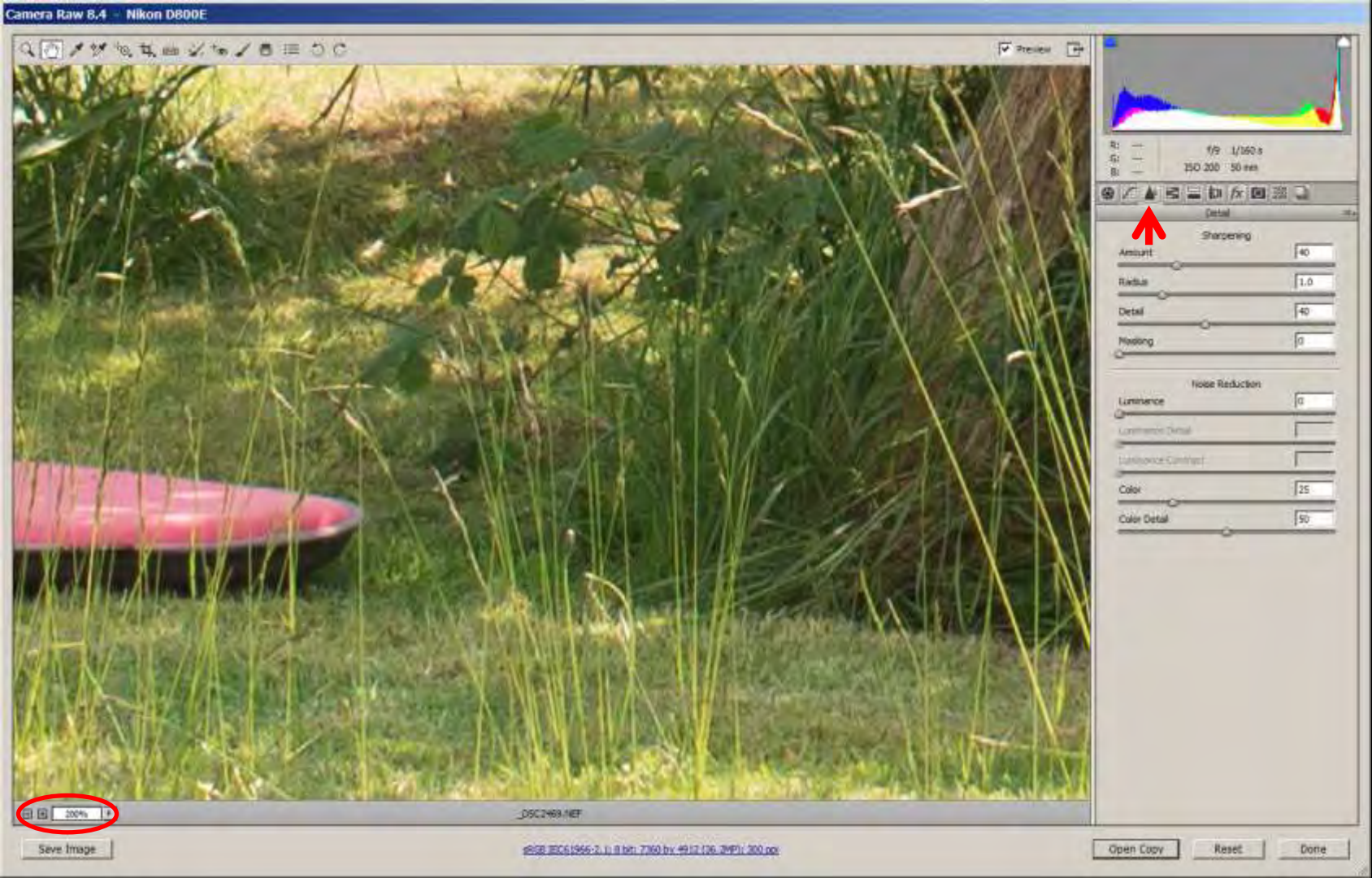
Tone Curve

Parametric | Point

Curve: Custom

Channel: RGB

Input: 0 Output: 0


Camera Raw 8.4 - Nikon D800E
Preview
f/9 1/160 s
ISO 200 50 mm
Detail
Sharpening
Amount 40
Radius 1.0
Detail 40
Masking 0
Noise Reduction
Luminance 0
Color 25
Color Detail 50
100%
_DSC2469.NEF
Save Image
Open Copy
Reset
Done

Detail

Sharpening

Amount 40

Radius 1.0

Detail 40

Masking 0

Noise Reduction

Luminance 0

Luminance Detail

Luminance Contrast

Color 25

Color Detail 50


Camera Raw 8.4 - Nikon D600E
Preview
Convert to Grayscale
Reds
Oranges
Yellows
Greens
Aquas
Blues
Purples
Magentas
Save Image...
Open Copy
Reset
Done

