

THE WIRED BIRDER

Bird Imaging for Art and Documentation

Shawn Carey, Donald Crockett, Stephen Mirick, and David Larson

For this issue, The Wired Birder dives into photography, videography, and digital imaging of birds. In February 2001 the authors conducted a workshop for the Brookline Bird Club on bird imaging. Each of us uses different equipment to image birds, and for different reasons. In brief, Shawn uses high-end photographic equipment to produce visually stunning photographic images of birds on 35mm slide film. Don uses sophisticated digital video equipment to produce amazing video sequences, and great stills. Steve and Dave both use less expensive handheld digital cameras, often coupled with telescopes, with the goal of documenting rarities. Steve uses a digital video camera to capture still images, as well as extended behavioral observations in video mode. Dave uses a digital still camera to capture images ranging from birds to bugs for display on his websites. What follows are commentaries by each of us, focused on equipment and technical issues. The mention of brand names does not constitute an endorsement by *Bird Observer*.

Shawn Carey: Photographing Birds using 35mm SLR

I have been photographing birds (using 35mm) for about eight years. I will give you my views on the equipment I use and the cost for each piece of equipment.

If you wish to photograph birds using 35mm SLR, there are several pieces of equipment you will need to have to be successful. I recommend that you always buy the best piece you can afford; if there is a lens that costs \$800 and another that costs \$200, wait until you can afford the \$800 lens. Photography is like many things in life: you get what you pay for, and with photographing birds, the better your equipment the better the quality of your photos. For most professional photographers there are only two brands to look at, Canon and Nikon. I have used both of them with excellent results. At present I am using Canon, and I try to purchase the top of the line

equipment with them and all other equipment I use. The quality of the images I get back are first rate; when I used lesser quality equipment (when I first started), the final results were less than satisfactory.

The first thing you will need is a camera body; I use Canon and own the EOS-3 (body only \$1000) with the Power Booster (\$400). This gives me rechargeable batteries (\$140 each), and I can shoot up to seven frames per



Eastern Bluebird by Shawn Carey

second. Like most new camera bodies it has a motor drive, so loading film and nonstop shooting as well as rewind is a snap. With Canon lenses you also get autofocus; more on that below.

Second and more important is your selection of a lens. You need at least a 400mm lens, but would do much better with a 500mm or 600mm for most bird photography. Keep in mind that the bigger the lens the more it is going to cost. I use two different lenses. The Canon 400mm f5.6 (~ \$1200) is good for flight shots and everyday use. This is the lens I would recommend for someone just starting out: it's small enough to hand hold (with a fast shutter speed) and big enough in the right conditions to get good photographs. Also, this is an autofocus lens, so you will be able to get flight shots that six years ago would have been nearly impossible. With the Canon autofocus system, you need only place the focus sensor on the subject and shoot. If the object is moving, just keep the sensor on the subject, and the camera and lens work together to track the focus for you. The first time I used it, I could not believe how well it worked. With manual-focus cameras and lenses, it was a total crapshoot if the subject was moving. The second lens is the BIG LENS (or Godzilla), a Canon 600mm f4.0 (let's just say it's a lot of money). This is the lens I use for most of the bird photography I do, and in many cases it is still not enough. You would be very surprised at how small a 600mm lens really is in the field; you always wish for more focal length.

One of the things you can do to help is add a teleconverter or extender, 1.4x or 2x. With the 1.4x your 400mm f5.6 lens will become a 560mm f8 lens. A 600mm f4 lens becomes a 840mm f5.6 lens. As you can see, it's a quick solution to adding more length to your lens, but the downside is you lose one stop of light (meaning the light intensity is halved) with the 1.4x. However, I use the 1.4x converter (cost \$370) and have excellent results. If you go with the 2x extender (Canon 2x extender, \$310), you will double the focal length of your lens (400mm f5.6 becomes 800mm f.11), but you lose two stops of light. Having said that, there are still times when I will use the 2x with my 600mm f4.0 lens, giving me an autofocus 1200mm f8 lens.

