Beyond Snapshots

Model Railroad Photography: Problems, Solutions, and Hints

– Charlie Comstock

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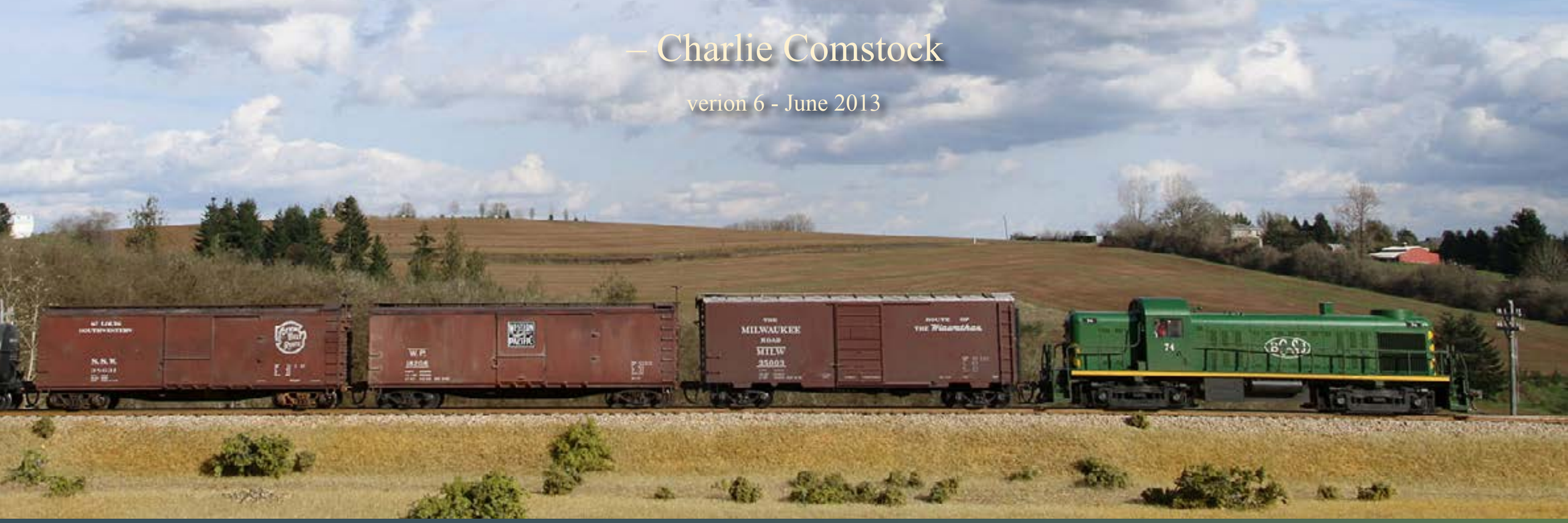


Who is Charlie?

- A model train photography nut
- Superintendent of the Bear Creek & South Jackson Railway Co.
- Contributing editor at Model Railroad Hobbyist magazine
- PNR 2nd division superintendent

Part I. Common Model Railroad Photography Problems

- Inappropriate use of flash
- Incorrect white balance
- Graininess
- Focus (or lack thereof)
- Depth of field

Rule #1 – NO flash photography (unless you're the reincarnation of O. Winston Link)

NO direct flash!

What's wrong with using the pop-up flash?

The camera's auto mode set-ting picks a wide aperture due to low light level – and depth of field gets trashed!

Foreground illumination is harsh and/or overexposed. Background is dim.

Inky black, stark, shadows!

What's wrong with pop-up flash (continued)?

The mighty Adobe Photoshop can help with dim areas, but can't rescue this disaster masquerading as a photo.

Once image information is lost due to overexposure, underexposure, or blurry focus, it's gone forever.

What about bounce flash?

unprocessed

Bouncing a flash off the ceiling is better than direct flash. The diffused lighting isn't as harsh and there are no stark shadows.

But light intensity falls off rapidly. Post-processing with Photoshop helps, but the back corner is still dim...

post-processed with Photoshop

Flash as a fill light ...

Flash can be used as a fill light to lighten up darker areas. The best fill lighting uses diffusers to soften the light and avoid stark shadows. But it only works near the camera.

This photo was auto-exposed @ f/3.5, with the camera picking the aperture. f/3.5 results in shallow depth of field. Note the darker area on the far right where the lighting from the flash is reduced ...

Direct flash fill

Diffused bounce flash fill

aperture priority – f/22

Bounce flash fill

No flash

The truth about flash photography …

- In the right hands it can be useful
- Winston link used HUNDREDS of flash bulbs for some of his nighttime steam railroad photos
- NEVER use a built-in flash or speedlight aimed directly at the subject when you care about photo quality
- A single flash unit creates an island of light surrounded by darkness.
- Bounced or diffused flash is useful for fill lighting
- Pros often invest thousands of $$$ in flash gear for studio work

Rule #2 - Get your white balance right!

- Film cameras require filters to match the color temperature of the lighting to the film
- Digital cameras can compensate for different lighting temperatures without filters.
- Get it right – avoid blue horses!

The camera's white balance set for incandescent lighting, but scene lighting is from fluorescent tubes...

Correct white balance makes a difference!

daylight – too red

This scene was lit with a 100W incandescent bulb.

Here are three different camera white balance settings …

The tungsten settings often aren't quite right for tungsten lamps!

tungsten – better

2700K – close, but not perfect

Setting the white balance on your camera ...

Some cameras support three ways to set white balance:

- Presets – daylight, cloudy day, tungsten lamps, fluorescent lamps, flash – the tungsten preset often produces extra warmth (reddish tint) rather than accurate color.
- Kelvin – the color of lighting is specified by its temperature measured above absolute zero in degrees Kelvin. A camera with white balance set to 5000K should be close to right on for a fluorescent lamp rated at 5000K.
- Custom white balance – show the camera something that's pure white or gray and the camera figures how to compensate for the lighting to balance the red, green, and blue lighting components.