HSL / Grayscale

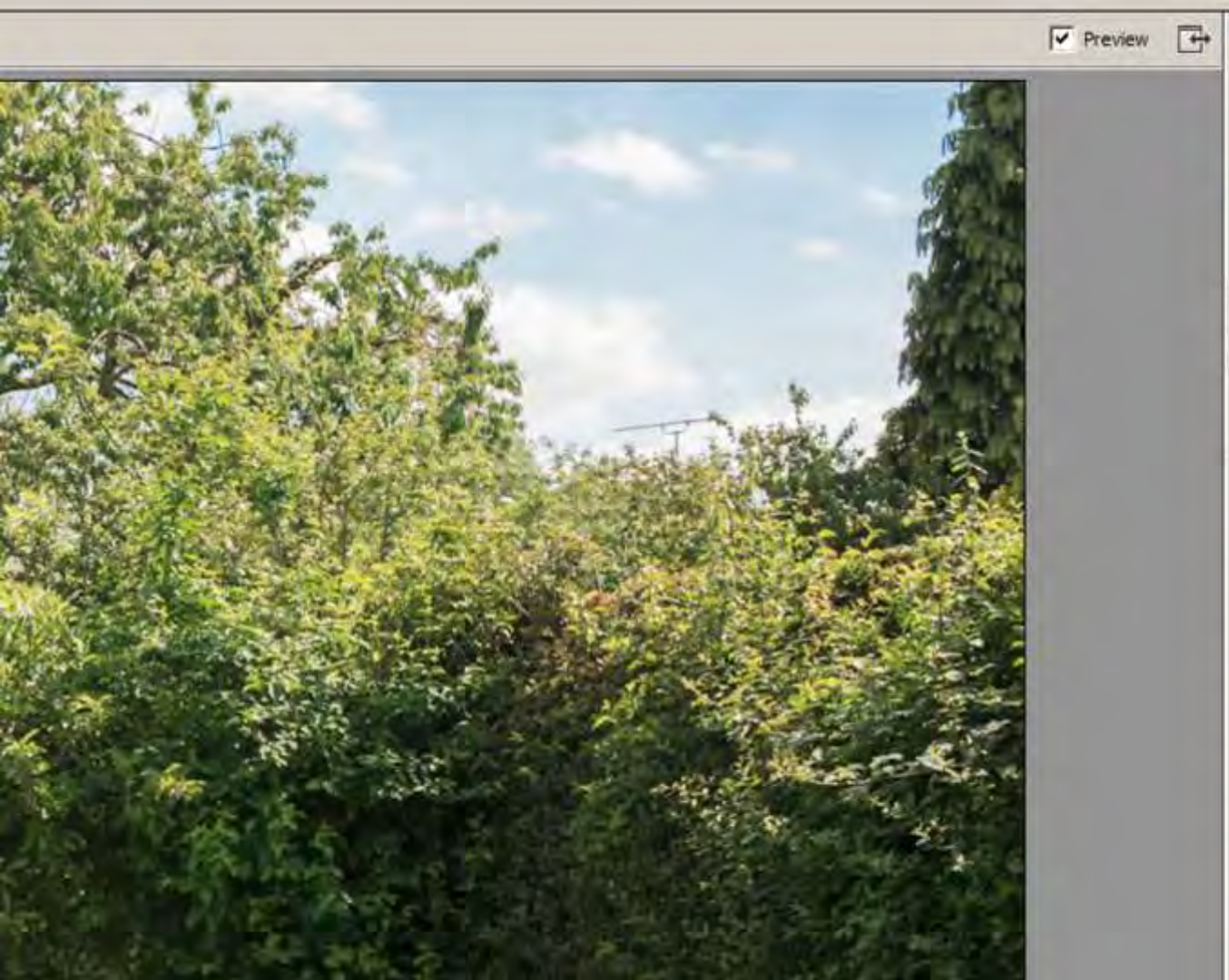
Convert to Grayscale

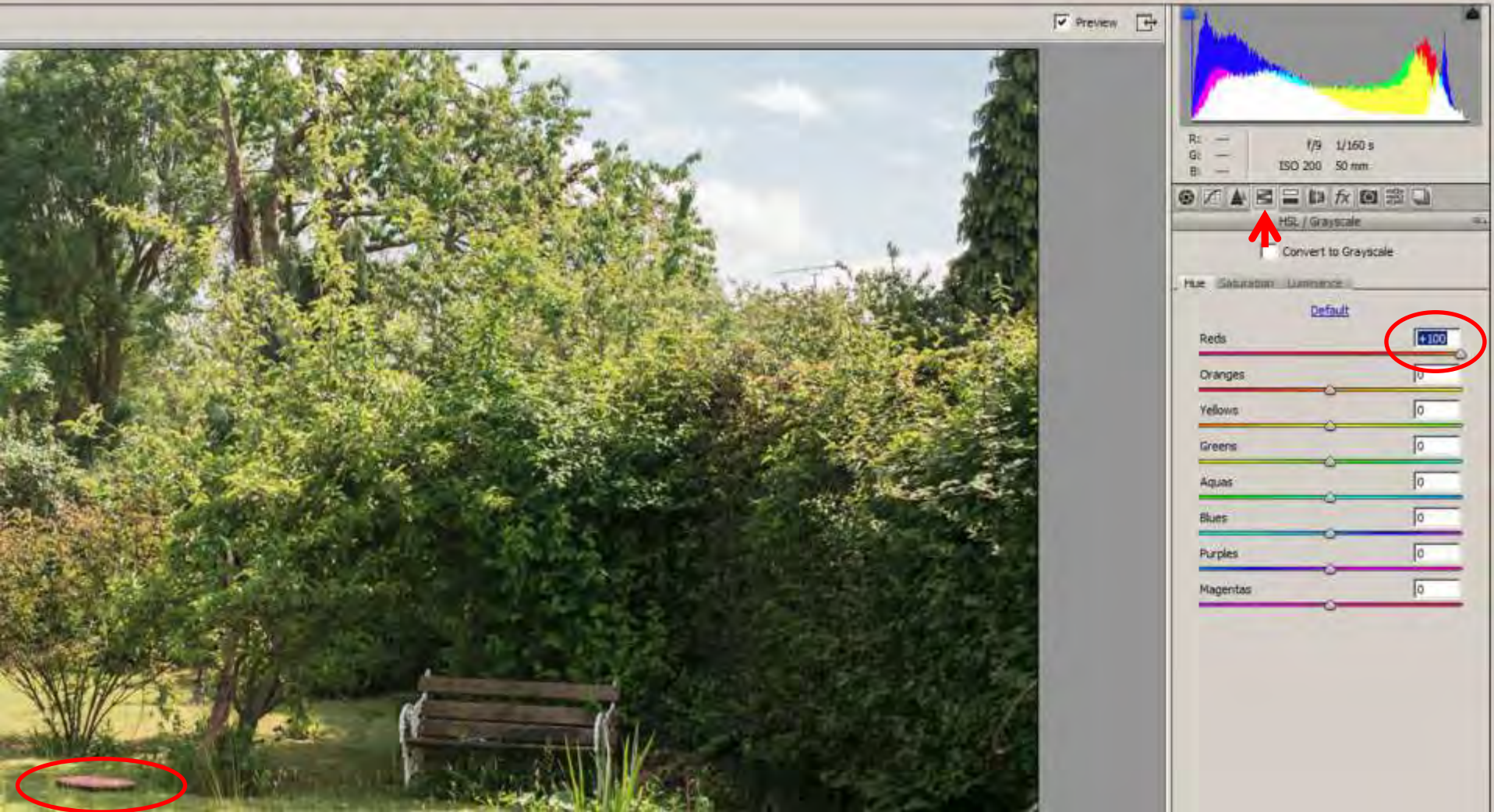
Grayscale Mix

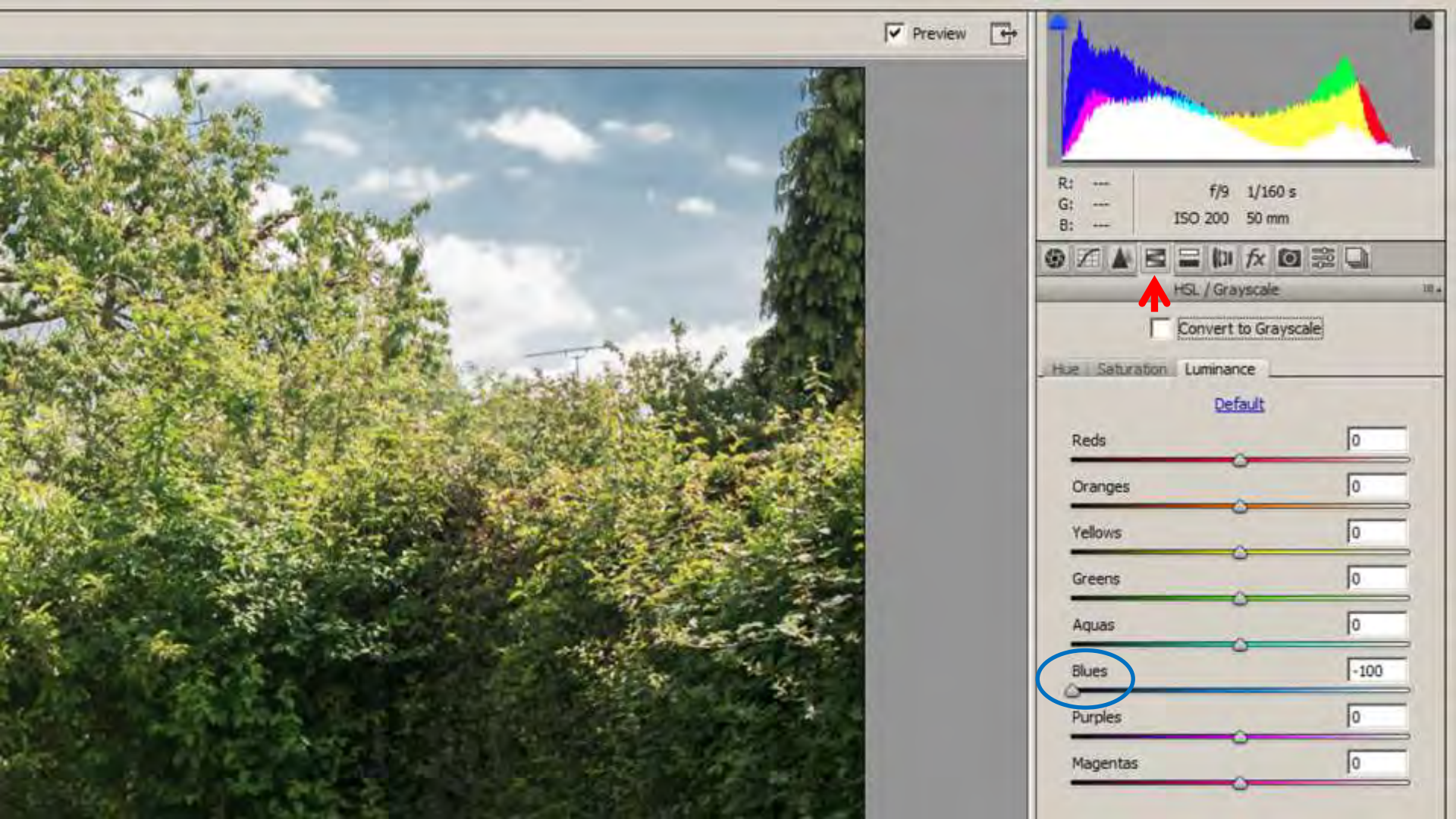
Auto Default

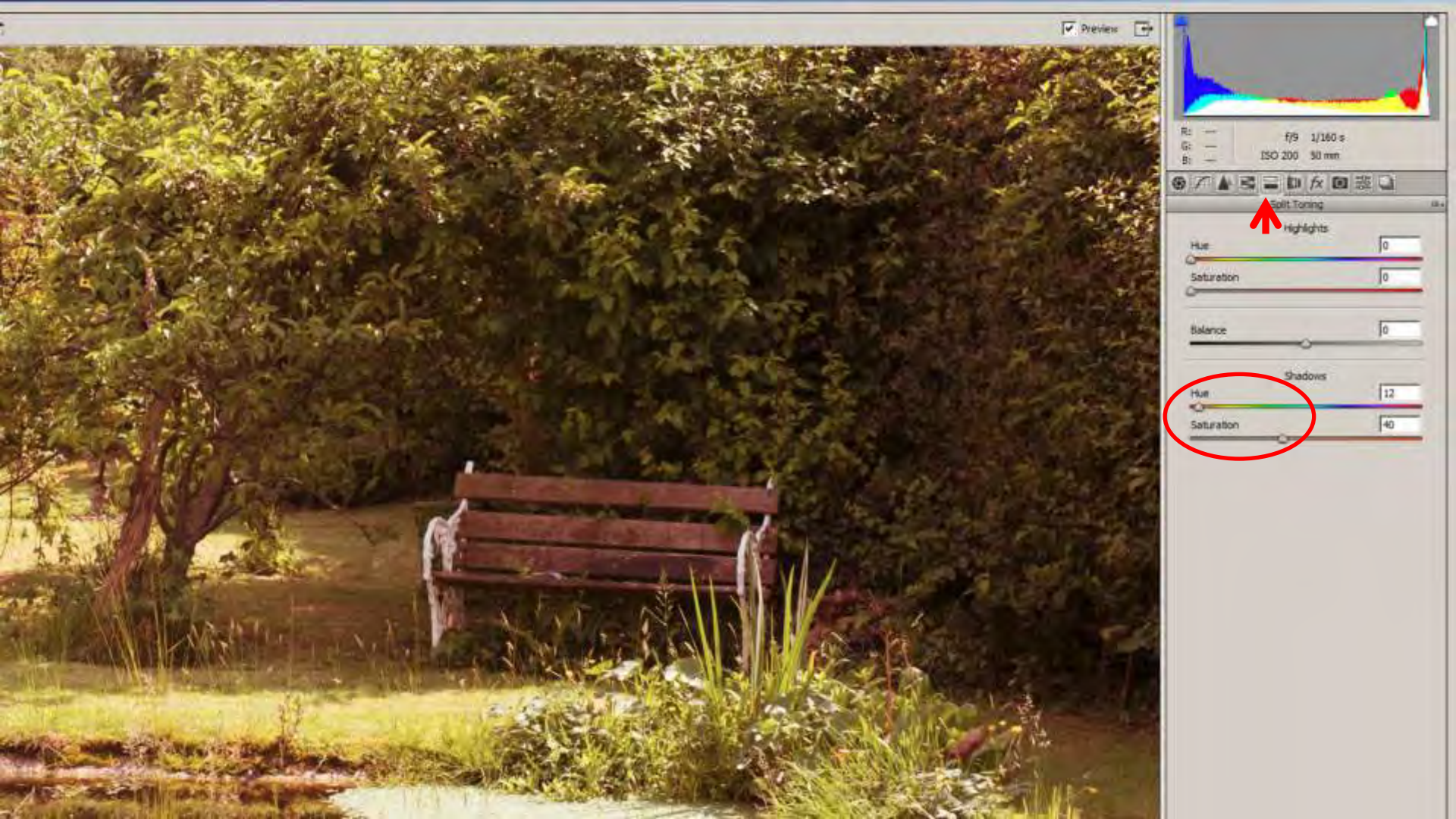
Reds	0
Oranges	0
Yellows	0
Greens	0
Aquas	0
Blues	0
Purples	0
Magentas	0


Camera Raw 8.4 - Nikon D800E
Preview
Convert to Grayscale
Grayscale Mix
Auto
Default
Reds
Oranges
Yellows
Greens
Aqua
Blues
Purples
Magentas
+100
-100
Save Image...
Open Copy
Reset
Done


Preview
R: ---
G: ---
B: ---
f/9 1/160 s
ISO 200 50 mm
HSL / Grayscale
Convert to Grayscale
Hue Saturation Luminance
Default
Reds 0
Oranges 0
Yellows 0
Greens 0
Aquas 0
Blues +100
Purples 0
Magentas 0


Preview
f/9 1/160 s
ISO 200 50 mm
HSL / Grayscale
Convert to Grayscale
Hue Saturation Luminance
Default
Reds +100
Oranges 0
Yellows 0
Greens 0
Aquas 0
Blues 0
Purples 0
Magentas 0


Preview
R: ---
G: ---
B: ---
f/9 1/160 s
ISO 200 50 mm
HSL / Grayscale
Convert to Grayscale
Hue Saturation Luminance
Default
Reds 0
Oranges 0
Yellows 0
Greens 0
Aquas 0
Blues -100
Purples 0
Magentas 0


Preview
R: —
G: —
B: —
f/9 1/160 s
ISO 200 50 mm
Split Toning
Highlights
Hue 0
Saturation 0
Balance 0
Shadows
Hue 12
Saturation 40

Lens Corrections

Profile | Color | Manual

Enable Lens Profile Corrections

Setup: Default

Lens Profile

Make: Nikon

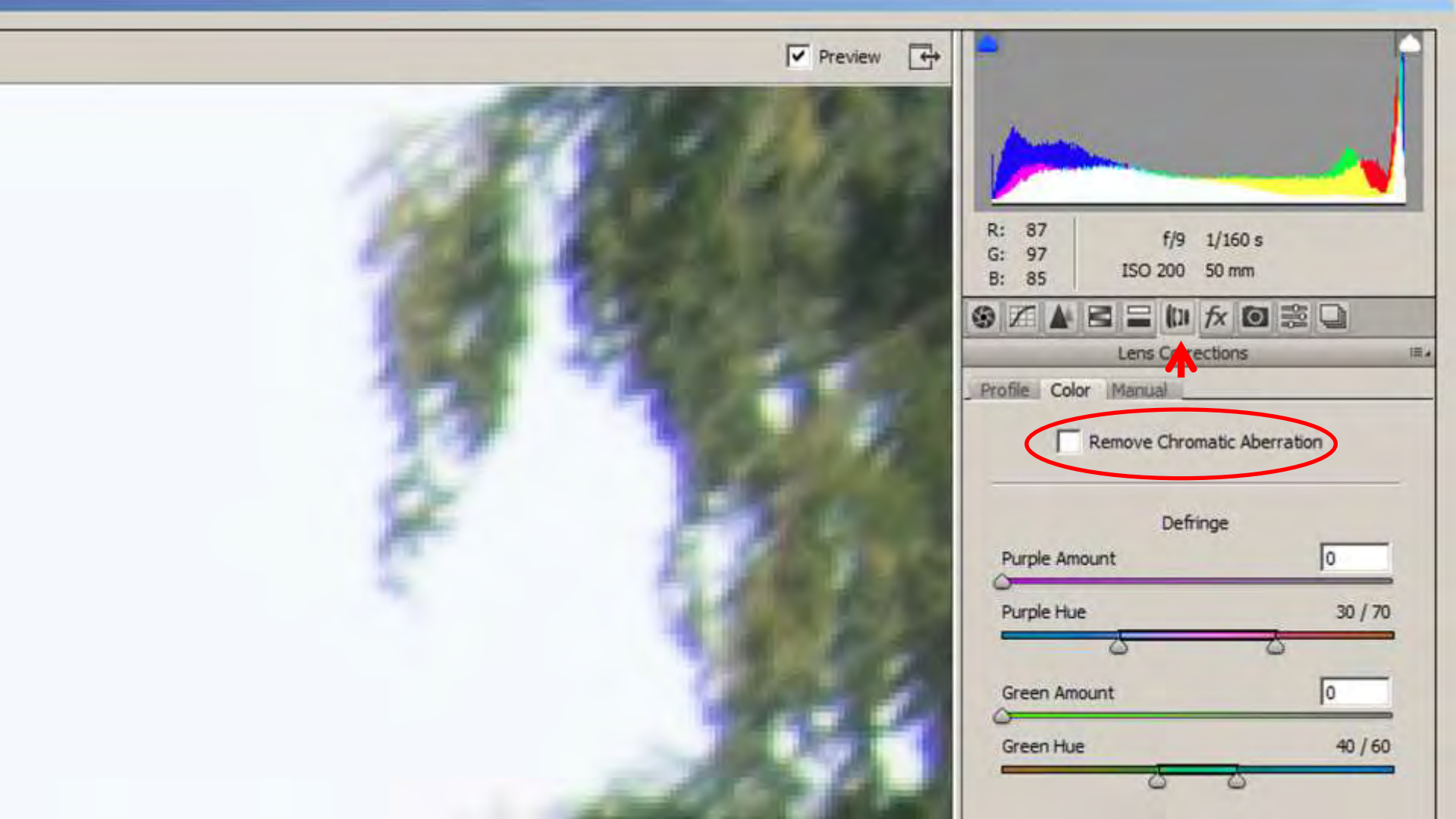
Model: Nikon AF-S NIKKOR 50mm f/1...

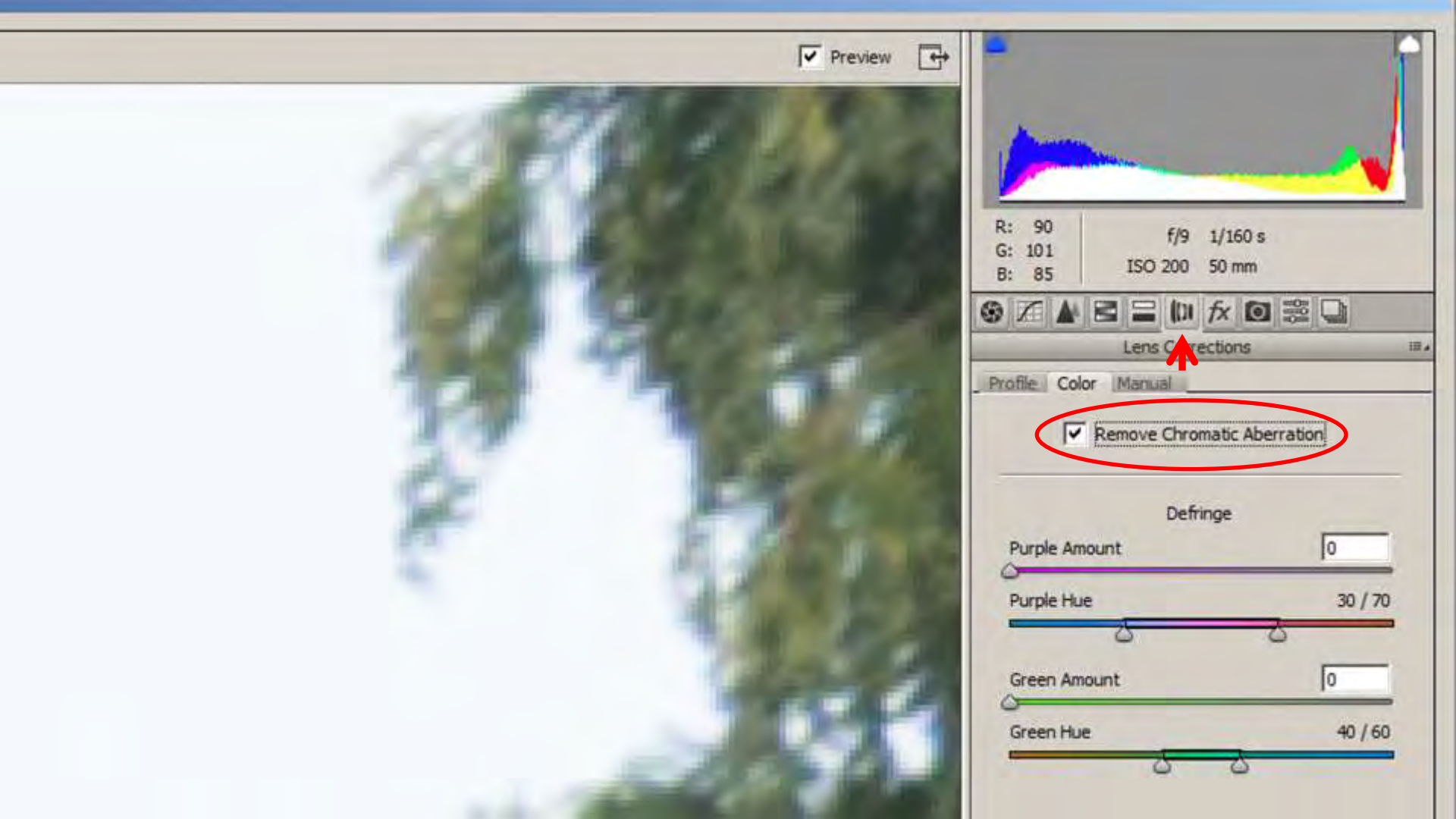
Profile: Adobe (Nikon AF-S NIKKOR 5...

