Understanding the Camera

Many courses will teach you camera basics and how to fully use and maximize your camera investment. And while you may have taken some of these courses, we’ll talk about how some of the basic principals apply to what we do specifically in bird photography. This is where we connect our learned skills and apply them in the field.

While many of you may (or may not) photograph in Program or full Auto mode, which for many subjects is perfectly suitable, there are many benefits that go beyond basic auto functions when you start venturing into taking more control of your camera and using the other modes the camera has available to you, and we’ll discuss the difference here.

Program or Full Auto Mode - The camera takes full control of all functions and it’s quite simply the “auto pilot” for photography. You, the photographer have no creative license to your image making (other than composition of course). This is a good solution if you want to put little to no thought into images, and it does have its place. For example, when I’m shooting with my Panasonic Lumix point and shoot camera, I really have no interest in taking control over the camera. All I’m looking for are family snap shots where the moment is more important than my creative control. So “P” for Program works for me.

Aperture Priority Mode - Aperture Priority Mode does exactly what the name implies. It puts the cameras priority on the aperture settings to control depth of field and the amount of light that reaches the camera sensor. When using aperture priority, the photographer only need worry about moving the aperture and the camera will figure out the appropriate shutter speed for your aperture value. Aperture allows more light into the camera which results in a reciprocal value of either a faster or slower shutter speed. The wider the aperture (the lower the number) results in more light that reaches the sensor allowing a faster shutter speed. The smaller the aperture (the higher the number) results in less light reaching the camera sensor requiring a
longer shutter speed to create a proper exposure. Nikon users will be used to controlling aperture by adjusting the dial with the index figure on the front of the camera by the power button, while Canon users will be used to adjusting the aperture using the thumb on the dial next to the viewfinder on the back of the camera. Aperture Priority Mode is a good choice when photographing landscapes for example when depth of field is of most importance and shutter speed not so critical of a consideration.

Shutter Priority Mode - Shutter speed is dictated by the amount of light reaching the camera sensor. The more light that reaches the sensor, the faster the shutter speed. The less light that reaches the sensor, the slower the shutter speed required to make a proper exposure. Just like aperture priority, the user only need worry about adjusting the shutter speed and the camera will determine the appropriate aperture setting. Shutter Priority Mode is a great choice for birding and sports, where shutter speed and freezing or implying motion is more critical (under most circumstances) and depth of field is of less importance.

Manual Mode - Full manual mode is the best choice when you, the photographer, wants to retain full control over all the camera settings. Manual mode allows the user to adjust both the shutter and aperture to balance a proper exposure. Outside of sports, birding and general wildlife photography, manual mode is my preference.

ISO - ISO is the sensitivity to light. The lower the ISO, the lower the sensitivity to light, which may require faster shutter speeds and lower aperture settings such as f5.6 or f2.8 to allow more light to the sensor. The higher the ISO, the higher sensitivity to light resulting in faster shutter speeds and higher aperture settings such as f16 or f22. Lower ISO settings such as ISO 100 and 200 permit the cleanest images with smooth transitions in tonal values. I recommend low ISO settings for optimal image results. Higher ISO settings create digital noise and graininess in images that are not very appealing. And while the camera has High ISO Noise Reduction built in, noise reduction quite simply blurs the image to minimize noise at the expense of image sharpness and loss of detail.
The photo below was photographed in Shutter Priority mode as confirmed by the camera settings in *Figure 7* on the next page. Since this particular bird was stationary in a branch, a faster shutter speed wasn’t necessary. This photo could have actually been taken at one stop slower at 1/160th second. Stationary subjects don’t require faster shutter speeds, so you can safely photograph them between 1/125th second and 1/250th second or faster if you prefer.

![American Goldfinch (Winter) Carduelis tristis](image)

*Figure 6, American Goldfinch (Winter). Carduelis tristis
Canon 5D MII, 400mm lens, f5.6 @ 1/320 sec, ISO 400.*

Why do I mention all of this you ask? I mention all of this because as photographers, we have choices in how we approach our photos and what tools we use in camera to achieve the creative results we are looking for. And most of your birding photography will be spent around Shutter Priority.

By using advanced modes, you, the photographer retain creative control over your photos, with not having to worry about all the variables of full manual mode. The basic rules of photography apply just as much to birding as they do any other form of photography. The three basic principals of the camera are Aperture, Shutter and ISO.
The Reciprocal Lens Factor

My first, number one most important advice in birding and wildlife photography is to shoot fast. A good general rule of thumb is at least 1 time (1x) the reciprocal of your lens. Meaning, if you are shooting with a 400mm lens, your shutter speed should be no less than 1/400th second, which will equate to a common shutter speed of 1/500th second. However, 2 times (2x) the reciprocal of your lens is even better and what I prefer. So, if shooting with a 400mm lens, your shutter speed should be 1/800th second, which equates to a common shutter speed of 1/1000 second. The reason I suggest 2 times (2x) the reciprocal of your lens is to avoid motion blur. Secondly, the magnification of your subjects when working with super zooms or telephoto lenses become quite significant, and every bit of motion blur will show in your photos. So, the faster the shutter speed, the better.