You have your camera and your lens — now what? You need a good tripod with a ball head or Wimberley head for the bigger lens. The tripod brand of choice for most outdoor photographers is Gitzo. I use the Gitzo 1548 carbon fiber tripod (\$900) with a Wimberley head (\$600 with clamp and plate) or an Arca Swiss B1 ball head (\$400). Gitzo makes many other tripods, most of which cost less than the 1548. Bogen is another choice, and the cost will be about half, but overall they are not as nice and offer fewer options built into the tripod that are useful in the field. My everyday tripod three years ago was a heavy duty Bogen, but since I changed over to the Gitzo, I am much happier. I cannot stress enough how important a good tripod is. Many people who get into photographing birds and wildlife spend much time and money on every other piece of equipment, but think they can cut corners with their tripod. DON'T DO IT! This is no place to go cheap, get a good tripod! Wait let me say this again, GET A GOOD TRIPOD! Now I feel much better, since I have done my public service; you can't blame me if you get a cheap tripod and your hard-earned

photos turn out soft because the camera was shaking. If you really must save some money, skip the newer autofocus and go with used manual focus equipment (this means no flight shots).

A few more closing thoughts. There are many additional items that you will find useful as you get into photographing birds: things like a camera bag, flash, film, extension tubes, filters, additional lenses, maybe even a photo blind. These are all things that I use on a regular basis when the time calls for it. However, do yourself a favor and research any item before you purchase it. Talk to people who already use it, go to your local camera store and talk to a knowledgeable sales person, check on the web, read one of the many books on the subject, or pick up *Outdoor Photographer* magazine. Contact one of the many camera clubs, and see what you might learn from them. Find a photo workshop; I teach bird photo workshops for the Massachusetts Audubon Society, but there are many other people who give classes as well. These are all things that in the long run will help you to become a better photographer. I am always learning new things and looking for someone to show me something I didn't know, so keep at it, and each photograph you take will be a learning experience.

Remember you can't get the photograph if you're sitting in your living room, so get out there and start shooting!

Don Crockett: Digital Video Recording

Here's a quick summary of some things to consider to achieve better quality video of birds (or other wild animals).

Focal Length of Lens: One of the most important factors in getting interesting video of birds is how large they appear in the frame. There are two ways to increase the size: by physically getting closer, and by increasing the focal length of your lens. Think about the difference in the quality of the image of birds you get between your binoculars and a spotting scope. With the right optics, you can get the desired size of the bird in the frame without the bird feeling threatened. This will allow you to record longer footage and capture natural behavior. Some camcorders (like the Canon XL-1 that I use) take interchangeable lenses, so you can attach a super-telephoto lens.



Copyright © 2000 Don Crockett

King Eider by Don Crockett

Camcorders with fixed optics can often be fitted with optical "doublers" that multiply the focal length. Camcorders can also be used to videotape the view through a spotting scope (see Steve Mirick's section). Don't be fooled into thinking that the digital zoom factors will give you the magnification that you need. Most camcorders don't have imaging sensors with much higher resolution than what's presented on screen (around 640x480 pixels depending on the recording format), so digital zoom is accomplished by

interpolating between pixels. This rarely provides a better image. The other thing to be aware of is that a camcorder lens zoom factor of 15x is not the same as a 15x scope. 15x only refers to the ratio of the maximum focal length to the minimum focal length, not the amount of magnification. The minimum focal length on most camcorders is a wide-angle view, which means the maximum focal length will provide considerably less magnification than a 15x scope. Try the optics out in the store (but try to get the opportunity to take it outdoors to test it) and find some objects that are roughly the size of different types of birds. Think of the closest you have been to the bird without flushing it. Then look at the object through the camcorder at maximum zoom at that distance, and imagine how the bird would look at that distance or greater.