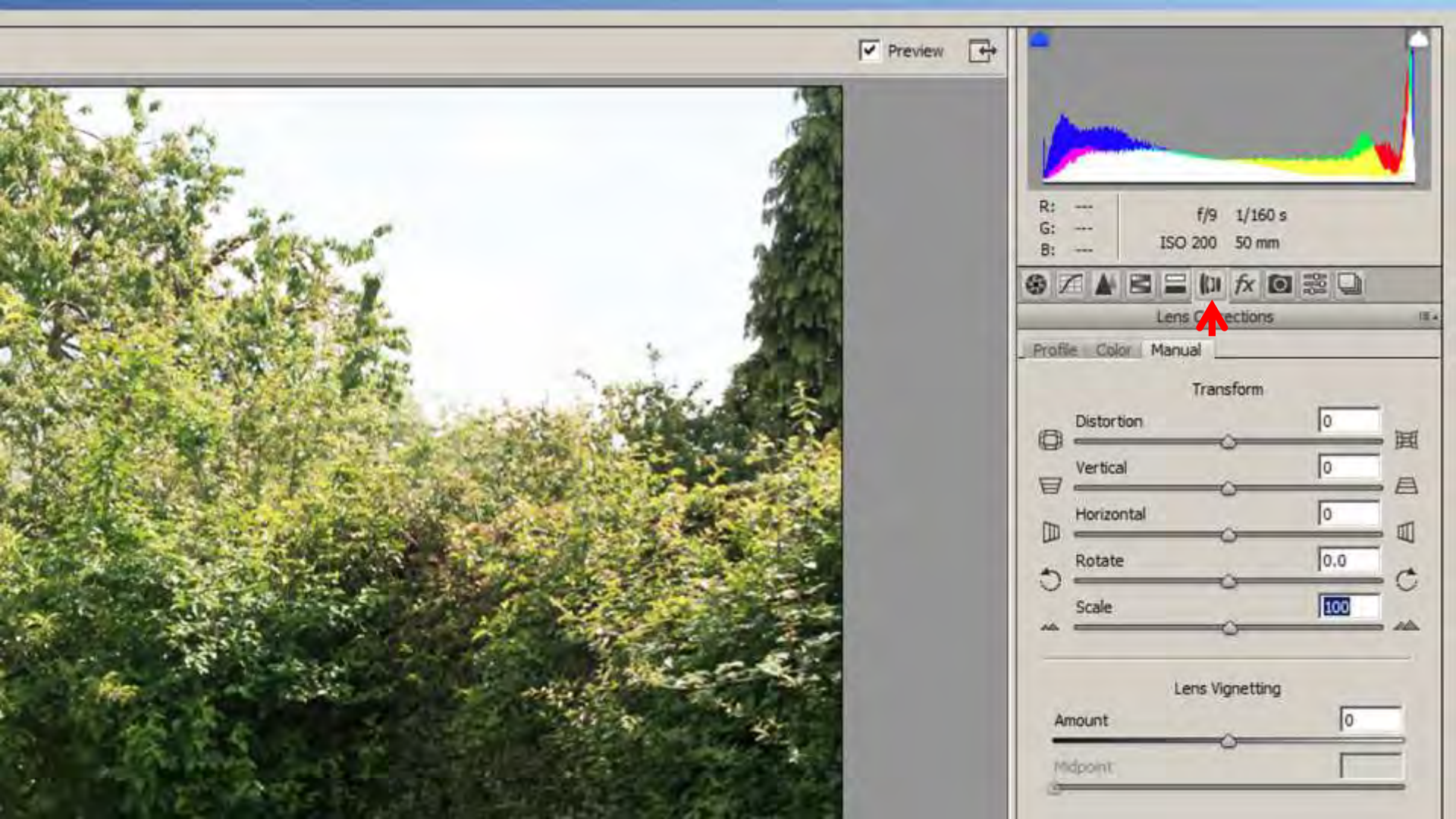
Correction Amount

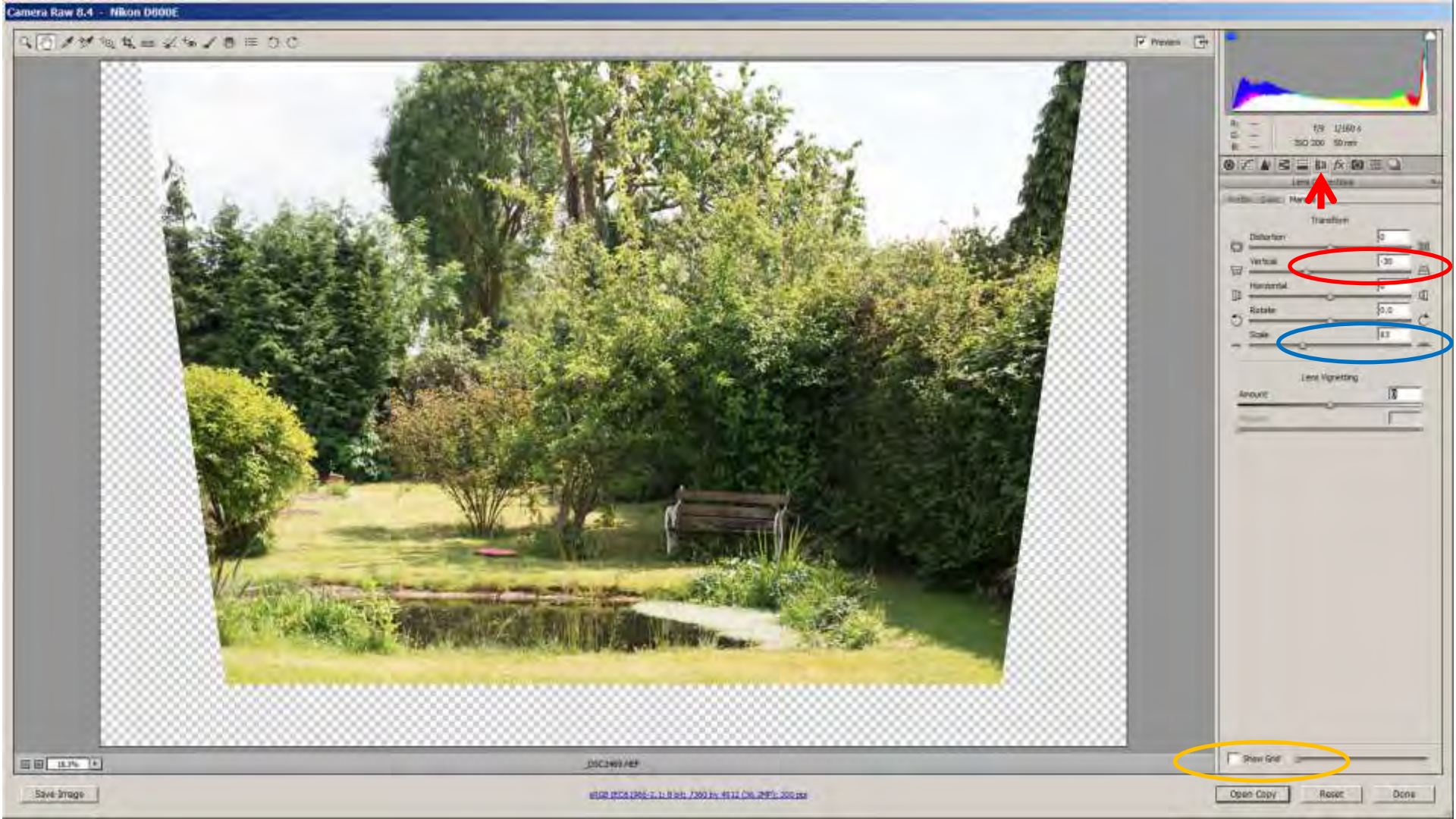
Distortion 100

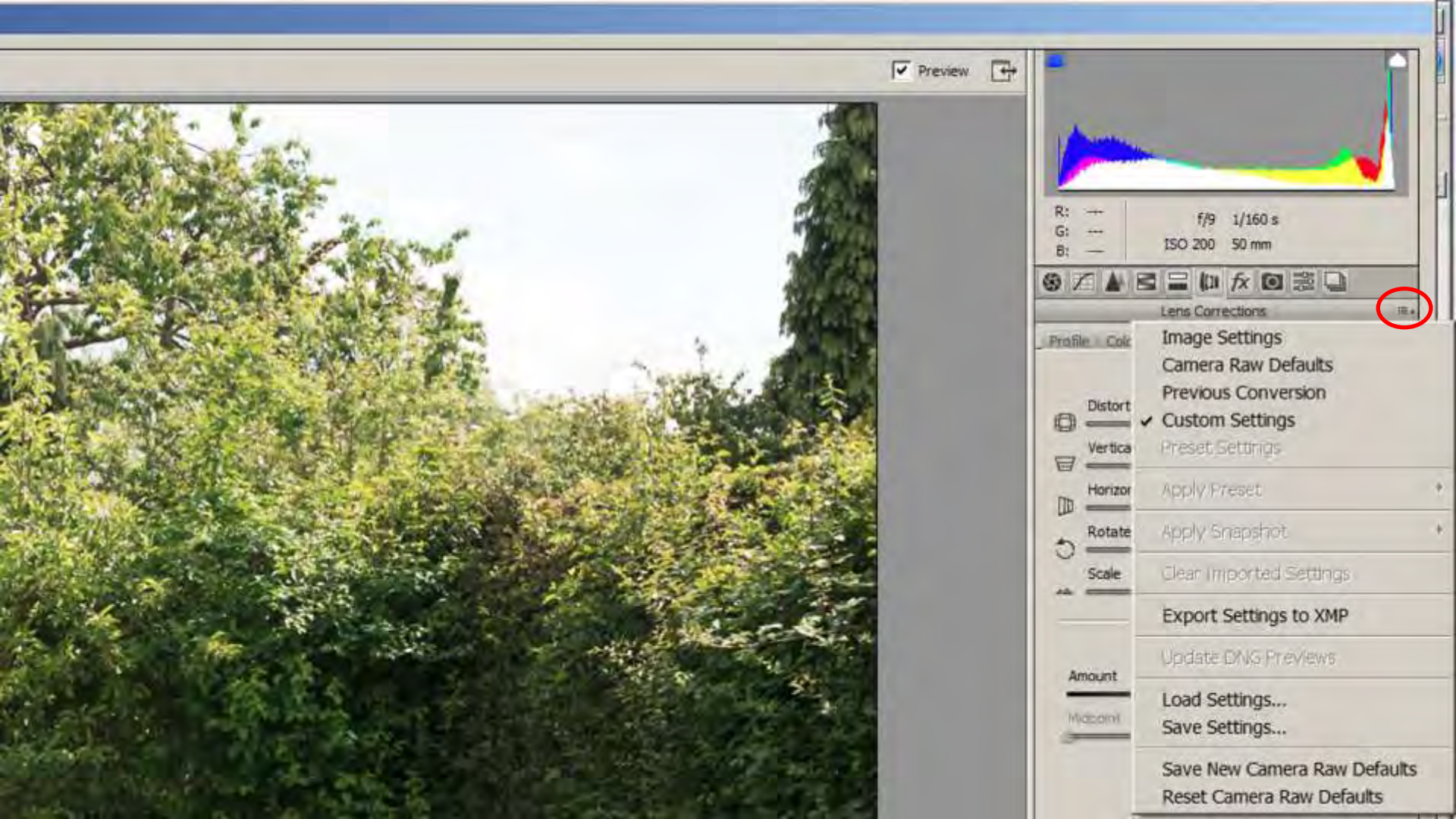
Vignetting 100


Preview
R: 87
G: 97
B: 85
f/9 1/160 s
ISO 200 50 mm
Lens Corrections
Profile
Color
Manual
Remove Chromatic Aberration
Defringe
Purple Amount
0
Purple Hue
30 / 70
Green Amount
0
Green Hue
40 / 60


Preview
R: 90
G: 101
B: 85
f/9 1/160 s
ISO 200 50 mm
Lens Corrections
Profile
Color
Manual
Remove Chromatic Aberration
Defringe
Purple Amount
0
Purple Hue
30 / 70
Green Amount
0
Green Hue
40 / 60


Preview
R: ---
G: ---
B: ---
f/9 1/160 s
ISO 200 50 mm
Lens Corrections
Profile Color Manual
Transform
Distortion 0
Vertical 0
Horizontal 0
Rotate 0.0
Scale 100
Lens Vignetting
Amount 0
Midpoint


Camera Raw 8.4 - Nikon D600E
Preview
Transform
Distortion
Vertical
Horizontal
Rotate
Scale
Lens Vignetting
Amount
Show Grid
Save Image...
Open Copy
Reset
Done


Preview
R: ---
G: ---
B: ---
f/9 1/160 s
ISO 200 50 mm
Lens Corrections
Profile
Distort
Vertica
Horizor
Rotate
Scale
Amount
Midpoint
Image Settings
Camera Raw Defaults
Previous Conversion
Custom Settings
Preset Settings
Apply Preset
Apply Snapshot
Clear Imported Settings
Export Settings to XMP
Update DNG Previews
Load Settings...
Save Settings...
Save New Camera Raw Defaults
Reset Camera Raw Defaults