Post-processing white balance problems …

daylight WB with tungsten lighting

after the (82) cooling filter – better

Remember those filters film photographers used to adapt film to the color of their lighting?

Photoshop offers software versions of those filters.

But getting the white balance right BEFORE pressing the shutter is best – don't rely on post processing.

Same scene – with custom white balance …

Custom white balance

Rule #3 - Don't push the ISO setting …

What in tarnation is an ISO setting?

- ISO specifies light sensitivity. Higher numbers mean greater sensitivity. Greater sensitivity in a digital camera is provided by increasing amplification of the electrostatic charge at each photo site.
- Just like turning up a hi-fi produces more hiss, turning up the amplifier gain in a digital camera increases digital noise. A high ISO setting will have more noise.
- DSLRs generally have 'quieter' amplifiers than a point-and-shoot
- Noise goes down as photo-site area goes up – increasing mega-pixels decreases photo-site size.
- Noise is a bit similar to film grain

ISO and image noise on a Canon 40D DSLR

A 40D has fairly good image quality even at a high ISO setting of 1600. Both images are magnified.

High ISO considerations ...

- Recent DSLRs have impressive high ISO performance.
- Point and shoot cameras rarely have their big brothers' high ISO abilities.
- Check your camera ISO settings to see how it performs.
- Cameras with a larger 'full frame' sensor (for example, Canon 5D-II or Nikon D3) have larger photo-sites and very good electron-ics. But you'll pay for this performance, and in the model railroad world where depth of field is king, full frame 35mm sensors don't have as much depth of field as their smaller APS sensors.

Rule #4 - Get Focused – be Sharp!

It's tricky to create photos that are REALLY sharp.
Here are some factors that contribute to soft photos:

- Camera moves during the exposure
- Auto-focus chooses the wrong part of a scene
- Auto-focus is miscalibrated
- Manual focus wasn't correct
- Motion blur – the subject is moving
- Know your lens – use the 'sweet spot' if possible, usually around f/5.6 to f/8, when depth of field needs permit.

Camera stability is VERY important

Use a tripod, bean bag, or place the camera on something solid. If the camera jiggles while the shutter is open, the image won't be sharp. If you must hand hold:

- Use a shutter speed inverse to the lens focal length – if your lens is 50mm then shoot at 1/50 second or faster. If 300mm, then 1/300th or faster. Faster shutter speeds are better if there's enough light available.
- Image stabilization systems greatly reduce apparent camera shake allowing longer exposures. Watch out for motion blur!
- Exhale, and gently squeeze the shutter. DON'T jerk the camera.
- Brace your elbows or a shoulder against something solid like a table or wall.

Autofocus isn't necessarily automatic

Modern cameras have multiple autofocus spots.

- Be sure at least one of the active spots is on the center of interest of your scene.
- Cameras sometimes get confused and mix up foreground or background objects.
- When in doubt, look at an ENLARGED image on the camera's display to verify focus!
- Sometimes, auto-focus may be slightly off. If your camera is consistently out of focus, get it checked by a good shop.

Manual focus

Manual focus is king for model train photography, but you need to be able to tell when a shot is really in focus!

- Best is to link a computer to your camera and verify photos on a LARGER display. This isn't always practical.
- Next best is to use the display on the back of the camera in magnify mode to verify focus before shooting.
- A through-the-lens view finder (like those on a DSLR) is handy, but the image may be small, making it hard to tell if a shot is in precise focus.
- Not all DSLRs are created equal. Some (more expensive ones) have much bigger and brighter viewfinder images than others.
- Examine some of your photos under 5x or 10x magnification to verify focus.

Verifying focus – magnification is your friend!

Both images seem to be in focus – until they're magnified!

Motion BBlluurr

A camera opens its shutter for a short, but finite amount of time. If objects in the frame are moving, they'll leave a ghostly snail trail across the image.

- The faster an object moves, the blurrier it will appear.
- Reduce motion blur by shortening the exposure.
- When I shot my kids soccer games I used 1/1000th second to 'freeze' the motion. This shutter speed isn't usually necessary for our slower moving trains.
- It's not cheating to pose your "action shots" statically and completely avoid motion blur.

Motion blur to show objects in motion!

Pan the camera to follow a moving object. This is quite tricky to do well, but when done properly the object will be sharp while the foreground and background will look blurred.

Rule #5 - Depth of field

What is depth of field, what affects it, and why should I care?

- Depth of field is the distance between closest and farthest objects that appear acceptably sharp in an image.
- Depth of field is influenced by: lens focal length, focus distance, and aperture – wider angle lenses, more distance between camera and subject, and smaller apertures increase depth of field.
- Prototype photos have nearly infinite depth of field (because the camera is usually far away from the subject). Lack of depth of field is a big model railroad photo giveaway.
- The smaller the scale of the model, the closer your camera needs to be for the "same" image, and the bigger the depth of field problem becomes.

Small aperture and depth of field...

f/32 @ 50mm

Large aperture and depth of field...

f/4.5 @ 50mm

Depth of Field (continued)

If small aperture increases depth of field, why not use a pinhole lens?

- Pinhole describes a lens with a tiny aperture - f/80 or smaller.
- Although these lenses offer near infinite depth of field, the extremely small aperture is subject to diffraction effects.

Diffraction makes the overall image quite soft. This is why photos shot at f/22 or f/32 are softer than those at f/8.

How can I get infinite depth of field?

Technology to the rescue!

Use a technique called focus bracketing (or stacking).

When focus bracketing, multiple photos are shot each focused further into the scene.

Then, computer software examines the source images and merges them by selecting the sharpest image for each point in the output image.

