

Images are the biggest lump of sluggish web page weight.

**Faster-loading
JPEG images
for better user
experience**



A pixelpeeper carefully evaluates resolution and image quality of magnified digital photographs.

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MOST WEBSITE VISITORS EXPECT A PAGE-LOAD time of no more than two seconds. Any longer, and the “waiting pain” begins – and perhaps ends – as they start looking for the *Back* button. One of the most common causes of slow page loads is images that aren’t optimized. Optimization is a trade-off between file size and image quality.

Everyone hates pages that load too slowly. WordPress image-optimization plugins are a good way to improve user experience, making it easy to get a good balance of image-file size and quality.

Many designers know that optimizing images is important, but most don’t spend the extra time necessary for good results.

What is the real speed gain from image optimization? For example, a 158k image loads in 2 seconds on a bare-bones WordPress page. A 36k image loads in 1 second for the same conditions. That kind of compression is easily done without sacrificing visual quality. Users perceive a one-second page load time as a *seamless flow of thought*.

For this experiment, the answer is: Yes, users will notice the speed difference. We can add almost one second worth of other web assets (such as text and forms) and still be under our two-second performance budget.

Users will never see how pretty an image is if it’s too heavy. They just won’t wait. Aesthetics must take second place status to speed.

**The aim of every
JPEG algorithm is
to achieve a
visually lossless
look**

THERE ARE THREE FILE COMPRESSION formats JPEG, PNG, and GIF. The Joint Photographic Experts Group is the committee that created the JPEG image standard. It's a common method of compression for digital images. You can adjust the degree of compression for a selectable trade-off between storage size and image quality. Files using this form of compression are known as JPEG files, with a file extension of .JPG.

JPEG compression is for either full-color or grayscale images of real-world scenes. JPEG isn't appropriate for flat-color art such as lettering, simple cartoons, icons, or line drawings. JPEG compression introduces noise into solid-color areas. This distorts and blurs flat-color graphics. For these images, use GIF or PNG formats.

JPEG images can achieve 10:1 compression with little perceptible loss in image quality. There are three web compression methods: 1) lossy, 2) visually lossless, and 3) lossless. All JPEG are lossy and create smaller files by discarding original image information. JPEG compression removes details and color changes it deems too small for the human eye to differentiate. Everyone will have a different opinion of how good-is-good-enough compression. It's psycho-visual judgement on where the visually-lossless threshold starts.

JPEG is the most widely used image type on the Internet. Of all websites, 70 percent use JPEG images. JPEG image compression exploits certain properties of

our eyes. We're more sensitive to slow changes of brightness and color than we are to rapid changes.

The human eye is good at small differences in brightness over a large area; but not so good at distinguishing the exact strength of a rapidly varying brightness. We can reduce the amount of information in the rapidly varying components. The high-frequency information is then selectively discarded, depending on the user quality setting.

Does visually lossless mean irreversible image loss? Yes. So what? It's essential for web speed. The question is how much to lose.

Ten-to-one compression usually produces an image indistinguishable by eye from the original. The appropriate level of compression depends on the image usage and the audience perception.

JPEG compression is particularly suited to picking up patterns in certain types of files, and compressing them even better. JPEG supports 24-bits of color depth or 16.7 million colors. The human eye can only perceive 7 million colors.

JPEG compression reduces file size by removing redundant information. This makes an image file smaller without compromising resolution. Users won't notice it. There will be unnoticeable, imperceptible pixel-level color-value differences after file reduction. But you'll have a much faster transfer rate.

All browsers support JPEG images

■ The abbreviation 70Q means 70 percent of full-scale quality. The lower the number the higher the JPEG image compression.

■ Web designers who use an arbitrary, maximum 100Q setting waste local disk space, web bandwidth, and remote hosting space. Conversely, those who use extreme low settings risk distortion in photos with gradual gradients.

There's no improvement in visual quality above a setting of around 70Q and image weight increases quickly.

Create image file sizes as small as possible without losing visual quality

WITHOUT TRAINING AND PRACTICE, it's hard to find a balance between speed and quality – and every image is different. Machines rarely can judge image quality. Quality discernment is for humans. If product images are unrecognizable and ugly, of course, that's different. Who defines that quality threshold?

Web visitors don't care much about image quality.

Except on product photos where they are squinting to see fine details. Ironically, the more texture detail a product image has the more you can compress it without perceived loss. Visitors want information for product evaluation or comparison to make a purchasing decision. If a product's fine details are important and the user can't see them, there's a good chance they'll leave and look elsewhere.

So “how good is good enough?” calls for a relative answer and not a hard absolute. In other words, “small vs. large” and “quality” are subjective. What optimization method is best or true? It's like arguing about which muscle car is fastest when there are regulatory laws governing speed limits. Or comparing stereo amplifiers where audio frequencies exceed the human-hearing range.

In the real world of site optimization, we push an image until noticeable distortions occur. Our eyes must hurt first and then we back off a couple of compression notches. Commercial automated optimizers stay as far away from that visual edge as possible. Why? First, web designers suppose they need better image quality than what's wanted by the audience. This is psychological – based on intangible emotions like fear, idealism, and pride. It's akin to irrational web design by committee. Optimized images aren't compressed as much as they could be to benefit site visitors.