Shutter Speed and the Direction of Travel

When it comes to shutter speed and motion, you need to be thinking directionally. In other words, the direction of motion in which way the bird is flying. Is it flying towards your? Away from you? Or across you in a side to side direction? Each direction will require a different shutter speed. Let's first look at side to side.
1/500th is the magic number

1/500th second shutter is a great place to start all photos. This gets you to your 1x the reciprocal of most of your lenses and is a great shutter for directional travel. Canada Geese are a very common fixture here in the Northeast during Spring /Summer /Fall, so they give us photographers plenty of opportunity of great subjects to photograph. I was in my canoe photographing Eagles as I came across this flock. Figure 8 below gives us a good look at some of these geese in flight moving across (and away) from the frame. This was shot with a Canon 5D Mark II, 400 mm lens, f6.3 @ 1/500th second, ISO 800, Shutter Priority. So a good baseline for motion moving across the frame is 1/500th second.

![Canada Geese during migration season](image)

Figure 8: Canada Geese during migration season

Notice the direction of travel with this Immature Bald Eagle as it moves across the frame from right to left in Figure 9 on the next page. Any direction of travel moving across the frame requires a faster shutter speed in comparison to motion coming towards you, or away from you. Camera settings on this was Canon 5D Mark II, 400 mm lens, f5.6 @ 1/1600 second, ISO 400, Shutter Priority, or 4x the reciprocal of the lens. Notice how the Eagle is itself is sharp and crisp even at full wing extension in motion.

When a birds direction of flight, or motion is traveling across and in front of you from left to right, or right to left, it is often best to use a technique called “panning”. Panning is a technique where you point your camera at a moving subject, lock your focus on the subject
and move your torso and camera in the direction of travel with your subject. I may make this sound easier than it is, but it requires practice and you should plan to lose many photos. While this is an advanced technique, it is relative to shutter speed, as you need to choose the right shutter speed for the photo and your subject to yield the best results.

![Figure 9: Immature Bald Eagle in flight](image)

With that said, you may have heard that good panning speeds should be done around shutter speeds of 1/15th second to 1/45th second. While this is true for slower moving subjects, birds in flight require much faster shutter speeds, as you not only need to photograph your subject in relative sharpness as it moves across the frame, you need to capture the motion of the wings as well. So birds have what I call “competing motion” and two sets of variables. They have flight, and they have wing motion. Notice the softness of the surrounding water around the Merganser in the photo below while the Merganser is sharp and crisp. This is due to a fast pan.

*Figure 10 below is a Female Common Merganser in flight moving left to right. I panned this photograph at a relatively high shutter speed for panning. My exposure settings on this shot were Shutter Priority Mode, f11 @ 1/640th second, ISO 400. I simply chose the ISO and shutter speed I wanted to work at and the camera chose the corresponding aperture to create a proper exposure. Had I not panned this photograph, the necessary shutter speed to freeze the motion of the Merganser may have been upwards of 1/2500th second or faster, as this bird in flight was very fast. While your camera is perfectly capable of shooting at*
1/2500th or 1/5000th second, it doesn’t mean there is enough light to expose your photograph properly. So by allowing myself to pan the photograph, I am allowing myself more shutter speed to work with and less light necessary to do so.

Forwarding & Receding Motion

Forwarding or receding motion is a direction of travel that is coming toward you or flying away from you. Because the motion is toward or away, the camera and shutter speed can’t capture or imply as much motion as sideways travel which crosses the plane directly in front of you. These are situations where you can get away with less shutter speed than you may think, but it is usually dictated by the birds motion (or lack there of). So my best advice to you for forward and receding motion is to shoot no less than 1/400th

With that said, let’s take a look at the potential consequence of shooting at less than 1/400th second. Take for example the two Golden Eyes in Figure 11. This Male and Female pair was coming in for a landing on a local river and I happened to see them at the last second. Just arriving at the river and not in my blind yet, these two came in by surprise and came in hot, so I quickly snapped a few frames. While I wasn’t fully prepared for their approach, at least I was in Shutter Priority Mode and able to respond fast enough to catch this photo and get a few frames off. Camera data on this one is Monopod mounted Canon 5D Mark II; 400 mm lens; 1/200th second @ f20; ISO 400. While I got the shot off, it wasn’t without consequence. Notice the motion blur in both birds as the outlines of each one is far
from sharp and crisp. This is a shot I would reject and delete, but its a good shot to use as an example slow shutter speeds don’t usually work in bird photography.

![Figure 11: Pair of Golden Eyes.](image)

Now, adverse to the Golden Eye’s in Figure 11, Figure 12 below is a Common Loon gently meandering its way through the surface of this lake. This Loons line of travel was coming directly towards me, and this was photographed at less than 1/400th of a second without shutter consequence. Camera data for this photo is Nikon D2Xs; Manual Mode; 80-400mm lens; 1/320th @ f5.6; ISO 1600. So it is possible to photograph motion at slower speeds, you just need to be aware of how much you can (or can’t) get away with.