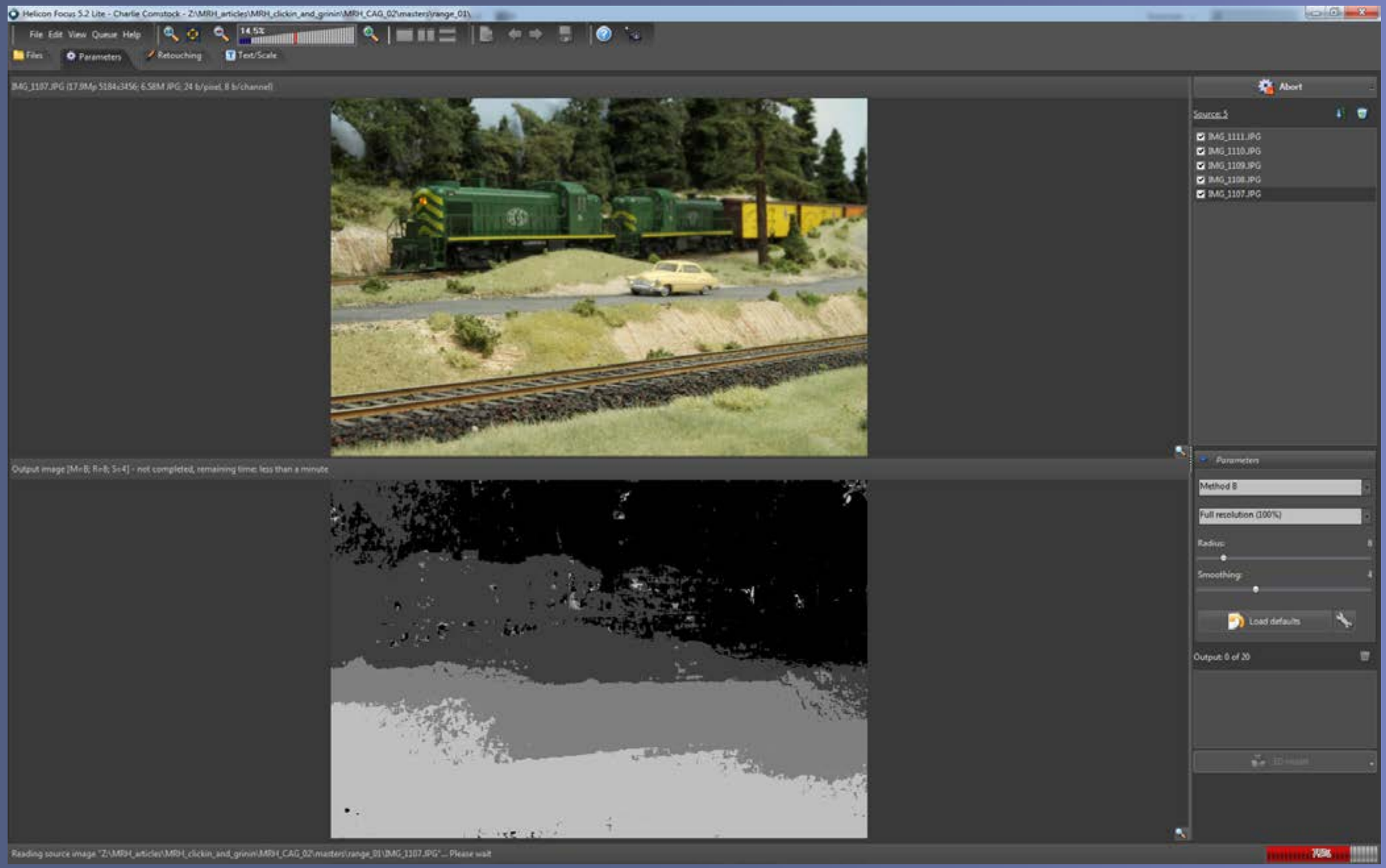
Helicon Focus®

I use the Helicon Focus® program to create images with near infinite depth of field.

When shooting the image sequence:

- Use FULL manual aperture, exposure, white balance, and focus to prevent brightness changes in the focus stack images.
- Ensure the camera is rock-steady. Movement will misalign the images and confuse the focus bracketing software.

Helicon Focus® (continued)



Focus bracket - 01

Focus bracket - 02

Focus bracket - 03

Focus bracket - 04

Focus bracket - 05

Focus bracket - 06

Focus bracket - 07

Focus bracket - 08

Focus bracket - 09

Focus bracket - 10

Focus bracket - 11

Focus bracket - 12

Focus bracket - 13

Focus bracket - 14

Focus bracket - processed image

Why not focus bracket every shot?

- Some scenes are relatively shallow. Other scenes don't demand infinite depth of field.
- Focus bracketing fills up flash cards and disk drives, and wears out cameras.
- If the camera is more than a few feet from the scene, f/32 should have sufficient depth of field for normal (non-telephoto) lenses.
- Focus bracketing can only be used with static scenes – no live action shots!

But when a shot screams for infinite depth of field, especially with a telephoto lens, focus bracketing can save your photo.

What camera / lens is needed to focus bracket?

- The camera / lens MUST have: full and independent MANUAL control over focus, aperture, exposure, white balance, and ISO.
- Manual focus must have fine enough resolution to step the focus consistently from shot to shot.
- I shoot between f/11 - f/16 with my DSLR and a 28mm to 50mm lens. The individual images are sharper than f/22 or f/32, but the depth of field is better than f/8 helping the software.
- Shoot at minimum aperture when using telephoto lenses where depth of field is especially challenging.
- If your camera came with remote control software, that can be a good way to see what you're doing.

Part II.

Let's shoot some photos!

Important things to be think about of:

- Camera angles
- Special effects
- Police the scene looking for goofs

but ...

The three MOST important things in model railroad photography are:

Lighting

Lighting

Lighting

Kind of like real estate – location, location, location ...

What's the best kind of lighting?

It depends on the type of photo you're after:

Documentary photos

Product photos

Art photos

Documentary photos

These are news photos. You're documenting an occasion or event.

- Good lighting is nice, but sometimes you've got to make do with what's available (or even, gasp, use a flash!)
- Having a camera with usable high ISO settings is wonderful for dim venues.
- Shots of a train meet, layout tour, or op session are examples of this type of photo.

Documentary photos (continued) …

The old newspaper photographer motto, “f/8 and be there” applies. While perfect photos are nice, it’s more important to BE there and get something.