Tripods and Video Heads: Another important factor in the quality of your video is how steady the camcorder is on stationary subjects, how smoothly it follows moving subjects, and how easy it is to compose the bird in the frame. To get the best results you really need to use a tripod with a video head. The best video heads have compensation so that you can tilt the head with the lightest of touches, but when you let go of the handle throughout the tilt angle range, the camcorder won't move from the position you left it at. They also have adjustable damping that will smooth out starts, stops, and pans so that your audience doesn't get seasick from jarring visual fields. You can spend thousands of dollars to get a professional tripod and head, and the difference is noticeable. It's a lot of money, but if you want to achieve professional results recording moving subjects, the better your equipment the better the results and the more footage that will be usable in quality productions.

Desirable Camcorder Features:

3-Chip Image Sensors — 1 chip each to record red, green, and blue. This produces more accurate and rich colors especially for images with high contrast.

Digital Recording — Image and sound are recorded as ones and zeroes rather than as analog signals. This permits copying without a loss in quality after each successive copy.

Firewire/IEEE-1394 port — allows high-speed digital data transfer to and from your computer, so that you can edit your videos into something that will entertain your audiences rather than put them to sleep.

Editing software has come down in price as the processing power of computers has increased in the last few years, making video production a much less daunting and expensive process.

Manual Focus — Autofocus works great if your subject is the most detailed object in the center of the frame. But put a bird in a tree or a bush, and the camcorder is much more likely to focus on branches than on the bird. It's good to be able to quickly switch to manual focus in these situations and adjust the focus for the bird.

High Shutter Speeds — The standard shutter speed for a camcorder is 1/60th of a second. If you want to be able to freeze the action of a moving bird, you need shutter speeds in the 1/250th - 1/1000th of a second range depending on the speed of the movement. This is especially important if you want to capture individual stills, but is also useful for playing back in slow motion. Some camcorders will

have a "Sports" setting which will use a high shutter speed. Having flexible manual control over the shutter speed is a better option, though.

Progressive Scan/Frame/Movie Mode — Normally camcorders record a half frame every $1/60^{\text{th}}$ of a second. Each frame only records alternating lines (i.e., frame 1 records lines 1, 3, 5, 7, . . . while frame 2 records lines 2, 4, 6, 8, When you try to extract a full frame of a moving bird the second frame will record the bird $1/60^{\text{th}}$ of a second later than the first frame. Interlacing these frames causes nasty artifacts, so typically one frame or the other is thrown away (de-interlacing), or they are averaged together to arrive at a still without these artifacts. Some better camcorders will allow you to record both interlaced frames at the same time. This produces highly detailed stills, but it also creates choppy motion at regular playback speeds (see the following section by Steve).

Microphone Windscreen — There are good-quality windscreens for some camcorder microphones that filter out much of the noise that can be created by the wind ripping past the microphone.

Lan-C Remote Connector — Better camcorders will have a Lan-C connector that will allow you to connect a wired controller to your camcorder. These controllers will allow you to start/stop/zoom your camcorder with the hand you use for the video head pan handle. Quicker stops and starts mean that you'll waste less tape and capture birds more often.

Steve Mirick: Digital Video for Bird Documentation

Two years ago I purchased the Sony DCR TRV-900 video camera with the intention of trying to shoot some video of birds for personal enjoyment. I soon realized, however, that capturing still images from the video and sharing them on the Internet was relatively simple and the quality was great. When I learned how to use the camera in combination with my Kowa spotting scope, I was amazed at the magnification and acceptable quality for documentation. I now believe that this camera, along with a good spotting scope, is the best combination available to birders for the documentation of rare birds.

Video cameras, by definition, have an advantage over still cameras in that they are able to record motion. This can help to show flight style and behavior of birds. During playback, the motion can be frozen or advanced frame by frame, and specific features of the bird, such as wing detail, can be captured during motion. The desired frames can then be stored on a personal computer or e-mailed to friends, other birders, or rare bird committees, for identification analysis or verification. After the images are saved on a personal computer, the digital tape can be recorded over with no loss in quality, creating a nearly infinite supply of film. Digital video also records CD-quality sound, and excellent bird vocalizations can be captured. These can then be played back onto a computer and stored in digital audio formats such as wav or mp3, where they can again be shared with others over the internet.