Effects

Grain

Amount 0

Size

Roughness

Post Crop Vignetting

Style: Highlight Priority

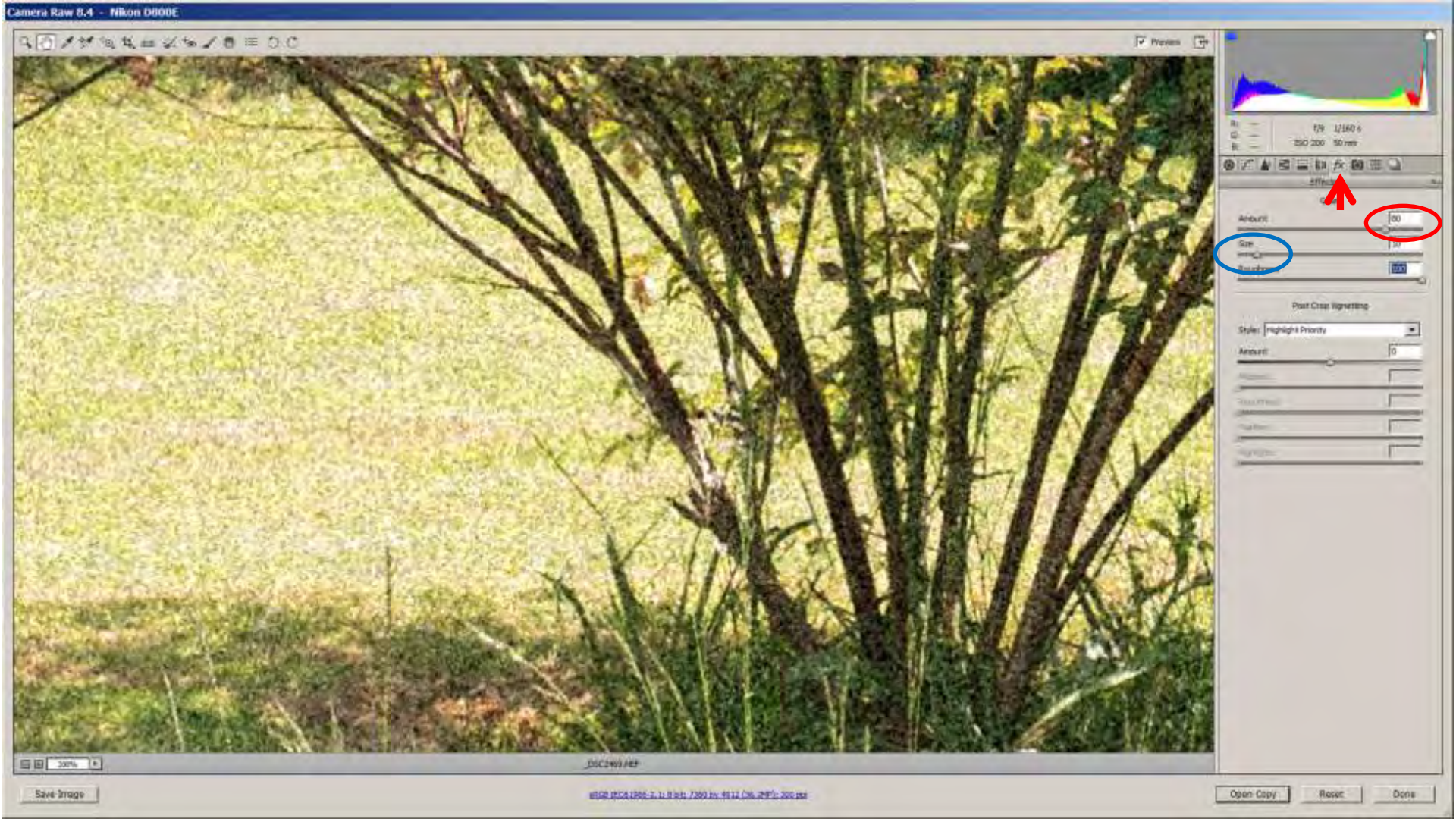
Amount 0

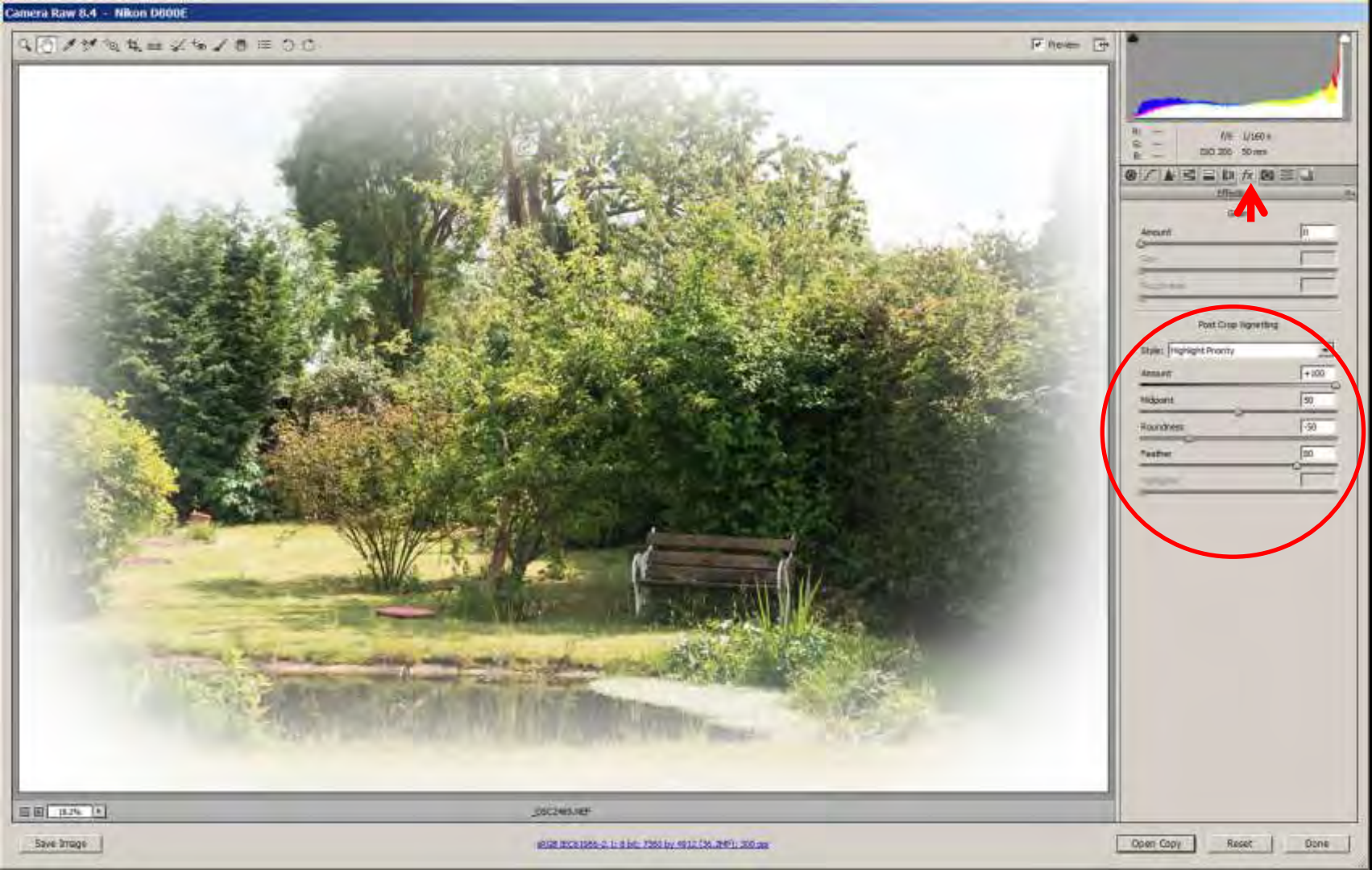
Midpoint

Roundness

Feather

Highlights


Camera Raw 8.4 - Nikon D800E
Preview
Amount
Size
Post Crop Vignetting
Style: Highlight Priority
Amount
Save Image
Open Copy
Reset
Done


Camera Raw 8.4 - Nikon D600E
Preview
Post Crop Vignetting
Style: Highlight Priority
Amount +100
Midpoint 50
Roundness -50
Feather 50
Save Image...
Open Copy
Reset
Done


Camera Raw 8.4 - Nikon D800E
Preview
Amount
Post Crop Vignetting
Style
Highlight Priority
Amount
Midpoint
Roundness
Feather
Highlights
Save Image...
Open Copy
Reset
Done

Camera Calibration

Process: 2012 (Current)

Camera Profile

Name: Adobe Standard

Shadows

Tint 0

Red Primary

Hue 0

Saturation 0

Green Primary

Hue 0

Saturation 0

Blue Primary

Hue 0

Saturation 0

Camera Calibration

Process: 2012 (Current)

Camera Profile

Name: Adobe Standard

Adobe Standard
Camera Landscape
Camera Neutral
Camera Portrait
Camera Standard
Camera Vivid

Tint

Red Primary

Hue 0

Saturation 0

Green Primary

Hue 0

Saturation 0

Blue Primary

Hue 0

Saturation 0

Camera Calibration

Process: 2012 (Current)

Camera Profile

Name: Adobe Standard

Shadows

Tint +100

Red Primary

Hue 0

Saturation 0

Green Primary

Hue 0

Saturation 0

Blue Primary

Hue 0

Saturation 0

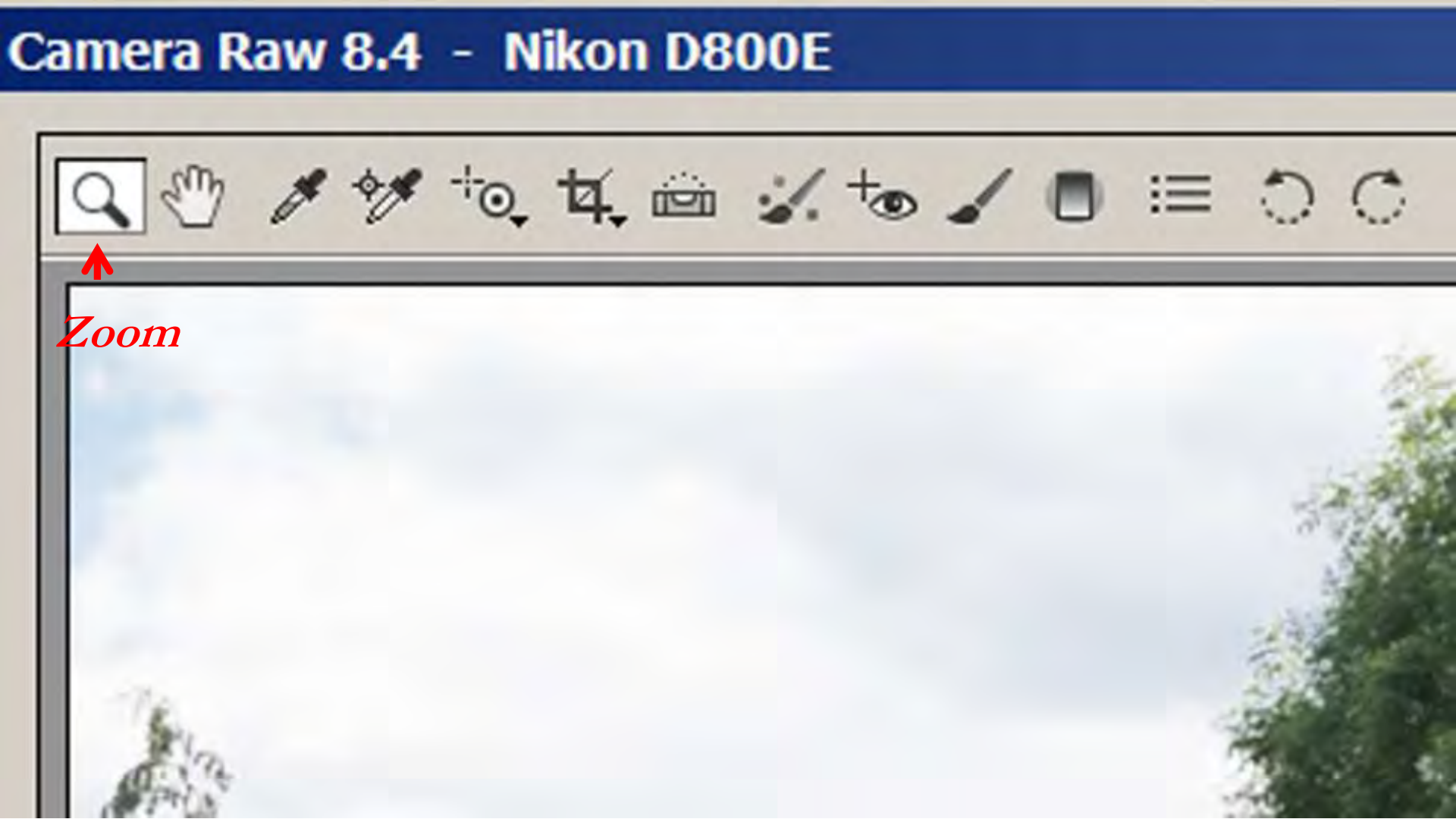
Presets

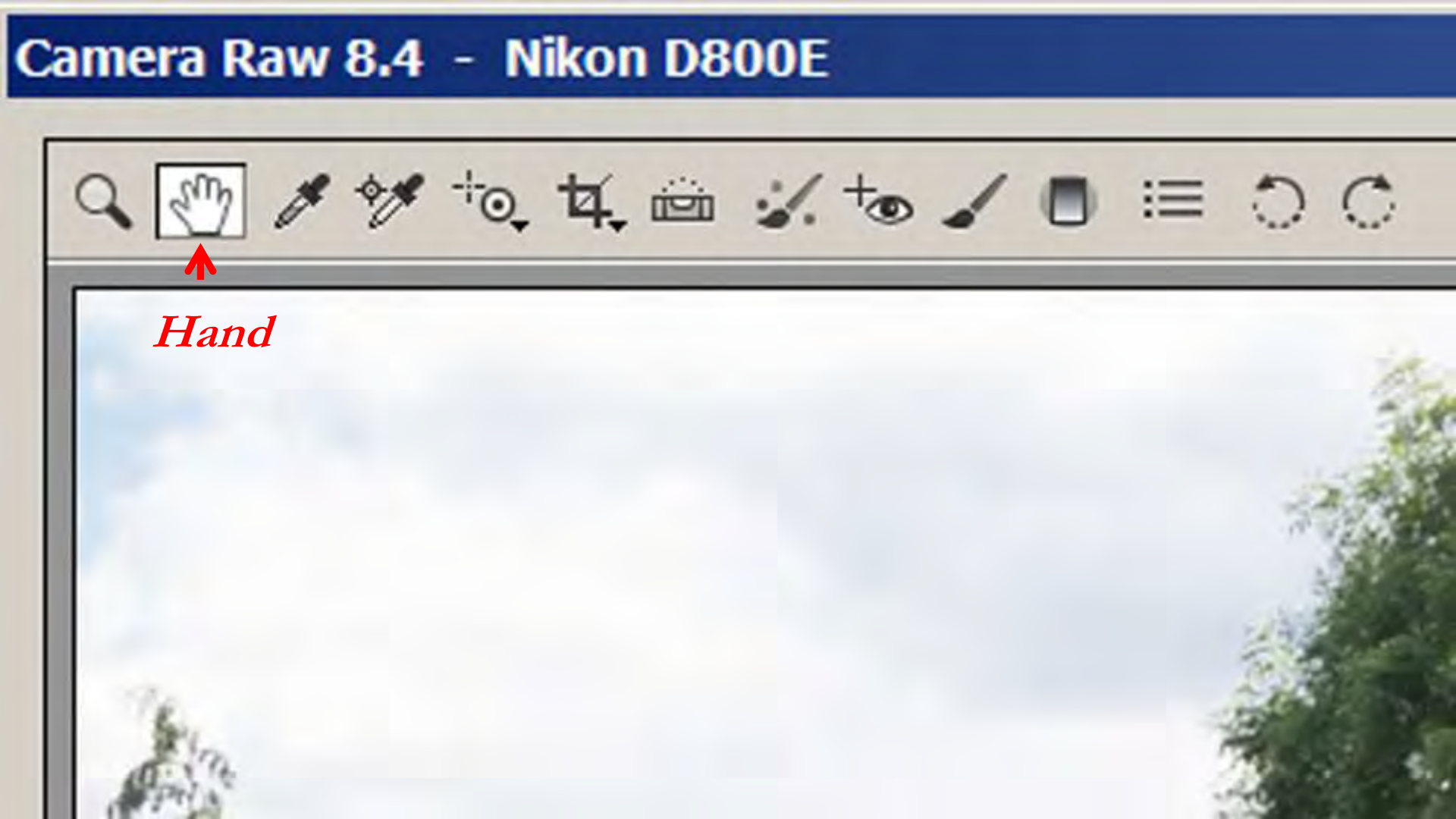
?

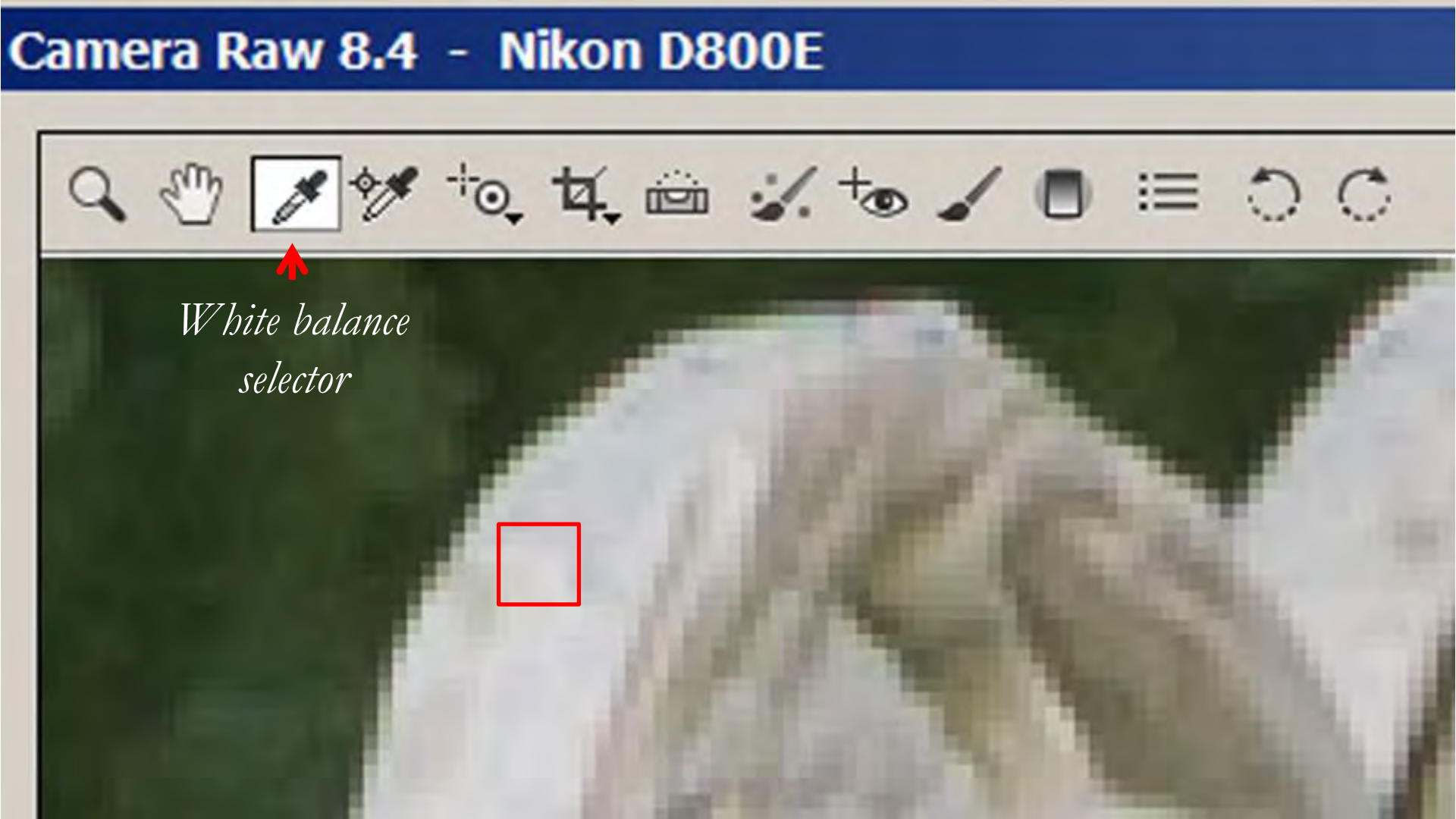

Camera Raw 8.4 - Nikon D800E
Preview
1-Original
2-Auto-fix
3-Manual_HDR
Save Image
Open Copy
Reset
Done