The combination of lots of fluorescent lighting in the ceiling and a usable ISO 1600 setting on my camera lets me shoot op session photos in my BC&SJ train room without resorting to flash. Not the best photos ever, but quite usable.

Product photos

Ad photos and step-by-step illustration photos are examples of product photos.

These are characterized by lighting set to show product features or step by step action. They are often shot in an artificial environment.

Dramatic lighting is usually a bad idea with product photos. Use plenty of fill light to lighten shadows – no details lost in dark shadows. A step-by-step photo often needs to illustrate an action. Not easy with still photography!

Product photos (continued)

The dual T8 fluorescent fixtures with diffusers in the ceiling of my train room provided even lighting for this photo of a Tichy water column.

No dark shadows obscure details. The black construction paper background is slightly blurred and non-distracting – I shot at f/5.6 to deliberately reduce depth of field.

Product photos (continued)

Compare the previous ‘product’ photo of the water column to this view of the water column in its home on my layout.

Although the photo is good, the water column is lost against the busy background and isn’t the center of attention.

Art photos

I think this is where photography gets interesting. There are many styles of lighting. Here are three:

- Take the models outdoors for the most realistic lighting.
- Simulate daylight using lamps for the sun and sky
- Night lighting – moonlight and building lights

Shooting outdoors

Advantages:

- Ultra-realistic lighting
- Natural backdrops
- Perfect sky and clouds every time
- Color film is balanced for sunlight (if using film)

Disadvantages:

- Have to wait for the right kind of light – God's schedule, not yours!
- Wind can be a serious problem
- Your models need to travel outdoors
- Contrails in the sky when shooting a '40s era or earlier scene

Shooting outdoors (continued)

The shadows and quality of real sunlight are hard to match indoors.

Shooting outdoors – things to watch for

Are background objects far enough away to seem reasonbly to scale? Or do they ‘impinge’ on the model space?

The background grass on the hillside is way too close.

Shooting outdoors – things to watch for

Watch out for inappropriate reflections in windows or water! The reflections in these windows are the railing of my porch! Luckily, they're a bit indistinct.

Shooting outdoors – things to watch for

If the wind kicks up, anything that's not sturdy, heavy, or well attached will move.

I had lots of trouble getting the cross bucks to be still enough to avoid motion blur.

Early morning light has a different character than late afternoon light. It's bluer and seems cleaner, perhaps because the air has less dust in it?

Shooting outdoors – things to watch for

As the seasons change outdoors, does the vegetation on your dioramas still match the backgrounds?

Shooting outdoors (continued)

Don’t ignore cloudy days.

Shooting outdoors (continued)

Indoors, this still pond would likely reflect the ceiling or walls.

Shooting outdoors (continued)

It’s hard to hide the joint between modeled foreground and real background when shooting from a higher spot and looking down.

Shooting outdoors (continued)

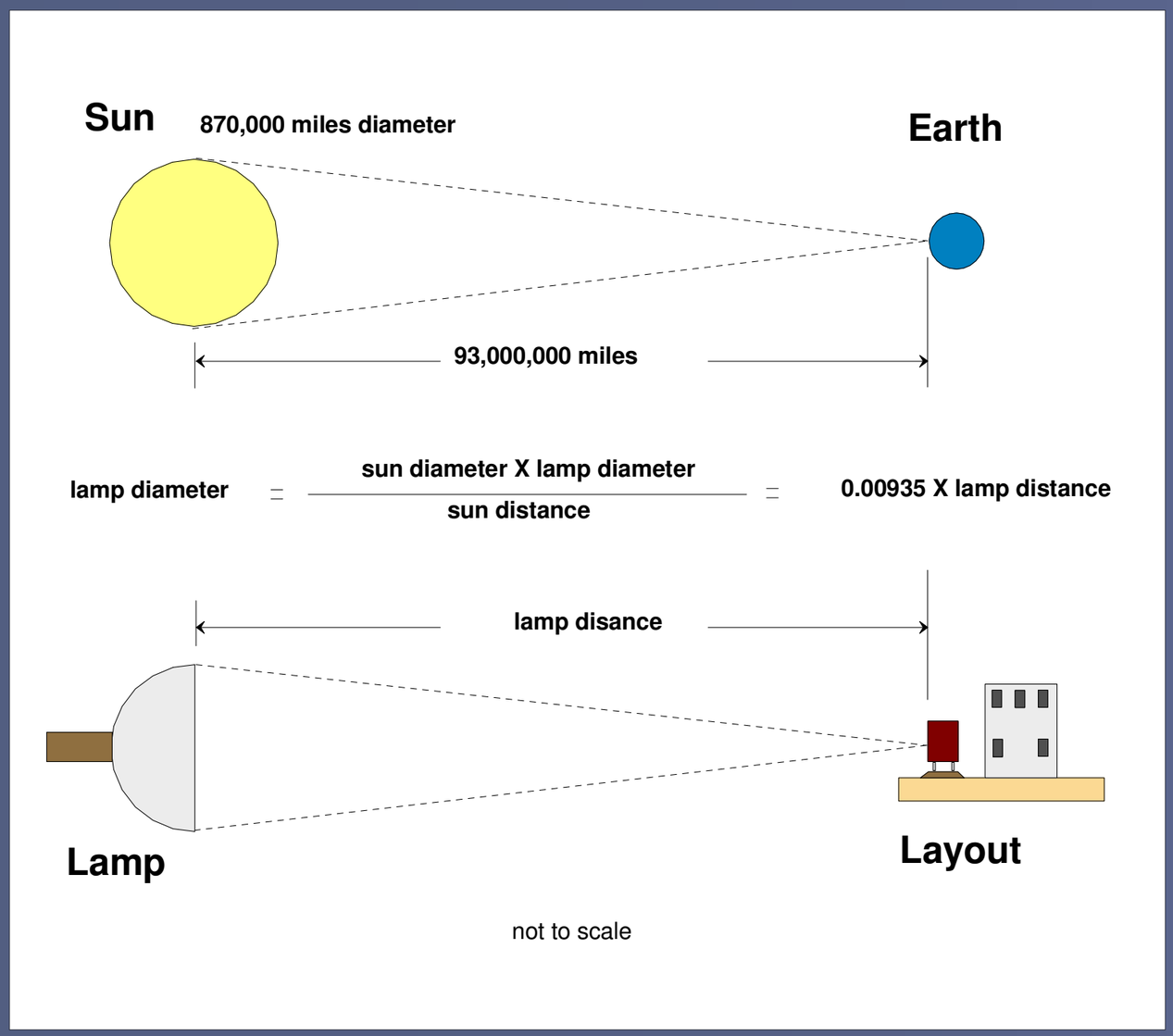
The joint between the diorama and real world is harder to see in this shot from a lower angle.

