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JOURNAL of Wildlife Rehabilitation

A Publication of the International Wildlife Rehabilitation Council

Special Topics Issue: Passerine Rehabilitation

Guidelines for Authors

The *Journal of Wildlife Rehabilitation* is designed to provide useful information to wildlife rehabilitators and others involved in the care and treatment of native wild species with the purpose of returning them to the wild. All feature articles are subject to a review process, and our staff and reviewers work with authors to produce the most accurate information possible in our ever-changing field.

The *Journal of Wildlife Rehabilitation* has various feature categories. We solicit submissions in the form of feature articles, rehabilitation notes, book reviews, news articles related to major events in the field, and selected case studies. Articles on veterinary medicine as it relates to wildlife rehabilitation are also welcome. We would like to expand the *Journal of Wildlife Rehabilitation* to include wildlife rehabilitation articles from countries outside the United States and welcome inquiries regarding such articles. We also have two short features we use for basic information: "For The New Rehabber" and "Simple Things That Make a Difference." They are intended for basic information or new ideas that are easily demonstrated with a short text and photos. All authors receive a $25 honorarium for each article accepted for publication or provide a one year membership or renewal.

Submission Instructions

1. An original and two copies of the manuscript should be submitted to the Editor, IWRC, 4437 Central Place, Suite B-4, Suisun, California 94585, USA. The manuscript should include references, photo legends, and footnotes, and should be typewritten, double-spaced, if possible. The author's name, address, and phone number should be placed on at least the first page of the article so it can be readily identified and the author contacted. Please note that each article should be accompanied by an abstract and a set of key words. If tradenames are used for products mentioned the author must indicate whether the product is ™ or ®. A product table at the end of the article should give readers the name and address of the companies involved and generic name or category of product.

2. The *Journal of Wildlife Rehabilitation* is prepared on a Macintosh personal computer with desktop publishing software. If papers are already on a personal computer disk, the submission cover letter should include that information, as well as what type of hardware and software systems were used. Obviously, being able to use the author's disk directly or translate it by machine to Macintosh format prevents input errors and speeds up the process. We are able to translate many IBM files provided that the software (including version) are written on the disk.

3. Manuscripts are received with the understanding that they have not been accepted for publication elsewhere. **It is the author's obligation to obtain permission or reprint rights if the submitted copy has been published elsewhere.** All accepted manuscripts are subject to editing. Unused manuscripts will be returned.

4. A separate page should be submitted with a short synopsis of information on the background of the author. Included should be the name, address, rehabilitation organization, phone number of the author and a biographical paragraph. Where appropriate, please list any academic degrees, special training, or experience that is relevant to the article (i.e., physical therapy—RPT, etc.) Articles pertaining to areas of veterinary medicine that involve tasks or decisions requiring a licensed veterinarian (e.g., soft tissue or orthopedic surgery) require a veterinarian as either the author or a co-author.

5. Black and white photographs are preferred for use in the *Journal of Wildlife Rehabilitation*. When no other option is available, color prints can be converted but this is costly and to be avoided when possible. Photo credits should be listed with the photographs.

6. Acknowledgments are limited to people who have contributed to the article in a major way.

7. References should be noted in the text with the last name of the author and the year published (i.e., Leighton, 1983) and listed at the end of the manuscript in alphabetical order in the following style:

LEIGHTON, FA; Peakall, DB; and Butler, RG. 1983. "Heinz-Body Hemolytic Anemia from the Ingestion of Crude Oil: A Primary Toxic Effect in Marine Birds." *Science* 20:871-873.

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Editorials . . .

The Plight of Neotropical Songbirds

I was speaking with IWRC member Elizabeth MacDonald (MA) today about why IWRC decided to devote a whole issue of the journal to passerine concerns and she said, " I have been rehabilitating songbirds for about 20 years now, and I don't often see the 'delicate' species like I used to." She went on to express concern for birds like Northern Orioles, once commonly admitted, now uncommon. What is happening to them? That is a good question.