Camera Raw 8.4 - Nikon D800E
Preview
1-Original
2-Auto-fix
3-Manual_HDR
Save Image
Open Copy
Reset
Done

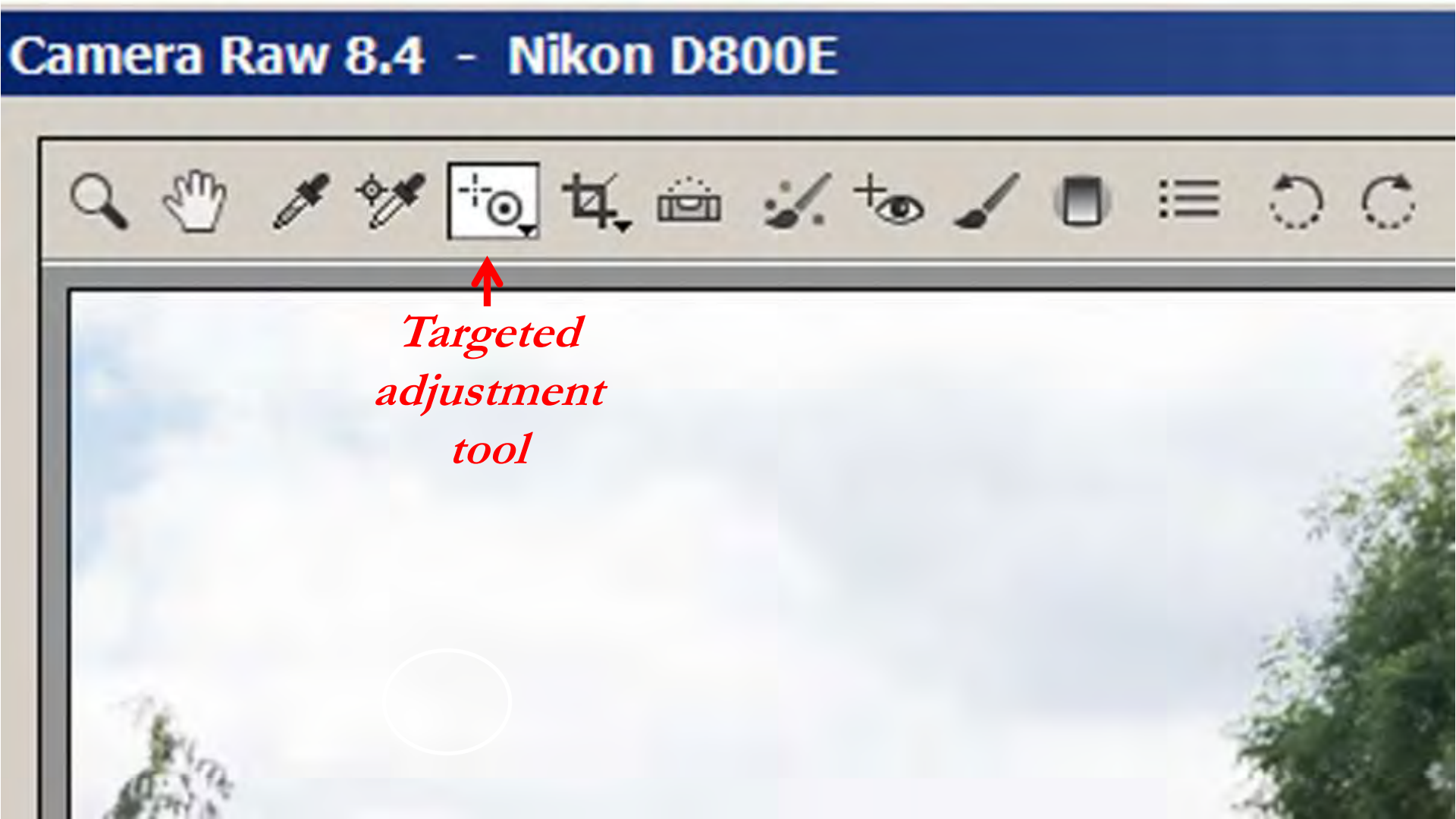

Camera Raw 8.4 - Nikon D800E
Preview
1-Original
2-Auto-fix
3-Manual_HDR
Save Image
Open Copy
Reset
Done

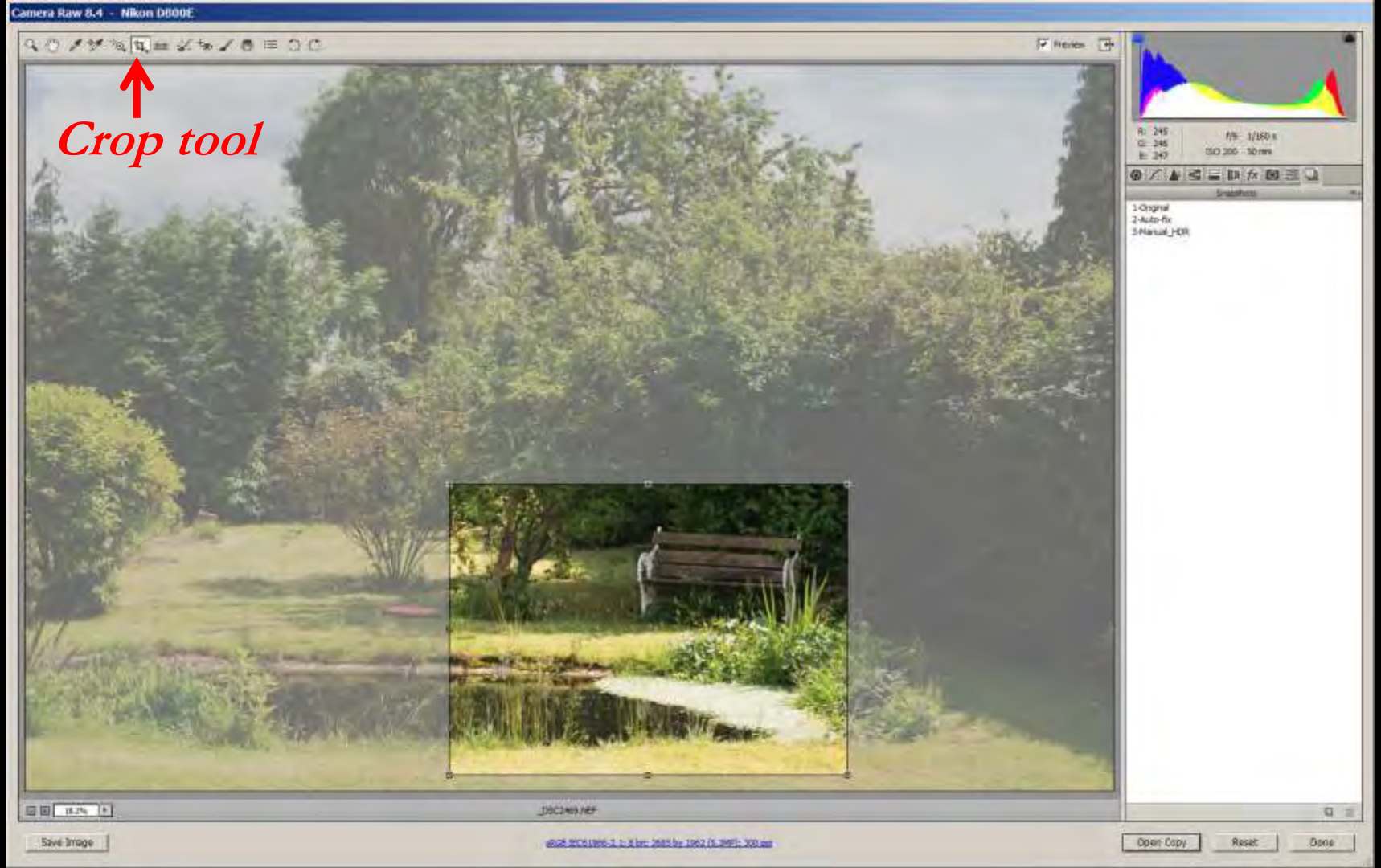

Camera Raw 8.4 - Nikon D800E
Zoom


Camera Raw 8.4 - Nikon D800E
Hand

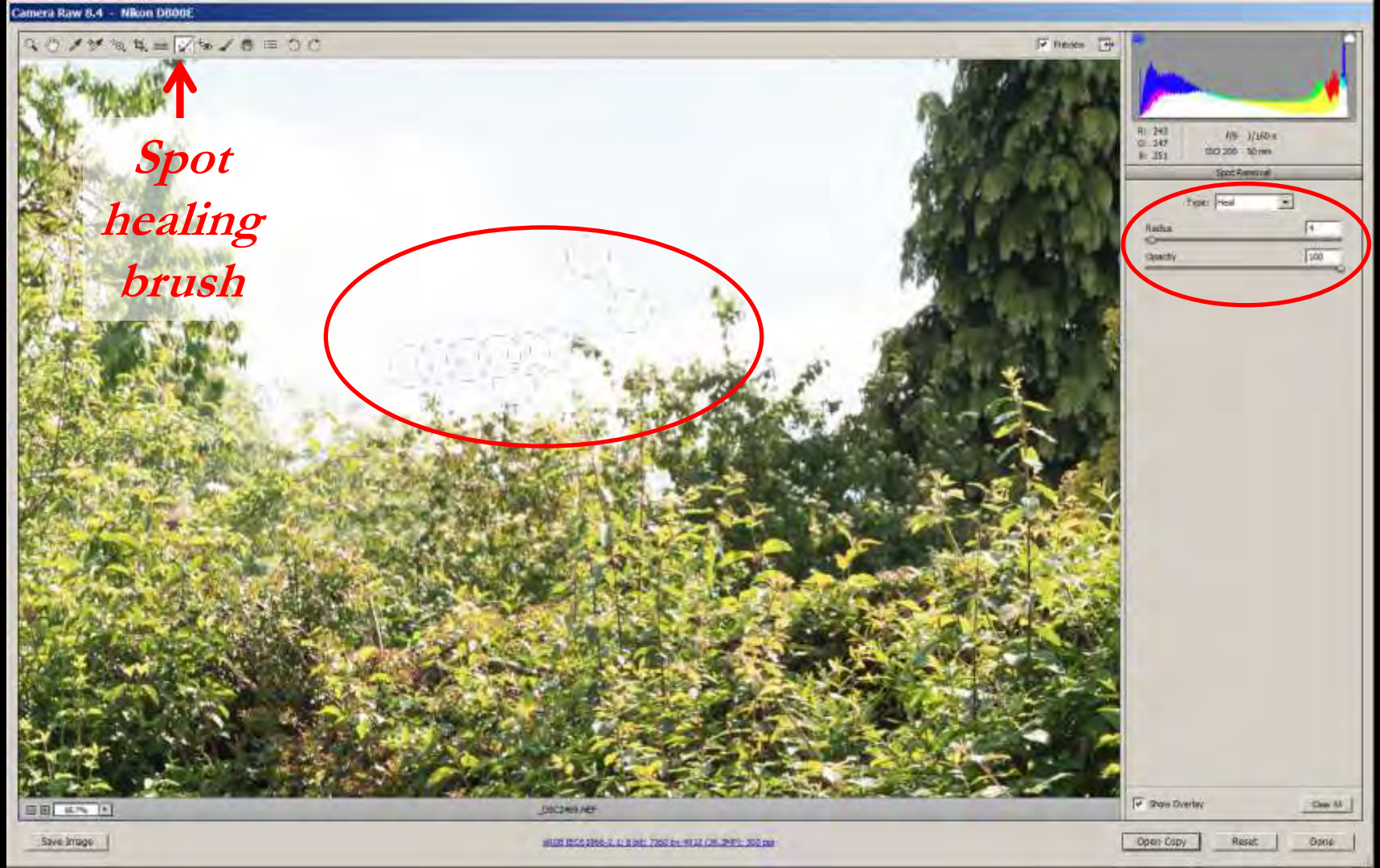

Camera Raw 8.4 - Nikon D800E
White balance selector


Camera Raw 8.4 - Nikon D800E
Colour picker
#1 R: 218
G: 101
B: 131
Clear Samplers