Shooting outdoors (continued)

When shooting outdoors you can't control the weather, but sometimes you get blue skies with billowy clouds – be ready for those days.

Shooting indoors – simulating sunlight

Duplicating sunlight is tricky. You need an intense direct light source plus a bluish ambient skybowl light. I've used a halogen spotlight for the sun and 4100K ceiling lights for the sky bowl.



How big should a 'sun lamp' be to cast realistic shadows?

If the lamp is 10' away then

0.00935 x 120" = 1.1" diameter

If the lamp is 20' away then

0.00935 x 240" = 2.2" diameter

A 12" photo reflector is 10x too big at 10' away!

Shooting indoors (continued) …

A 3” 90W halogen sun 15’ from the scene is 2x the optimum size. The shadows and specular reflections on the loco hood look OK anyway.

Dramatic Photos

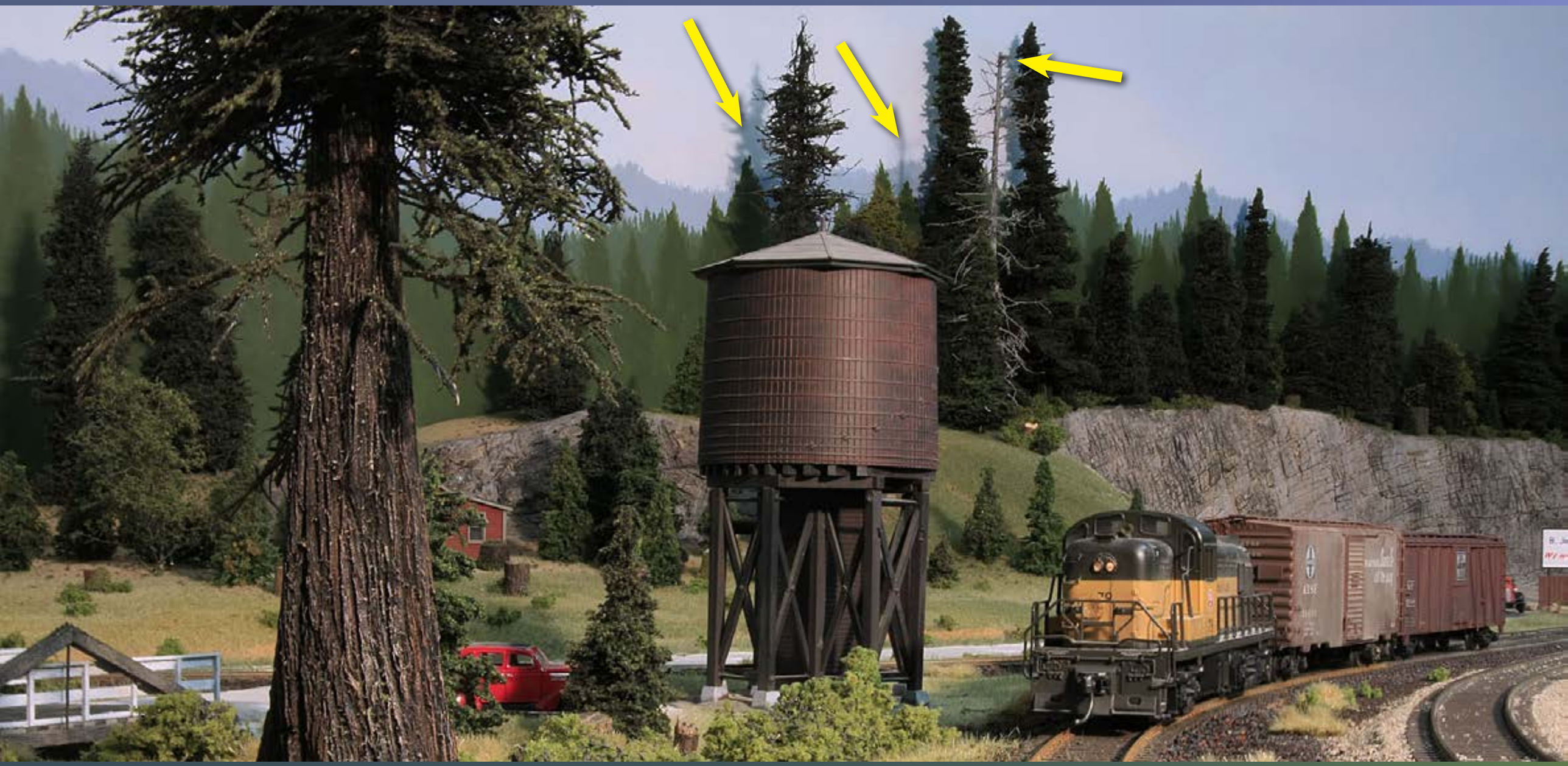
Many photographers prize early morning and late afternoon light. Its low angle creates dramatic shadows and brings out detail.

Dramatic Photos (continued)...

Lots of shadows from ultra low angle lighting plus extreme specular highlights on the gondolas give this shot extra contrast.

Shadows on the sky – how to handle ‘em…

You can over them in Photoshop, put the main light high and behind the camera to (mostly) hide them from view, or use only diffuse lighting. Low lighting angles produce the worst sky shadow problems.