The optical magnification of the Sony DCR TRV-900 is listed as 12x (digital magnification claims should largely be ignored when considering the purchase of digital video cameras). For additional magnification, I have purchased a separate 2x

teleconverter which I use for higher magnification. For super magnification, I hold the video camera in front of my Kowa scope, a technique sometimes called digi-scoping. Capturing good video this way is close to impossible, and even capturing a few frames in sharp focus can be difficult; however, the increased magnification is far superior to anything available with commonly encountered optical equipment. Even with the loss in quality, through-the-scope images are more than adequate for documentation. The accompanying Northern Hawk Owl image was captured from video taken through the scope.



Northern Hawk Owl by Steve Mirick

There are a couple of disadvantages of using video, however, over still image cameras. Video cameras can cost twice as much as still image cameras, and with most digital video cameras, it takes a powerful computer and software to capture the still images and perform video editing. Newer digital still cameras also have greatly improved image resolution, superior to the 640x480 still-image resolution most commonly captured from video cameras.

Advantages of the Sony DCR TRV-900 (over other consumer video cameras):

Digital Video (using MiniDV format) gives highest video resolution at 500 lines.

Progressive Scan Mode option for improved resolution on still images.

External floppy disk drive for simplifying the capture of still images, a unique feature for this camera.

3 CCD chips for improved color resolution and still image quality.

Very nice 3.5-inch LCD for playback in the field.

David Larson: Digital Still Photography for Documentation

Over a year ago I bought a digital still camera, and my various film cameras have been gathering dust ever since. For nature study and bird documentation, having a digital camera with a long zoom lens and image stabilization means that I have a lightweight field tool that is nearly always with me, doesn't require a tripod, and produces acceptable images in the macro, wide angle, and telephoto ranges.

There are plenty of digital cameras on the market today, but only a few deserve mention as birding cameras. If a camera only delivers a bird dot at distances that are comfortable for the bird, then you might as well leave it at home. The minimal optical magnification that would be useful without accessories approximates that of a pair of binoculars. I currently use a Sony Mavica MVC-FD91, which has a zoom range of 14x. The actual maximum magnification is 10x (roughly equivalent to a 500mm lens for a 35mm camera). Both 1.4x and 2x converters are available. This camera has

image stabilization (meaning it dampens vibration), auto- or manual focus, aperture or shutter priority auto exposure, and a built-in flash. Images are stored in jpg (compressed) or bmp (uncompressed) formats on 3.5-inch floppy disks (cheap, handy, and reusable). Each disk holds just one bmp, or 6-12 jpg images, so carry a pocketful. Shooting jpg images results in file size compression and some loss of image information.

The FD91 shoots a 1024 x 768 pixel still image. That means that there are 1024 pixels (picture elements) on the horizontal side of the rectangular CCD chip, and 768 pixels on the vertical side. Therefore, the chip has $1024 \times 768 = 786,512$ sensors, and the resulting image is made up of (maximally) that number of dots. Digital video cameras like those used by Don Crockett and Steve Mirick have maximal resolutions of 640 x 480, and thus lower resolution than my Mavica. Of course, other still cameras have higher resolution: 2, 3, and 4 megapixel arrays are becoming popular (a megapixel is a million pixels; my Mavica is approximately a $\frac{3}{4}$ megapixel camera), and there is a 16 megapixel camera in development.

The FD91 is no longer in production. It has been replaced by the FD95, FD97, and CD1000. These three cameras use a 2.1 megapixel chip and have a 10X zoom range (equivalent to a 380mm lens for a 35mm SLR camera). The FD95 and FD97 can write images to a floppy disk or a solid-state storage device. The CD1000 writes images to a mini-CD. Other digital cameras that would be useful for birding are the Olympus C2100 UltraZoom (2.11 megapixel), Olympus Camedia E-100 RS (1.5 megapixel) and the Canon PowerShot Pro90 IS (2.6 megapixel). The Olympus and Canon cameras use reusable solid-state storage devices. All of these cameras have a 10X zoom range, which would lead you to believe that they would not be as useful as the FD91, but the extra pixels more than make up for a little less optical magnification.