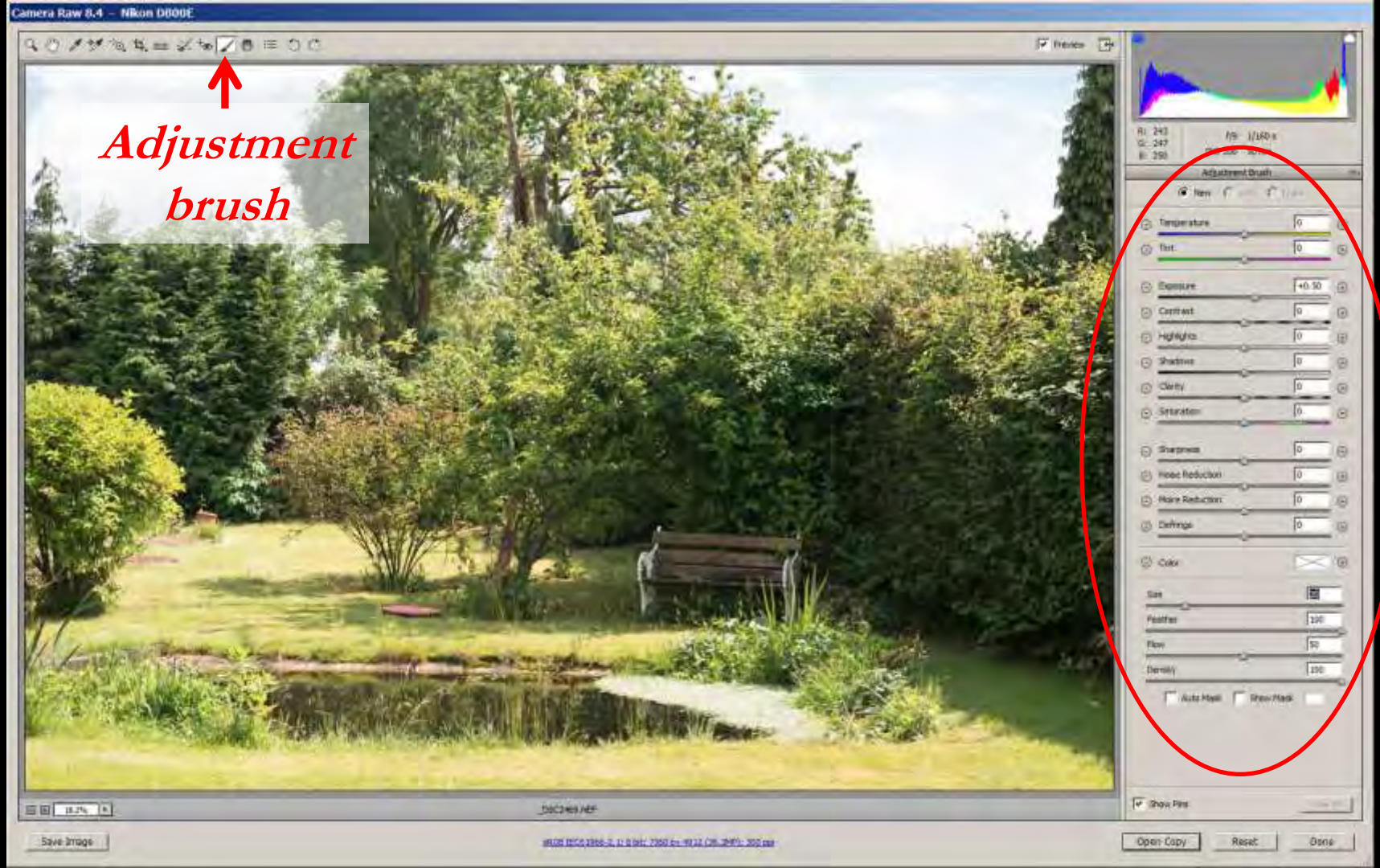

Camera Raw 8.4 - Nikon D800E
Targeted adjustment tool

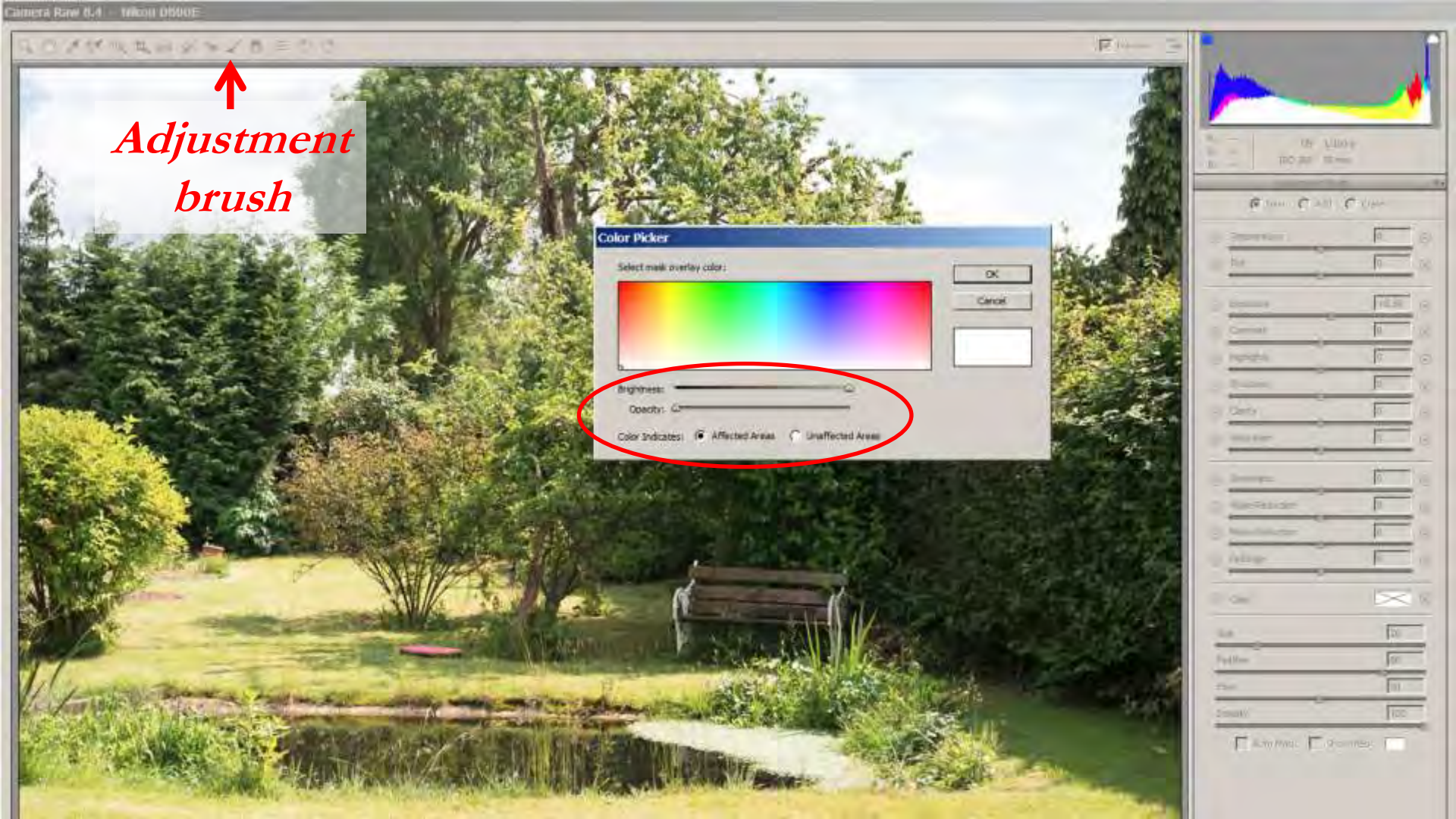

Camera Raw 8.4 - Nikon D800E
Crop tool
Preview
1-Original
2-Auto-fix
3-Manual_HDR
Save Image
Open Copy
Reset
Done

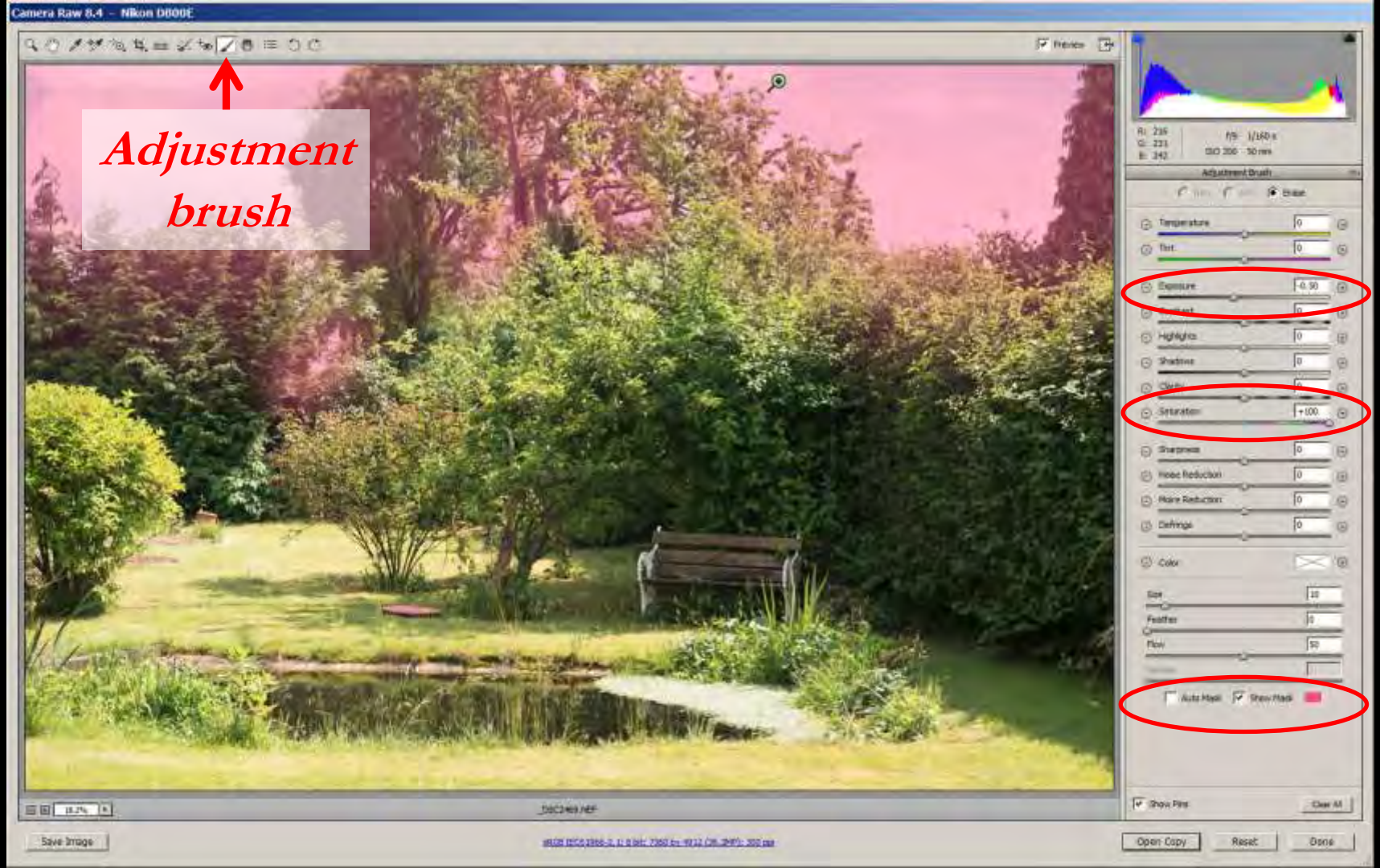

Camera Raw 8.4 - Nikon D800E
Level tool
Preview
1-Original
2-Auto-fix
3-Manual_HDR
Save Image...
Open Copy
Reset
Done

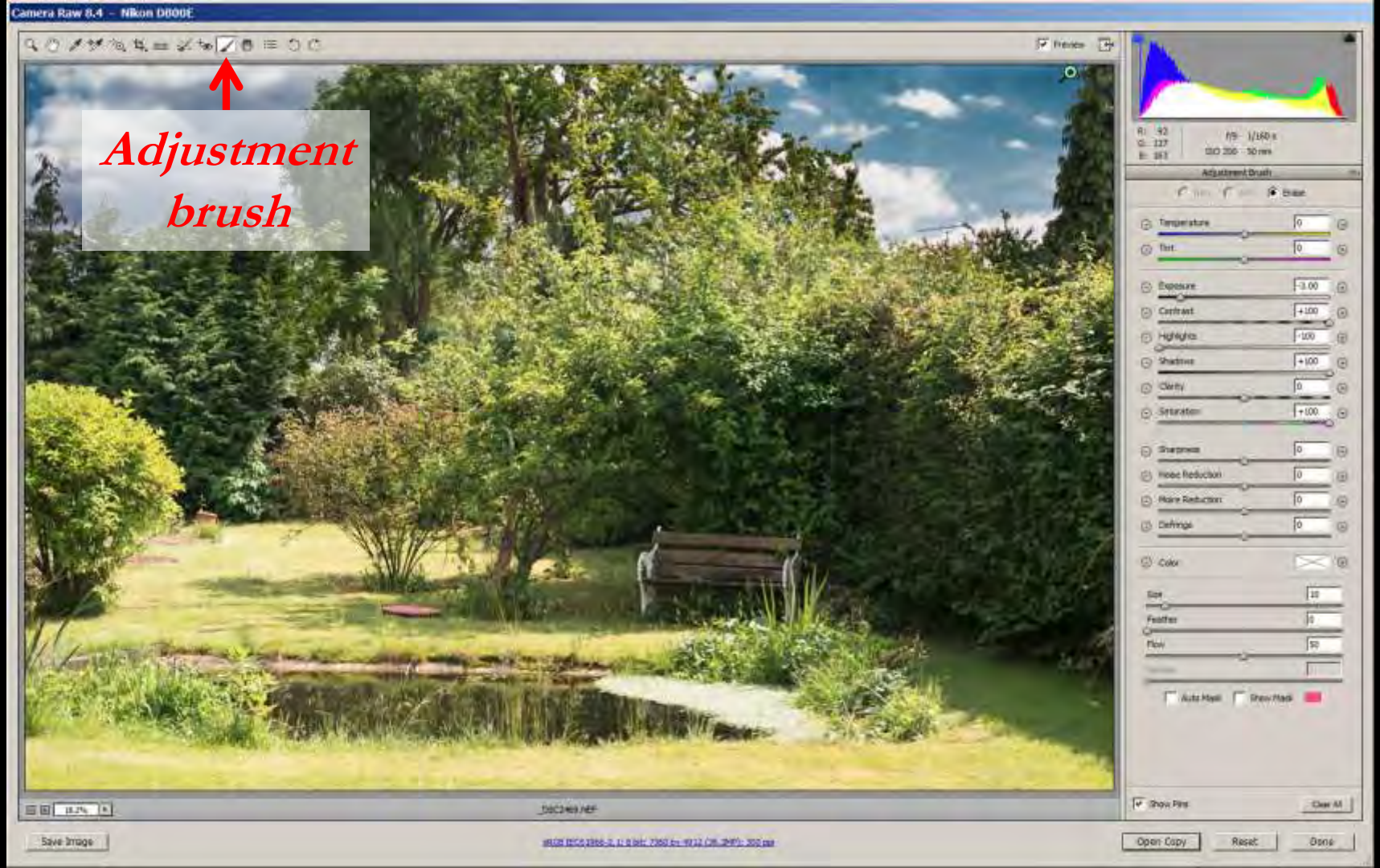

Camera Raw 8.4 - Nikon D800E
Spot healing brush
Spot Removal
Type:
Radius
Opacity
Show Overlay
Clear All
Save Image...
Open Copy
Reset
Done