Shooting indoors – hazy days

The easiest lighting to simulate indoors is a hazy day. Fluorescent tubes with diffusers are good at this (and the diffusers filter out most of the U/V rays that can lead to faded scenery colors).

Shooting indoors – hazy days

Multiple fluorescent tubes don't create strong shadows. But they are big, rectangular blotches of light in the sky. Watch out for reflections!

The reflection in the rear window of the Dodge doesn't look realistic. It shouldn't, since a dual T8 fixture looking like a brightly lit, 60' x 350' rectangle is hanging about 250' above the ground and is reflected in the 'glass'.

Also note the peculiar specular highlights on the trunk from the same fixture.

Shooting indoors – excess lighting …

I used too many fill lamps for this photo.
The right hand side of the building should be in shadow!

Mixed lighting types...

Are you building, finishing, or adding lights to a new train room?

Are you considering a mixture of can lights, halogens, fluorescents, sky lights, and windows in your train room?

If you care about layout photography,

DON'T DO IT!

Each of those light sources has a different color temperature. You'll go nuts trying to find workable white balance settings!

Mixed lighting types (continued)

Problems include:

- potentially unearthly colors
- color-tinged shadows depending on which light color is shadowed
- you'll need to set custom white balance for each shot

But you said you mixed fluorescent and halogen lights!

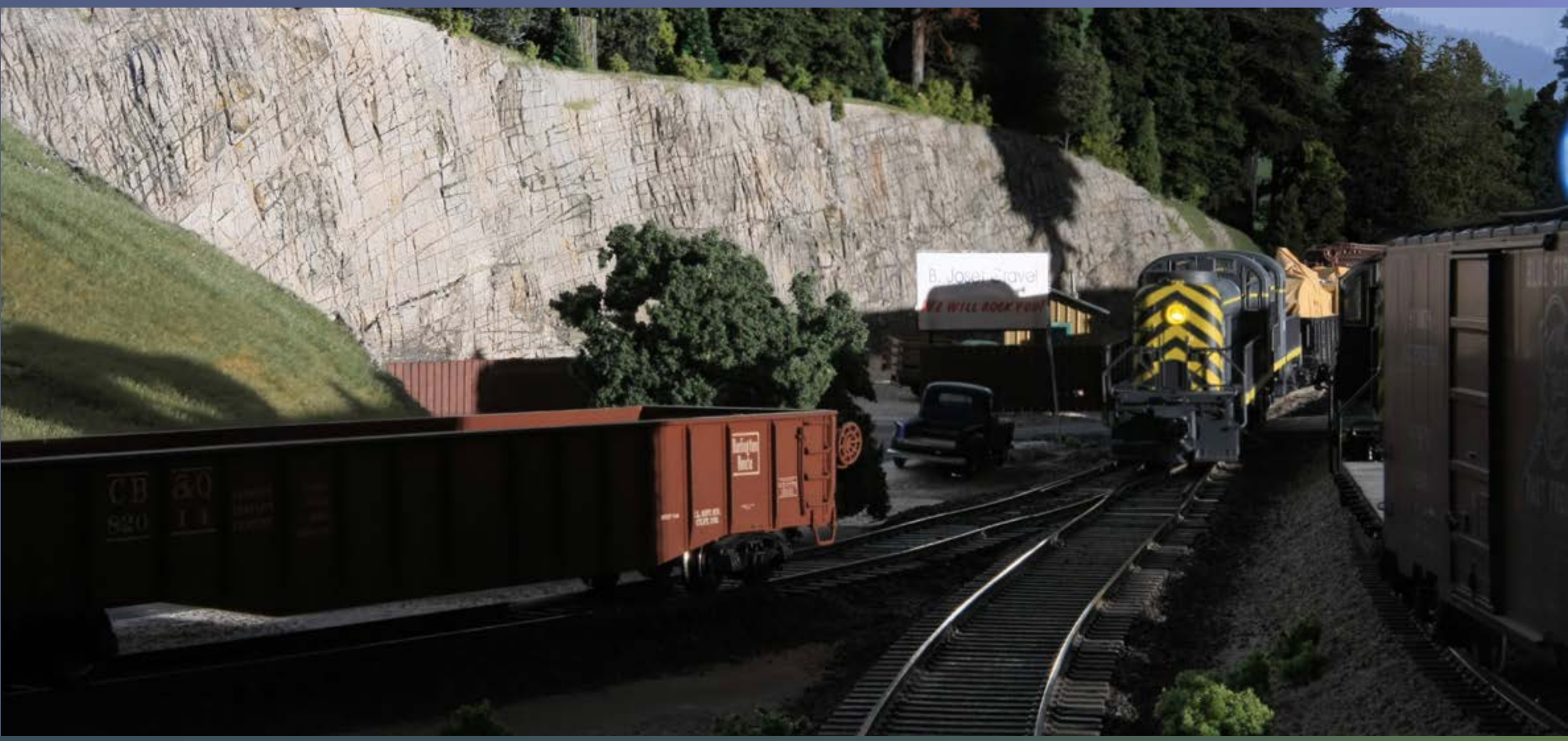
Well, yes, but that is for a specific purpose. Stay tuned ...

Mixed lighting types (continued)

A combination of cool white fluorescent tubes and incandescent bulbs gives this shot an unearthly appearance with multi-color shadows.