PROGRESSIVE JPEG IMAGES USE many passes of higher detail. The progressive method means just clicking a check-box before JPEG output. Progressive JPEG images gets sharper as the image downloads more. The image appears to “fade in” with successive waves of lines until the entire image loads completely. The first-pass progressive image is fuzzy. At half of the passes, most images are indistinguishable from the final image. The human perception is that they load in half the time.

When scoring site optimization, WebPagetest.org is the most common and standard speed testing utility. It – and the Yslow browser plugin – are most endorsed by thought leaders in web-performance optimization. WebPagetest.org penalizes web pages for not using progressive JPEG. Not using progressive JPEG gets a big red F for failure when tested.

We perceive progressive images as loading faster. Perception of speed is the most important factor in user experience design. WebPagetest.org checks each progressive JPEG image. A score is the percentage of JPEG bytes served as progressive images relative to the total JPEG bytes.

The score is the percentage of image savings when re-compressing the images. Many web designers benchmark improvements, so it makes sense to match WebPagetest.org’s de-facto standard.

Progressive images are usually smaller. So not using progressive because it might be bigger is a contradiction of facts. Using a progressive JPEG image setting is a web-design best practice.

Progressive JPEG images fade in as opposed to painting from the top down

“The perception of how fast your website loads is more important than how long it *actually* takes to load. User perception of speed will be based on how quickly they start to see content render on the page, how quickly it becomes interactive, and how smoothly the site scrolls.”

– *Designing with Performance*
by Lora Hogan, p19

■ Progressive JPEG is an easy change to improve user experience. **Progressive median speed improvements are 7 to 15 percent better.** JPEG images constitute more page bytes than other web images. Using progressive settings makes a difference. Only 7 percent of JPEG images online use progressive settings because web designers aren’t aware of the benefits.

Don't blame WordPress for site image bloat

■ WordPress optimizes JPEG quality to 90Q. That helps, but don't trust WordPress to optimize your images. It's far better to do it yourself.

If you've already loaded heavy visual content, there's a fix.

Automated image optimizers dummy-proof a website. They allow you to retrofit all images in your media library.

You can have site bloat reduction and image repairs in minutes.

TODAY – SOMEWHERE – an unsupervised, semi-skilled designer will add a big image to a WordPress website. If the image is a fresh-out-of-the-camera, megapixel JPEG, they'll now have a “broken” page. The page will load, but so slowly that no one will see the content. Site visitors are impatient. They'll vanish.

Streamlining with automated image optimization reduces decision making for unskilled website builders. Using a WordPress image-optimizer plugin means we don't need to fret about the balance between speed and aesthetics. The automation makes “good” decisions for us. Expert systems are decision-making helpers. These emulate the decision-making ability of a human expert. But, expert systems are only as good as their knowledge base. We think plugin optimizers – such as Kraken, ShortPixel, and EWWW – have great automation abilities. They're reliable technology applications. But, their philosophy is that of programmers or developers – not seasoned front-end designers. These groups have different mindsets and values when it comes to quality.

The shortcomings and variables of optimization automation are the same for human judgement:

- 1. Usage:** Some images compress better than others. They are images that are small, or in the background, or not emphasized. They may have lots of detail that can hold up under extreme optimization. The more textural the image the easier to compress it down to 30Q and below with no visual loss.
- 2. Quality:** Some humans can't recognize bad images. Optimizers can't detect image degradation even when it's obvious.
- 3. Perception:** Automation can't take into account perceived load time. This is a psychological component.

Is automation better than hand-compressing images?

No. It's just quicker processing. It doesn't produce superior images or image quality or even produce superior reduction. In the past, we created compressed images one at a time in programs offline – like Photoshop. Not everyone knows how to do this – or even wants to. People get confused about how much compression they should use. Automated image optimization is a good-enough shortcut.

Fifteen percent of websites don't use any images. None. Zero. They are completely text and CSS. But the average website is heavy on JPEG image usage. It's the big beast to tame. It's where the most unrealized potential is for UX improvement. But having no images can be even better if you can get away with it.

Will you avoid image-bloat problems completely by using image optimization? No. Sometimes it's best not to use an image at all under certain conditions. Think about it. Does the image contribute to understanding the website's written content? Does it attract, distract, or repel? Users are the judge. Not us. It requires testing.

How much testing? Simple. Ask just five people who aren't related to you and aren't your employees. That's it. You don't have to spend a lot of money or time.

Irrelevant images are a waste of space. Reducing page-load time is still the number one criteria for maximizing readership. One big question: Are images attractive or motivating – and not alienating or repulsive? These questions address a primary component of web credibility. Credibility is the feeling web designers want to achieve. What is right isn't always what feels good. If you put an ugly image into a compressor, it'll still be ugly – but faster loading – when it comes out. There is even a possibility it may be uglier from distortions.

There are times when – for the sake of the user – it's better to not have an image

■ Two easy ways to destroy an image:

1. **Pixelation from poor resolution.** These are visible, small, single-colored, square picture elements.
2. **Distortions from resizing and stretching with incorrect aspect ratio.**

■ Two best ways to improve images have nothing to do with optimization:

1. **Images with story appeal.**
2. **Images that demonstrate.**



*Cut through the
user experience knot.*

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