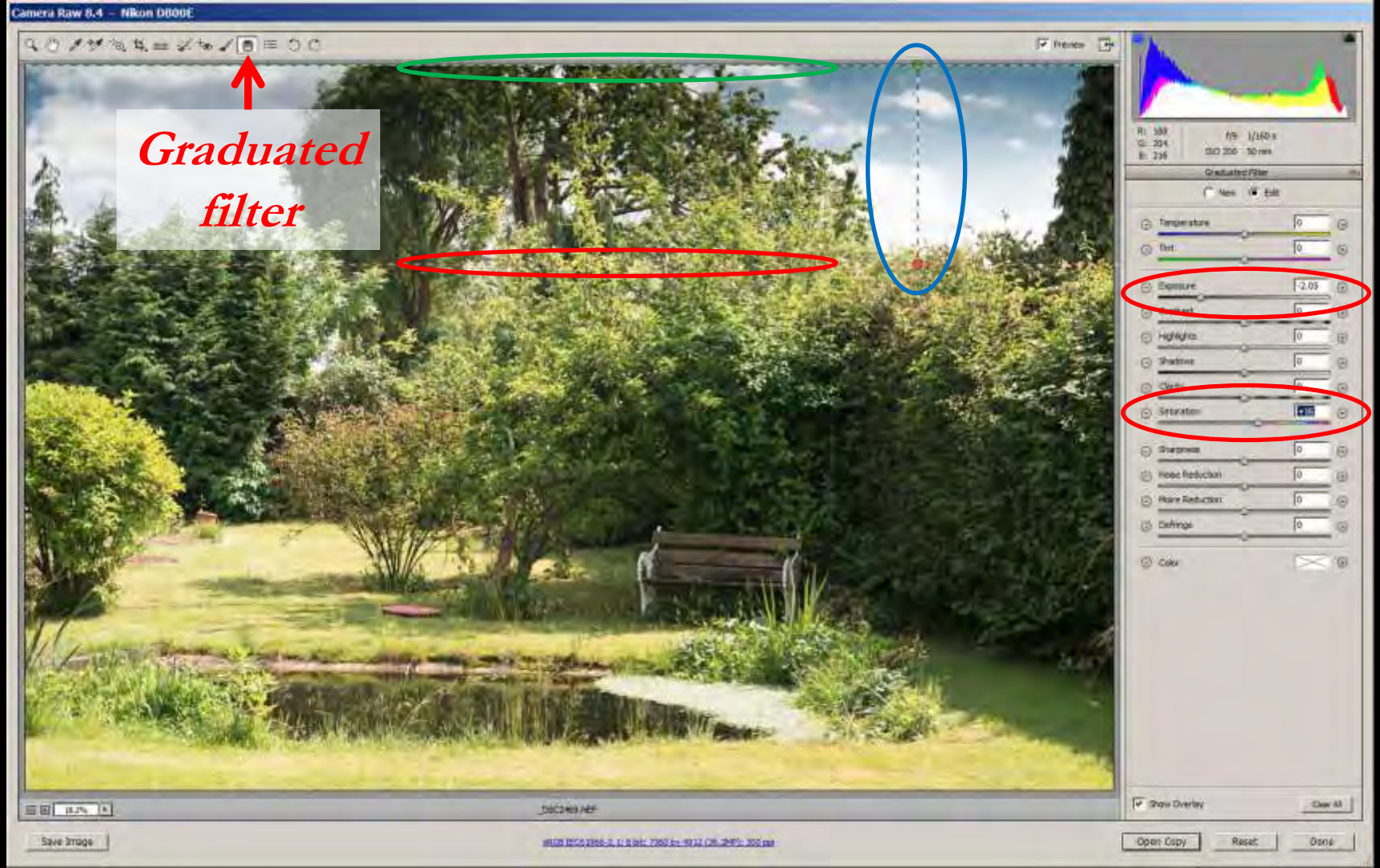

Camera Raw 8.4 – Nikon D800E
Red eye removal
Red Eye Removal
Pupil Size
Darken
Show Overlay
Save Image
Open Copy
Reset
Done

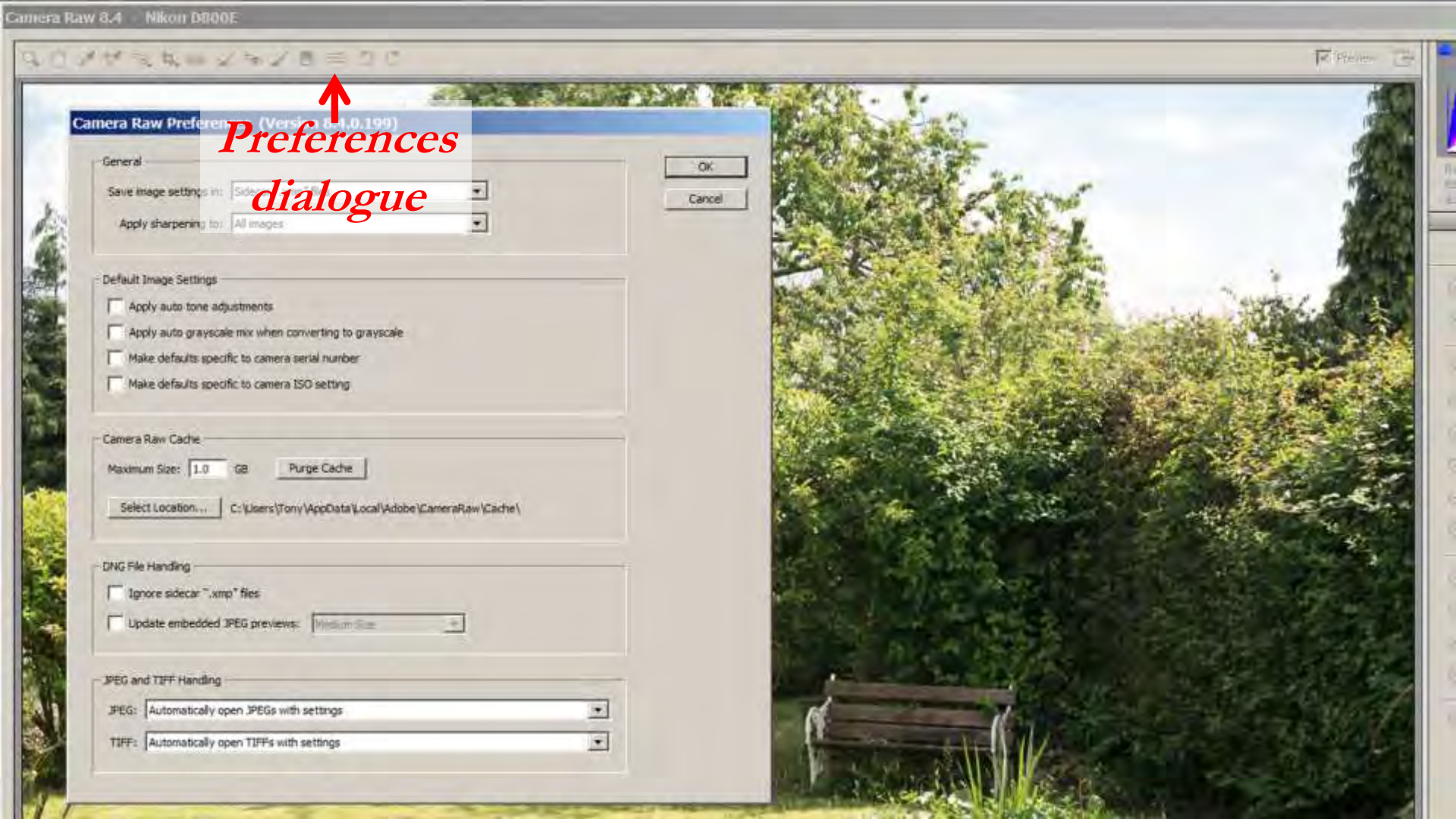

Camera Raw 8.4 – Nikon D800E
Adjustment brush
Adjustment Brush
Temperature
Tint
Exposure
Contrast
Highlights
Shadows
Clarity
Saturation
Sharpness
Noise Reduction
Moire Reduction
Defringe
Color
Size
Feather
Flow
Density
Auto Mask
Show Mask
Show Pins
Save Image
Open Copy
Reset
Done

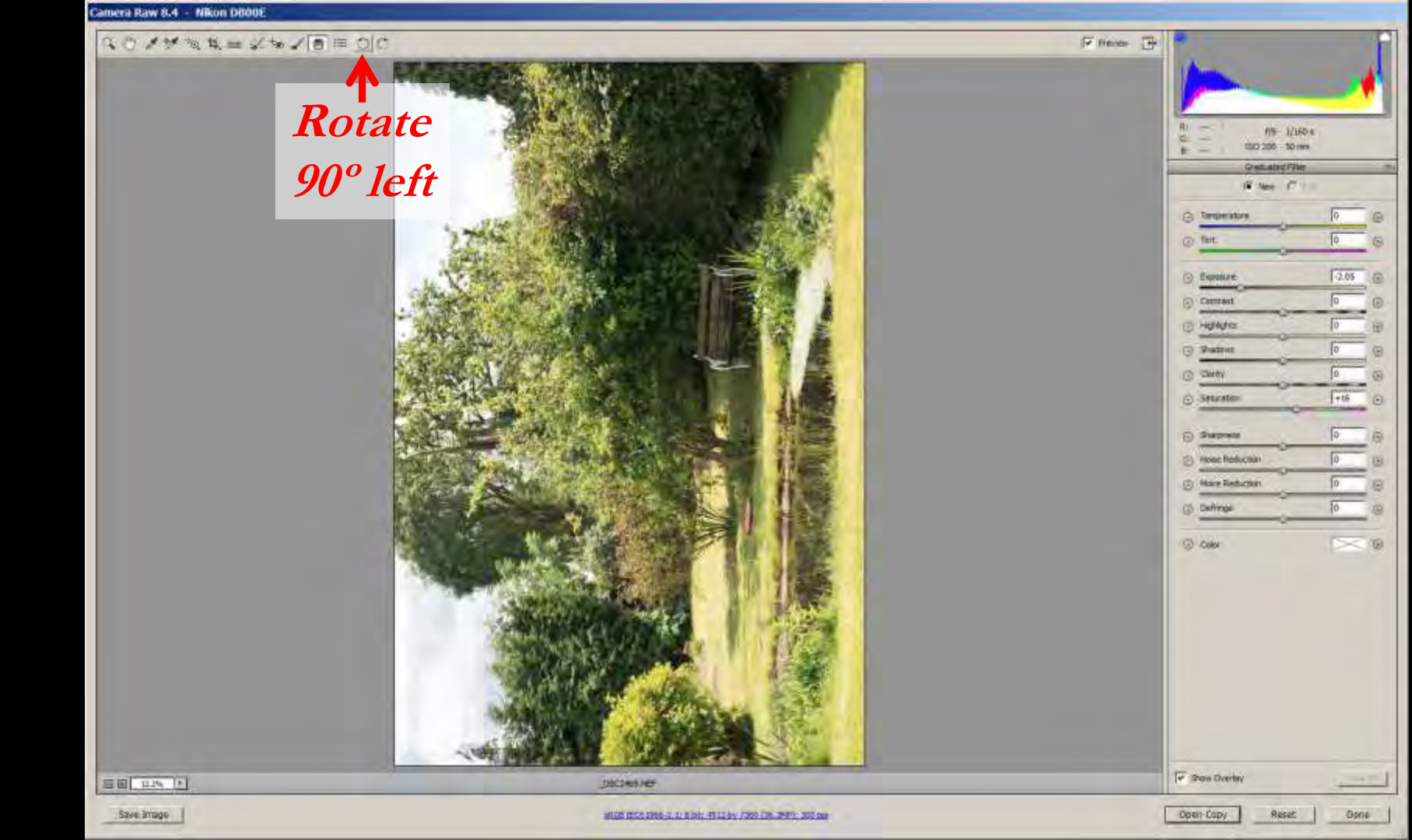

Adjustment brush
Color Picker
Select mask overlay color:
OK
Cancel
Brightness:
Opacity:
Color Indicates:
Affected Areas
Unaffected Areas

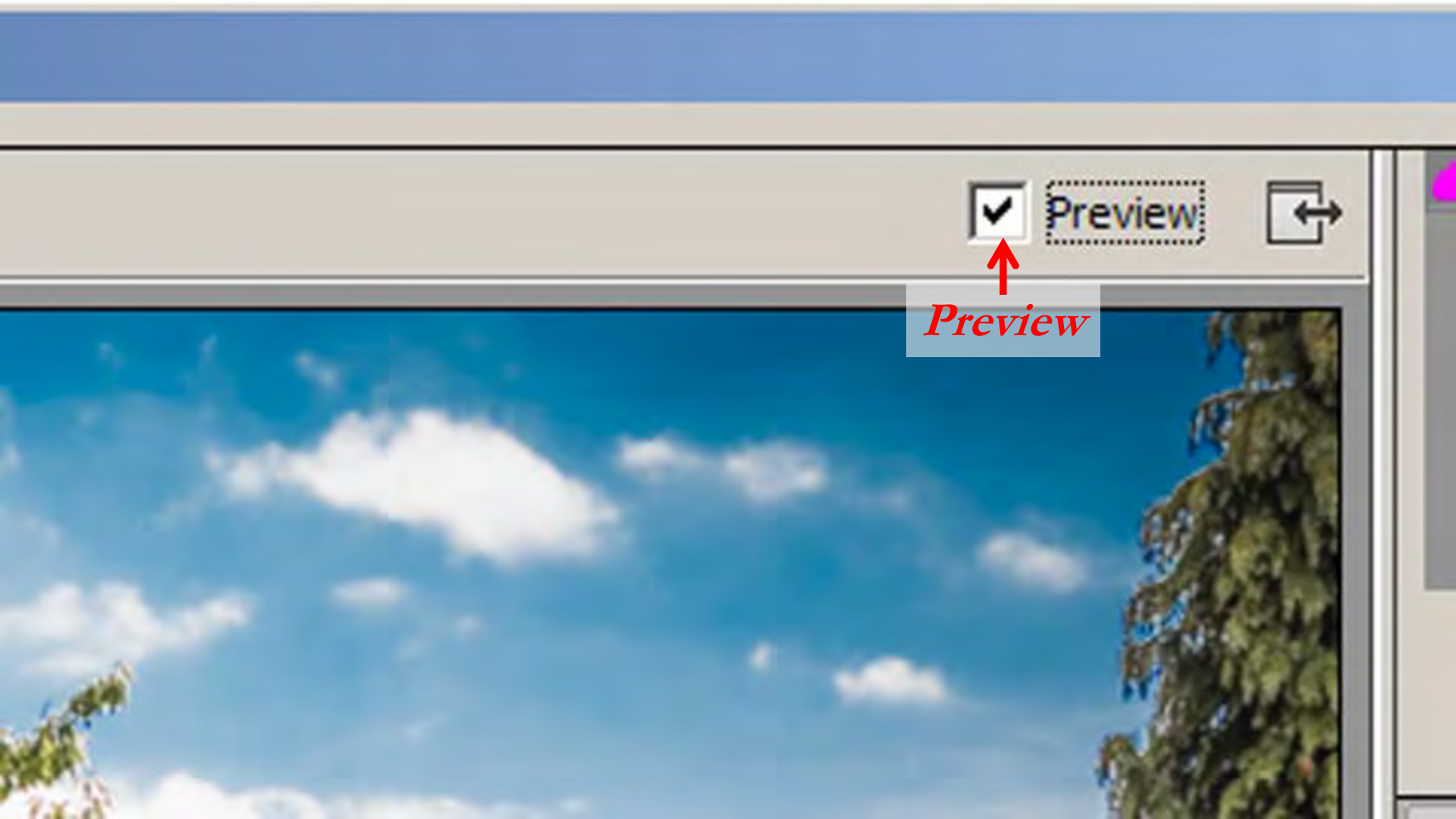

Camera Raw 8.4 – Nikon D800E
Adjustment brush
Adjustment Brush
Temperature
Tint
Exposure
Highlights
Shadows
Saturation
Sharpness
Noise Reduction
Moire Reduction
Defringe
Color
Size
Feather
Flow
Auto Mask
Show Mask
Show Pins
Clear All
Save Image
Open Copy
Reset
Done