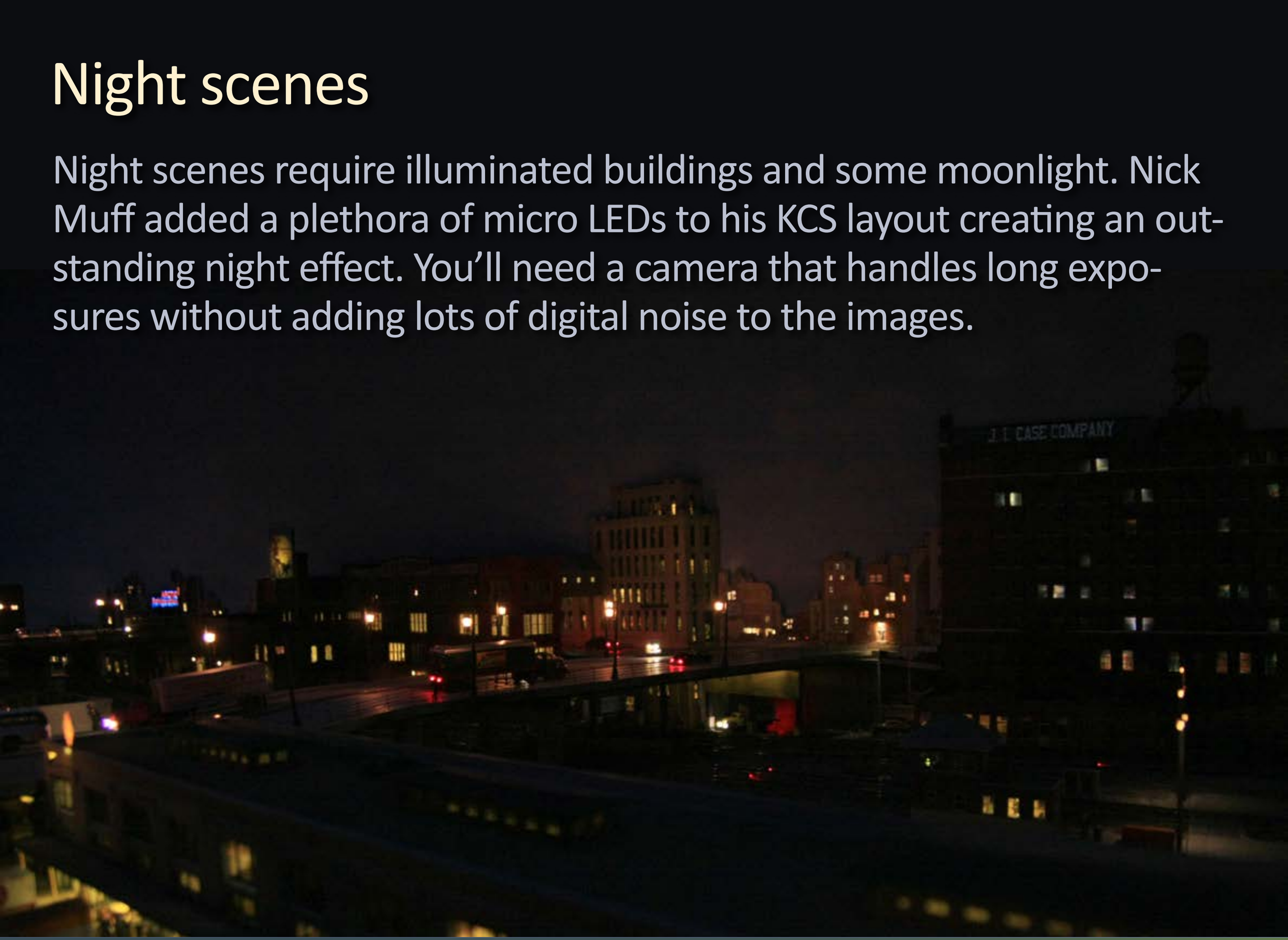
Mixed lighting types – the exception

Sometimes I use a halogen light for direct sunlight while simulating skybowl lighting with 4100K fluorescents with diffuers. The camera's white balance was set at 3300K making the sunlight slightly reddish.



Night scenes

Night scenes require illuminated buildings and some moonlight. Nick Muff added a plethora of micro LEDs to his KCS layout creating an outstanding night effect. You'll need a camera that handles long exposures without adding lots of digital noise to the images.



Night scenes (continued) ...

Building interiors are especially important in night shots.

Night scenes (continued) ...

Night scenes (continued) ...

Tom Miller went all out with the lighting of his Fn3 Little Colorado layout.

Multiple tube fluorescents, each wrapped in a theatrical gel automatically cycle between day and night.

Night scenes (continued) ...

Experiment with white balance until the lights have a good color.

Back lighting

Back lighting can produce very constrasty photos. The light is placed farther away from the camera than the subject. In this photo, the sides of the loco, freight cars, and rock face act as “mirrors” and have very bright specular highlights while the rest of the scene is darker.

Back lighting (continued) ...

I lit this scene at Belden on Rob Carey's N scale D&RGW layout with a single halogen fixture in the rear. Specular reflections highlight roof details, the river, phone wires, and the rails while much of the rest of the scene is in shadow.

Keep the lighting delicate.

Camera angles – no helicopters

Leave the company helicopter in the hangar unless you're shooting aerial cartographic images. Shooting from lower angles often produce more realistic results. Try to pick a place where a scale photographer could have set up a camera.

Which of the following is more plausible?

Camera angles – looking up

The helicopter shot (left) makes the joint between layout and back-drop readily apparent.

The right-hand image was shot looking slightly up toward the train on the trestle – a more plausible camera angle that hides the joint and feels like a view point a scale photographer could easily achieve.

Camera angles (continued) …

Instead of placing the camera on a tripod next to the layout, try locating the camera on the layout.

Set it on a road, some track, or even bare plywood. Prop it in place with some bits of wood or plastic if need be.

A remote shutter release is handy for this situation.

Camera angles (continued) ...

Looking down a road on the layout with good depth of field.

Lens selection

Should you use a wide angle, telephoto, or middle length lens?

The answer is all of the above! Each has its place.

- Wide angles lenses let you see more of a scene from up close. They do not exhibit fore-shortening. But if not aligned well with the scene, they can make buildings seem out of plumb. A macro wide angle lens gets your extremely close to your subject.

- Telephoto lenses let you see details in far distant objects. They also provide a degree of fore-shortening which makes curved trackwork look positively squirrely. They often don't focus on nearby objects, however macro telephoto lenses are available – for a price.