Whatever camera you use, the advantages of good magnification, autofocus, and exposure, light weight, image stabilization so you do not have to use a tripod, and simplicity in use mean that you will have a handy field camera for documenting birds, bugs, or whatever turns you on. Bear in mind, however, that ruggedness and

weatherproofing are not notable features of these cameras. My Mavica is mostly plastic, and it is not even remotely waterproof (ugly details of personal experience omitted).

Digi-scoping: If your aim is to document rarities, you will find that they usually are not particularly cooperative. What looks nice and clear and obvious through a pair of binoculars may be small and obscure in a photograph. So when you really have to reach out and fill the frame, you can




Eclipse male Garganey by David Larson

try using a combination of optics. I have been shooting through my Kowa TSN-4 spotting scope for over a year now, and I can get useable photographs most of the time. I just recently tried shooting through my binoculars, and that works too. In both cases you can expect ridiculous magnification (with the scope-camera combination, you might have to back up!), restricted light levels, and some softness of focus. Of course, when it really matters, you use what you have to to get the shot. I have posted some suggestions for digi-scoping with my combination of optics on my website <<http://larsonweb.org/birds/mavicaplus.html>>. If you have a digital camera and a scope, or even binoculars, try it and experiment. The key is to practice, practice a lot. You don't want to try it for the first time when you see your next first state record bird!

Shooting for the web: My primary venue for displaying my images is the web. That means that I have some flexibility with a 1024x768 image, since a reasonable maximum size for a web image is 600x450 or less (you can post larger images, but not many viewers will wait for them to appear on their monitors). Therefore, I can crop my image to that size to get a larger relative bird size. Of course, with higher resolution chips (2, 3, or 4 megapixels or more), one can crop even more tightly without loss. Conversely, if I have a full-frame bird image, I can shrink it to size without loss. Image manipulation software is also handy if you need to brighten the image a bit, or even remove a twig (or change a Black-throated Green into a Northern Gannet).

Shooting in field conditions with a handheld camera allows you to document birds as you bird — not in a stakeout blind or with a cumbersome panoply of equipment. That means that you are much more likely to have the camera with you when you really, REALLY, need it — say for that first state record, or when your birding buddy falls into the manure pit at Cumberland Farms.

Summary

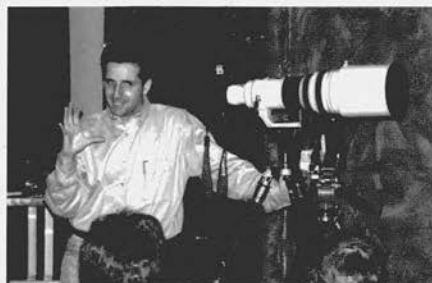
Ultimately, the equipment you purchase and use will depend on what you hope to accomplish and what you can afford. We have presented a gamut of choices from very expensive systems of the highest optical resolution and color fidelity, using huge glass lenses and requiring rock-solid tripods, to less expensive systems that are more portable and easier to use in field situations. Videography provides the additional dimension of capturing behavior, at the price of lower image resolution. Digital imagery, even for the very high-end photographers, is the wave of the future. 

Links to relevant web sites:

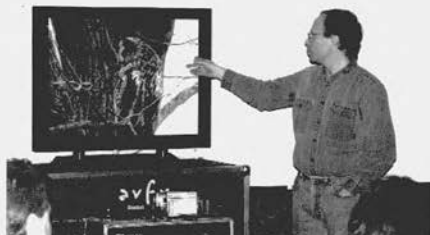
Migration Productions	http://www.migrationproductions.com
Used photographic equipment	http://www.keh.com
Canon EOS3	http://www.usa.canon.com/camcambin/cameras/35mm/slr/eos3.html
<i>Outdoor Photographer</i> magazine	http://www.outdoorphotographer.com
Gitzo tripods	http://www.bogenphoto.com/1.htm
Bogen/Manfrotto tripods	http://www.bogenphoto.com
<i>The Virtual Birder</i>	http://www.virtualbirder.com