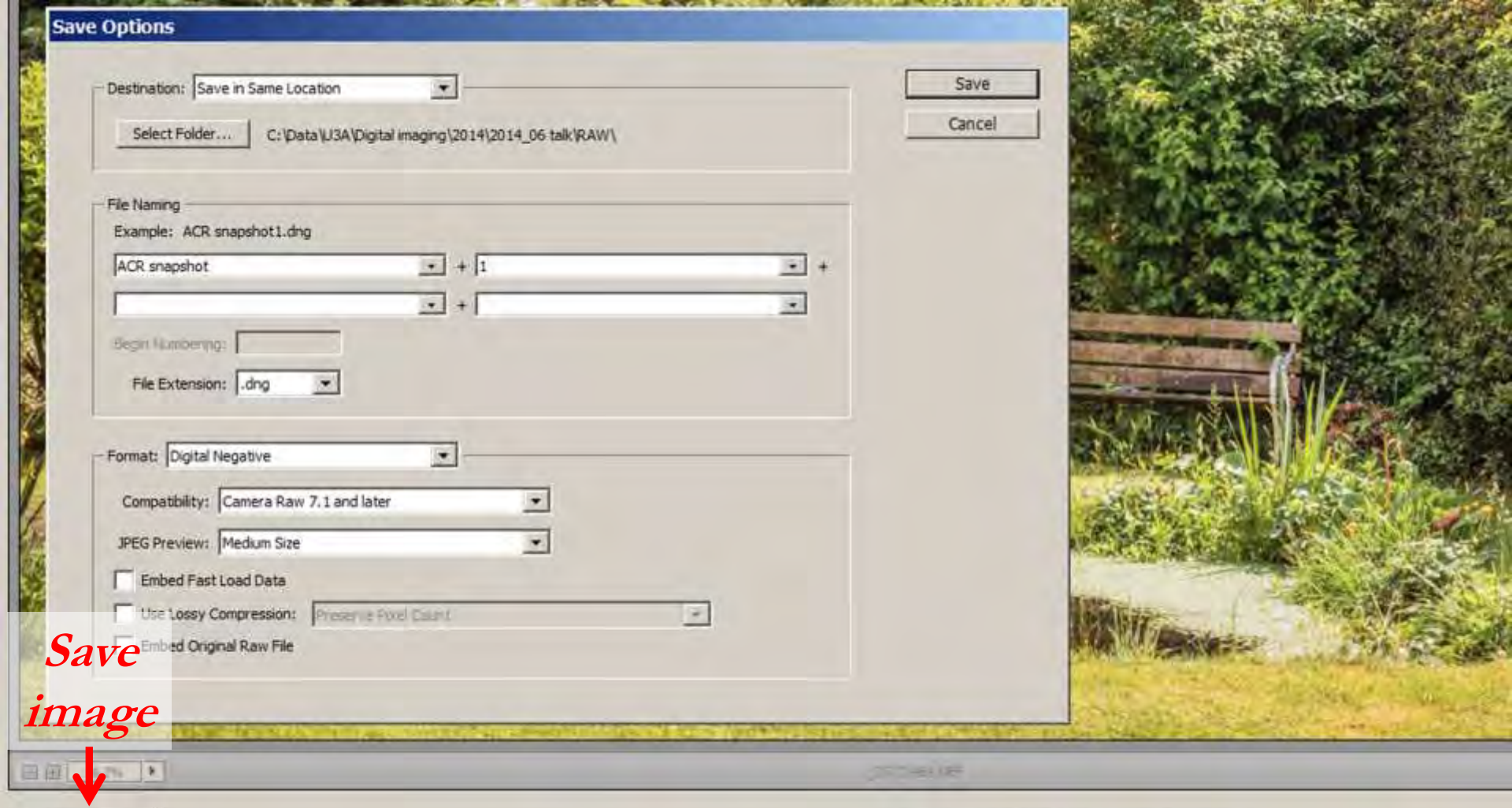

Camera Raw 8.4 – Nikon D800E
Adjustment brush
Preview
Adjustment Brush
Temperature
Tint
Exposure
Contrast
Highlights
Shadows
Clarity
Saturation
Sharpness
Noise Reduction
Moire Reduction
Defringe
Color
Size
Feather
Flow
Auto Mask
Show Mask
Show Pins
Clear All
Save Image
Open Copy
Reset
Done

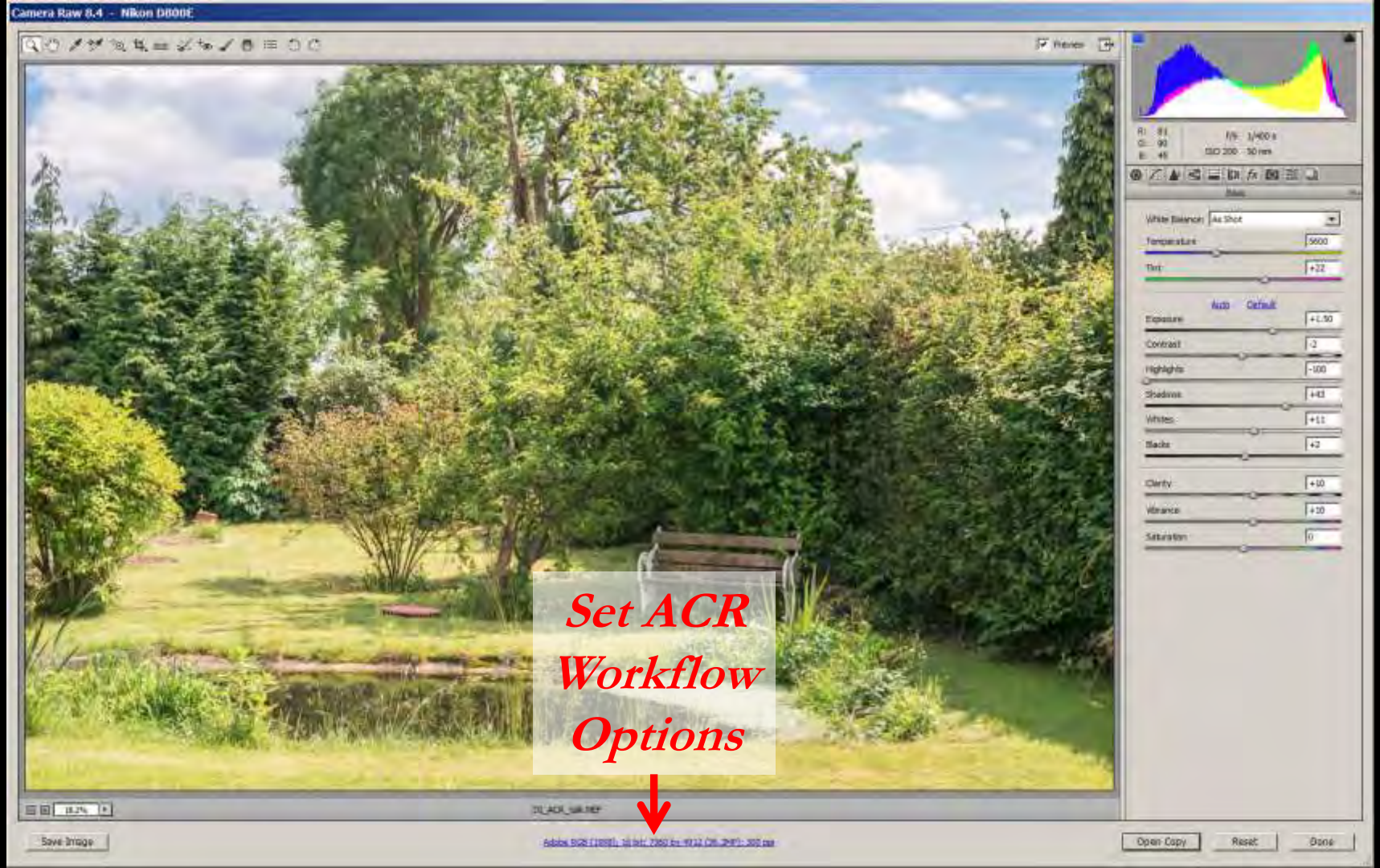

Camera Raw 8.4 – Nikon D800E
Graduated filter
Exposure
Saturation
Open Copy
Reset
Done

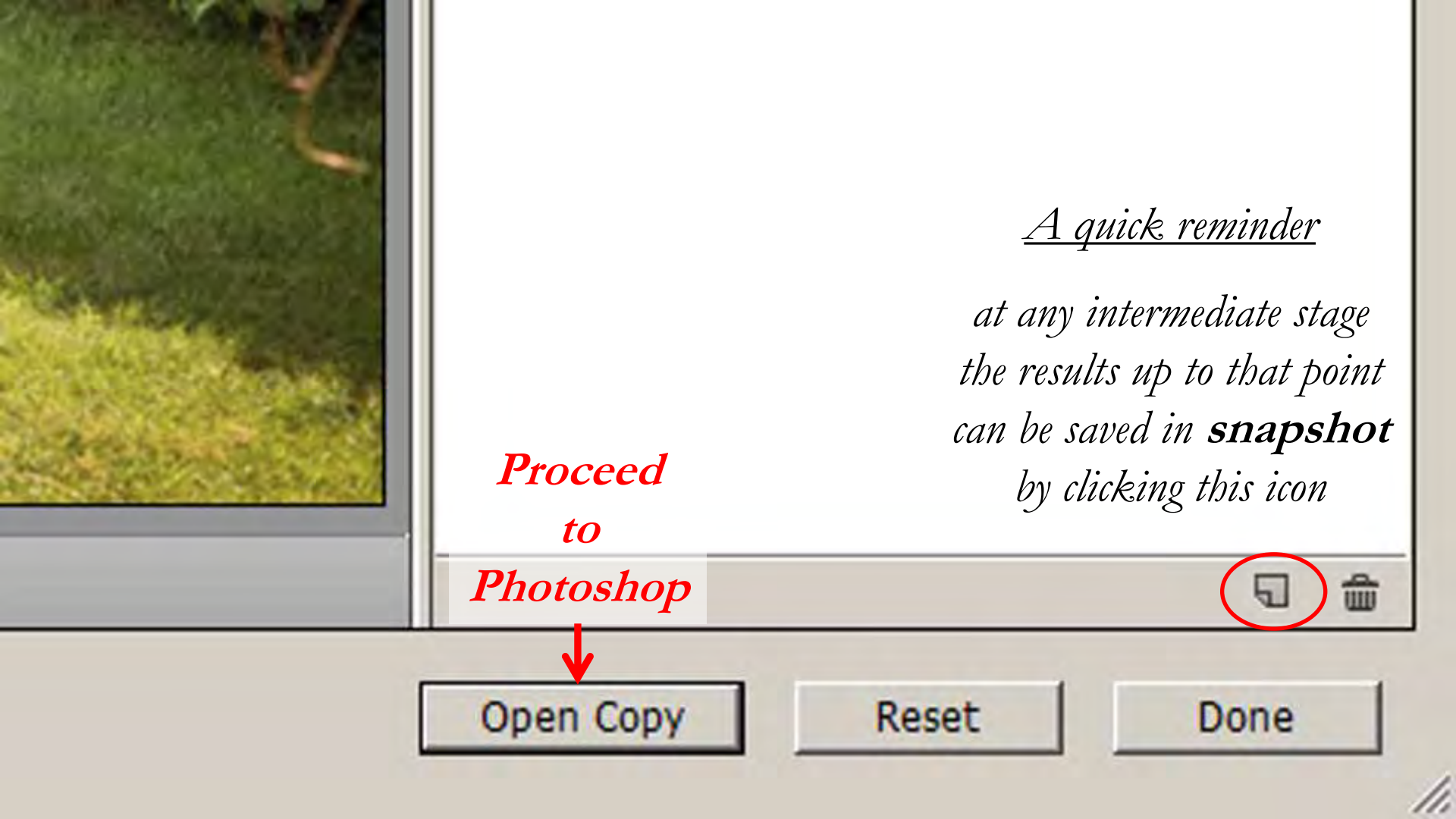

Camera Raw 8.4 · Nikon D800E
Preferences dialogue
Camera Raw Preferences (Version 8.4.0.199)
General
Save image settings in:
Apply sharpening to: All images
OK
Cancel
Default Image Settings
Apply auto tone adjustments
Apply auto grayscale mix when converting to grayscale
Make defaults specific to camera serial number
Make defaults specific to camera ISO setting
Camera Raw Cache
Maximum Size: 1.0 GB
Purge Cache
Select Location...
C:\Users\Tony\AppData\Local\Adobe\CameraRaw\Cache\
DNG File Handling
Ignore sidecar ".xmp" files
Update embedded JPEG previews:
JPEG and TIFF Handling
JPEG: Automatically open JPEGs with settings
TIFF: Automatically open TIFFs with settings


Camera Raw 8.4 - Nikon D800E
Rotate
90° left
Save Image
Open Copy
Reset
Done


Preview
Preview


Save Options
Destination: Save in Same Location
Select Folder...
C:\Data\U3A\Digital imaging\2014\2014_06 talk\RAW\
Save
Cancel
File Naming
Example: ACR snapshot1.dng
ACR snapshot
1
Begin Numbering:
File Extension: .dng
Format: Digital Negative
Compatibility: Camera Raw 7.1 and later
JPEG Preview: Medium Size
Embed Fast Load Data
Use Lossy Compression:
Preserve Pixel Count
Embed Original Raw File
Save image
Save Image...


Camera Raw 8.4 – Nikon D800E
Set ACR
Workflow
Options
Save Image
Open Copy
Reset
Done


A quick reminder
at any intermediate stage
the results up to that point
can be saved in snapshot
by clicking this icon
Proceed
to
Photoshop
Open Copy
Reset
Done

Why do I use RAW?

In my youth I enjoyed developing black and white film and enlarging using my condenser enlarger.

I still enjoy the processing side of photography and Camera Raw gives me many tools that enhance photos before finishing in Photoshop.

I hope that some of you who have shied away from RAW will give it a try. A few moves of ***Basic*** *panel sliders in Camera Raw will work wonders.*

A brief mention of my Nikon D800E camera

Special features

1 high pixel count 7,360 × 4,912 = 36 Mpx

2 anti aliasing is cancelled to sharpen pictures (but risks Moiré fringing)

Advantages of high pixel count

1 *Larger sharp prints can be produced;*

2 *Alternatively, cropping extends the effective focal length of lenses.*

Compared with a 9Mpx camera the effective focal length is doubled such that a fast 200mm lens becomes an equally fast 400mm lens without any increase in weight (or cost).

It also effectively becomes a telephoto with twice the angle of view.

Heavy cropping amplifies camera shake and poor focus,
Use precautions, as for use of the longer effective focal length
such as;

higher shutter speed and firm camera support.

The 36Mpx sensor matches the resolution of high quality optics
so cropping will reveal any deficiencies in lens quality.

A high pixel count camera can be worthwhile as it saves money (and weight)
on fast supertelephoto lenses,
or, alternatively, if you wish to achieve better sharpness in large prints.

In most cameras an anti-alias filter is placed in front of the sensor to reduce the risk of Moiré patterns but this also reduces resolution.

In the D800E an extra filter is added to cancel the anti-alias filter and thereby increase sharpness, especially useful for heavy cropping (or extra large prints).

I have only encountered Moiré patterns a couple of times, once deliberately when snapping a TV screen and when photographing the Shard through the roof of London Bridge Station where roof shutters nearly matched pixel spacing.

The ***adjustment brush*** *in Camera RAW allows removal of Moiré patterning in selected brushed areas.*


taken with 70-200mm F2.8
zoom lens at 200mm
lens weight 1½kg


cropped to 400mm
equivalent lens
(still F2.8)
new 400mm F2.8
costs £6,600 and
weighs 4.6kg


cropped to 800mm
equivalent lens
(still F2.8!)
new 800mm F5.6
costs £14,000 and
weighs 4.6kg


cropped to 1,600mm
equivalent lens
(still F2.8!)

cropped to 3,200mm equivalent lens (still F2.8!)

(taken late in day at ISO 1,250 so would've been better at ISO 200)

This crop covers 1/256 of area of original photo but might not win any RPS wildlife photography awards