Wide angle lenses

Besides getting lots of scene in a photo, wide angles let you snap in-your-face shots.

Wide angle lenses (continued) …

This somewhat wide angle shot let me fit the entire Baynes Valley trestle and its environment in a single photograph.

Telephoto lenses

An example of foreshortening from a 300mm lens...

Telephoto lenses - 300mm

Foreshortening emphasizes curves and undulations in trackwork.

Special Effects - Black and White

Creating a period effect using Photoshop...

Special Effects - Black and White (continued)

Remember this shot with the unearthly colors? How does it look in black and white?

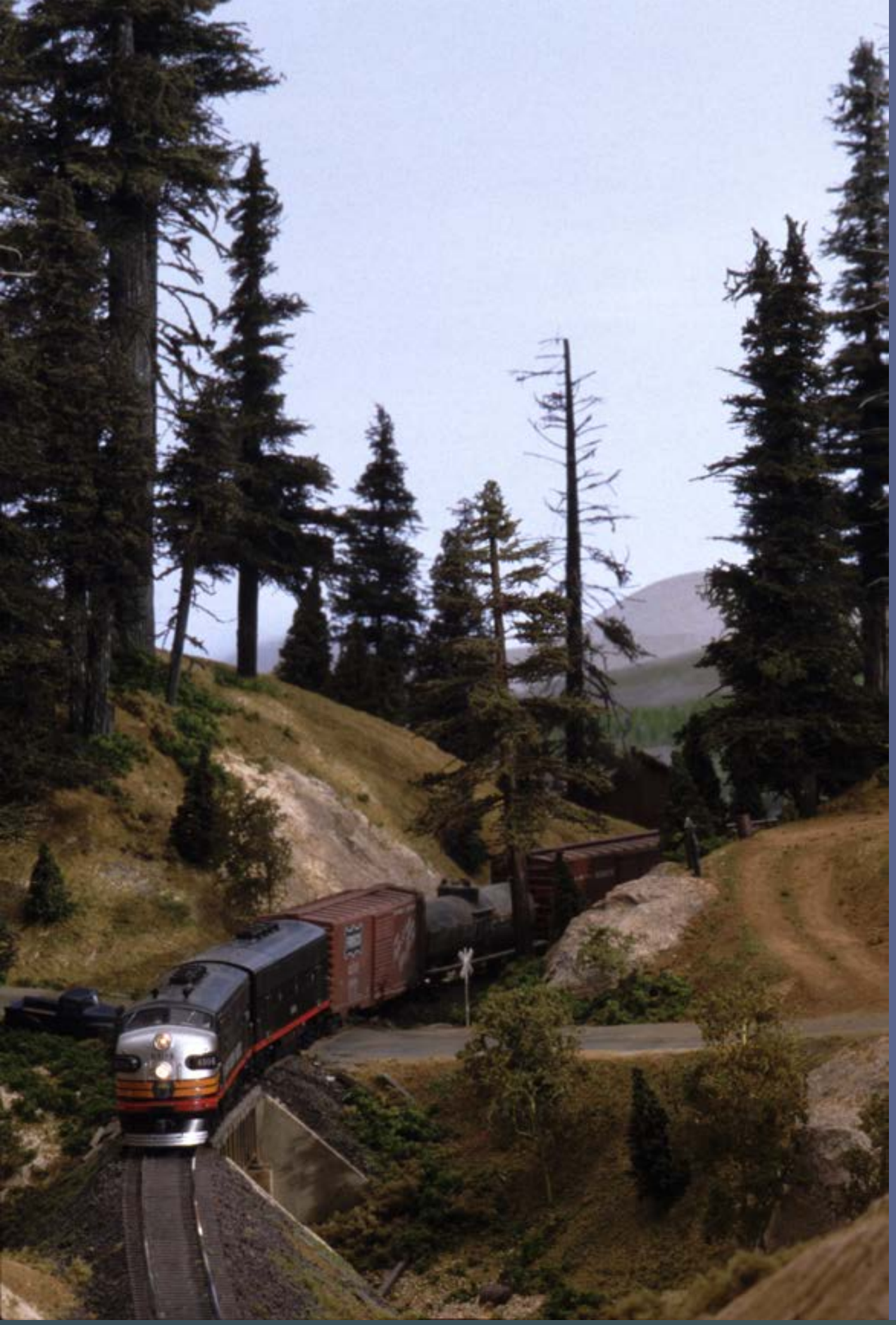
Special Effects - Black and White (continued)

Special Effects - Fog

Dry Ice Fog

Dry ice in a pan of hot water creates fog!

- NEVER touch dry ice!
- You'll need a 15 - 30 second exposure to avoid the look of a fog waterfall!
- Use a remote shutter release or an assistant.
- One hand for the remote, one to hold the pan of hot water and dry ice over the layout.
- Indirect (bounce) lighting is preferred.
- Headlights are good!



Telling a story with a photo …

Telling a story with a photo …

Telling a story with a photo …

Checklist ...

It's easy to miss things that can ruin what would otherwise be a great photo. Here's a partial list:

- Loco headlight off when it should be on or vice versa.
- Car(s) or loco(s) derailed
- Dead (or dead drunk) bodies. Make sure the people in a scene are sober enough to stand or sit in their proper place.
- Look for unwanted reflections of lights or outdoor windows on shiny or glossy objects in a scene.
- Construction debris on the layout (and in the photo)
- Specks of ground foam, flocking, or ballast on a road. It's amazing how insignificant these seem until you see the photos!
- Photo lights on that should be off, lights off that should be on.

Checklist (continued) ...

- Dust on the water (reminds me of an old Deep Purple song...)
- Shadows on the sky (see above comment)
- Fingerprints in the dust on cars, rolling stock, locomotives, or buildings.
- Greasy fingerprints on anything
- Giant cobwebs on people or objects – does Shelob have a lair on your layout?
- Buildings not planted properly – just say no to crack(s)
- Windows with missing glazing
- Crossbucks, phone poles, or trees not vertical

Questions?

Don’t stop experimenting!

The End