![Figure 12: Common Loon.](image)
ISO

Just recently in 2012, I changed from Nikon to Canon. I’ve been a Nikon shooter since 2005 when I purchased my D2Xs. In 2011, I purchased my first Canon as I needed higher resolution and better noise control, and Nikon wasn’t delivering a camera that fit my needs above 12 megapixels. They had the D3X, but for $8000.00, I said forget it, and bought a 5D Mark II. And I don’t regret it. The 5D Mark II does great at handling noise.

Aside from patience, shutter speed is most important variable in birding, and to get your shutter speeds up, you need higher ISO settings. But the consequence of high ISO’s is digital noise in either Luminance Noise (brightness) and Chroma Noise (color). So you need to balance your ISO with shutter speed as best you can to achieve the best possible results.

Figure 13 below are two male Common Mergansers. This was a winter day, late afternoon shortly after a snow storm when birds become very active and begin traveling and foraging for food again. The sky was overcast so exposure was of great concern to me knowing I’d be pushing my ISO to get a fast enough shutter speed. Using the 1x reciprocal method, the camera data for this shot was Canon 5D Mark II; Shutter Priority; 400mm lens; 1/500th second @ f10; ISO 1600. Notice the digital noise in this image is hardly noticeable. This is due to the low contrast of the photograph being shot under a dismal, cloudy sky. For me to get 2x the reciprocal, I would have been pushing my ISO to 3200, which renders most images unacceptable in my opinion with regard to noise levels, which we’ll review in Figure 14 below.

Figure 13: Male Common Mergansers in flight.
This sub-adult Bald Eagle was photographed in March of 2012 with my Canon 5D Mark 11. This is a cropped version of the photograph as the full frame version rendered the Eagle smaller within the frame, and of course the importance of this photo is the Eagle, not the Eagles environment. This particular photo was taken late afternoon as the sun was going down as you can detect from the sidelight on the Eagles left wing. Camera settings on this shot were Canon 5D Mark II, 400mm lens with 2x Extender, f11 @ 1/1000th second, ISO 3200, Shutter Priority, manually focused.

This photo was shot at 1/1000th second due to a 1x reciprocal factor of shooting at 800mm with my 2x extender to avoid motion blur with the magnification of the photo. While this cropped version looks reasonable with regard to noise to the naked eye, look at the enlarged version below in Figure 15. The high ISO noise levels degrades the quality of the original, especially after applying noise reduction in Adobe Lightroom. Digital noise is the consequence to high ISO settings while softness and pixilation is the consequence to heavy processing to reduce the noise. I try and draw a balance between the two.

Figure 14: Sub-Adult Bald Eagle
Now, if this photo was going to be used for publication, it would never be acceptable due to the lack of quality and heavy processing to yield a reasonable result. However, for my purposes of documenting Eagles in my observation territory, it is far more than sufficient for scientific purposes of this recovering bird of prey.

*Figure 16* below shows how I processed this photo to get to the result of where I am. This is a screen capture of my Lightroom catalog. The image on the left is the unprocessed photo while the image on the right is the processed after noise reduction. You can see a marked improvement of the unprocessed photo in comparison to the processed photo. We’ll show you how to get the most out of in camera noise reduction in Lesson 3.

*Figure 15: Digital Noise and Softness.*

*Figure 16: Lightroom screen capture of before and after processing photos for comparison*
Lesson Summary

- Shutter speed is most important in bird photography, with ISO second and aperture third on the list of exposure considerations

- Photograph using Shutter Priority Mode

- Remember to increase your ISO when you need to increase your shutter speed

- The Reciprocal Factor - Best to use a shutter speed 2x the lenses reciprocal factor. A 300mm lens will equal 1/600th second in shutter speed or a 400mm lens will equal 1/800th second

- Direction of travel will dictate the necessary shutter speed. Forwarding and receding motion will require less, such as 1/250th second while side to side motion will require more such as 1/800th second.

- 1/500th second is a good baseline to start your photos at. Adjust your ISO accordingly to get your shutter speed to 1/500th second

- Use panning techniques to get more from your camera to freeze your subject while implying motion and blurring the background that frames your subject

- Be careful with ISO settings. The higher the ISO, the faster the shutter speed, but be careful of digital noise
Week 2 Assignment

Okay folks. This week’s assignment (you guessed it) is to go out and photograph some birds in Shutter Priority mode. I’d like to see one or two photos of different birds at a reasonable shutter speed around 1/500th second and one or two photos of a bird in motion at a shutter speed of 1/1000th second or faster. Composition isn’t a major consideration yet as we’re practicing shutter speed first. Provide camera data for each photo in your caption and deliver up to three photos for critique. Happy shooting!