Canon XL1 <http://www.canondv.com/xl1/index.html>
 Sony DCR TRV-900 <http://www.bealecorner.com/trv900/>
 Sony digital cameras http://64.14.40.97/explore_products/productindex.jsp
 Steve's Digital Camera Reviews <http://www.steves-digicams.com>
 Olympus C2100 Ultrazoom <http://www.olympusamerica.com/>
 Olympus Camedia E-100 RS <http://www.olympusamerica.com/>
 Canon PowerShot Pro90 IS <http://www.powershot.com/powershot2/pro90/index.html>
 Foveon (16 megapixel camera) http://www.foveon.net/tech_f16.html
 Dr. Chan Kai Soon of Ipoh, Malaysia digi-scoping
<http://albums.photopoint.com/AlbumList?u=25214>
 Digi-scoping sites <http://www.md.ucl.ac.be/peca/test/a.html>
<http://www.birdingamerica.com/digiscoping.htm>
<http://www.surfbirds.com/Features/digiscoping.html>
http://www.angelfire.com/pe2/digiscoping/Page_6.htm

Photographs from the workshop (by Eddie Giles)



Above: Shawn Carey and Godzilla. Below: Dave Larson and his toys.



Above: Don Crockett explains how to expose for backlighting. Below: Steve Mirick and some of his equipment.




Shawn Carey is an accomplished photographer and one of the founders of Migration Productions <<http://www.migrationproductions.com>>. Don Crockett is perhaps best known as the editor, composer, and programmer of The Virtual Birder, the e-zine and birding resource <<http://www.virtualbirder.com>>, and proprietor of the A2Z4 Birders online birding store <<http://store.yahoo.com/a2z4birders/index.html>>. Steve Mirick is a stalwart of the New Hampshire birding scene and a bird trip leader. An index of some of his images can be found at <<http://www.nh.ultranet.com/~mirick/Photos/>>. Dave Larson is the Bird Observer Production Editor, a freelance writer and editor, and the webmaster of <<http://larsonweb.org/>>.

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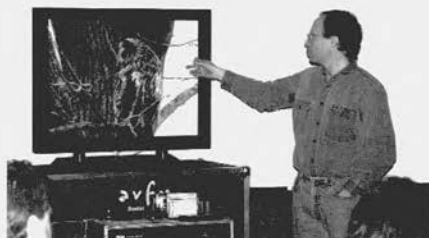
Migration Productions	http://www.migrationproductions.com
Used photographic equipment	http://www.keh.com
Canon EOS3	http://www.usa.canon.com/camcambin/cameras/35mm/slr/eos3.html
<i>Outdoor Photographer</i> magazine	http://www.outdoorphotographer.com
Gitzo tripods	http://www.bogenphoto.com/1.htm
Bogen/Manfrotto tripods	http://www.bogenphoto.com
<i>The Virtual Birder</i>	http://www.virtualbirder.com

Canon XL1 <http://www.canondv.com/xl1/index.html>
 Sony DCR TRV-900 <http://www.bealecorner.com/trv900/>
 Sony digital cameras http://64.14.40.97/explore_products/productindex.jsp
 Steve's Digital Camera Reviews <http://www.steves-digicams.com>
 Olympus C2100 Ultrazoom <http://www.olympusamerica.com/>
 Olympus Camedia E-100 RS <http://www.olympusamerica.com/>
 Canon PowerShot Pro90 IS <http://www.powershot.com/powershot2/pro90/index.html>
 Foveon (16 megapixel camera) http://www.foveon.net/tech_f16.html
 Dr. Chan Kai Soon of Ipoh, Malaysia digi-scoping
<http://albums.photopoint.com/AlbumList?u=25214>
 Digi-scoping sites <http://www.md.ucl.ac.be/peca/test/a.html>
<http://www.birdingamerica.com/digiscoping.htm>
<http://www.surfbirds.com/Features/digiscoping.html>
http://www.angelfire.com/pe2/digiscoping/Page_6.htm

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