Many of the passerine species in decline are classified as neotropical migrants — birds that nest in the northern hemisphere and winter south of the United States. They include most waterfowl, shorebirds and many species of raptors, gulls, terns and songbirds. Specifically, neotropical songbirds include hummingbirds, flycatchers, warblers, orioles, vireos, finches, thrushes, and tanagers. They face many challenges. For starters, it is estimated that somewhere between 100 million to one billion birds die each year when they collide with man-made structures (e.g., reflective windows, skyscrapers). Then there are the cats. Domestic cats kill as many as 2-3 million birds *per day* in the United States. It doesn't surprise me to hear that in some species, such as the Cerulean Warbler, population declines have averaged 3-4% per year for the last 25 years!

Some of these birds are generalists and are able to utilize a variety of habitats while others are very specialized in their requirements and therefore face greater risk as habitat changes occur due to deforestation and/or development. We are familiar with the changes we see in our local environment, but did you know that these birds leave our area to fly south into an area 1/6th as large? Some species fly tremendous distances (e.g., 15,000 miles annually) in their migrations. Once there, they face pesticide use long outlawed in the United States (but provided by US manufacturers). In third world countries, some of them (shorebirds) are still hunted for food. Land use changes in both hemispheres are reducing habitats that once supported a diverse array of wildlife to 'monohabitats' that are good for a specific cash crop.

All this is depressing, but not hopeless. While significant declines in neotropical migrants have been been documented for the last 25 years (up to 50% by some estimates), research and coordinated efforts to understand and reduce the losses are underway. The Neotropical Migratory Bird Conservation Program has organized state working groups in the United States and relationships with conservation professionals south of the border. But biologists know they need both public support and collaboration from other wildlife health care professionals to succeed. So, how can we help? Well, I think we need to begin to give declining species priority, even when they are not high visibility species. I so often hear other veterinarians saying yes to the treatment of resident Red-tailed Hawks and no to the Bullock's Oriole. We have informally trained rehabilitators to treat passerines because we have not felt they deserved the same quality of veterinary care given to 'more important species'. We need to change this — and the sooner the better.

This special topics issue highlights the passerine. From passerine rehabilitation to detailing a program to save birds that hit skyscrapers to articles that focus on their release, this issue brings higher visability to these birds and their plight. Many member communiques on passerines are also included in the newsletter. Why haven't we published more on passerines? Because we don't get many submissions. We hope for more in the future. There is no reason why we can't publish passerine articles in each and every journal—if we could get them. Have rehabilitators also come to believe that these birds are less important? I hope not.

Special thanks to guest editor Trish Drum and all the wildlife rehabilitators who responded to our letter asking for submissions—this issue was possible because of you. —Jan White, DVM

Rehabbing *Passerines* is Not for Sissies

Filling gaping beaks every thirty minutes from sun-up to sundown is not an easy task. It requires the physical stamina of an Olympic athlete, the manual dexterity of a diamond cutter, the diagnostic skills of a pediatrician, the mental clarity of a brain surgeon, the diplomacy of a foreign ambassador and the teaching skills of a college professor.

Passerine rehabilitators possess and utilize those attributes, all without the prospect of winning a gold medal or The Nobel Prize and usually without pay. Plus many even hold down full-time jobs and still manage to carry-on a somewhat "normal" life with families of their own — substantiating that "rehabbing *passerines* is not for sissies"!

It is to these stalwart souls that this special issue is dedicated. Hopefully the experience and knowledge shared within will serve to enlighten by propagating: different methods and approaches to help provide better care; tips and shortcuts to help save time and money; procedures to help increase success (release) ratio; and most important, to foster a communication network amongst professionals with a common goal. That goal being the conservation of wildlife through rehabilitation, plus the overwhelming endeavor of educating the public — with the utopian goal of one day making our jobs as wildlife rehabilitators obsolete.

I want to thank Dr. Jan White, Editor of the *IWRC Journal* for giving us this opportunity, and everyone who contributed —thus making this special issue possible. — *Trish Drum*

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Bird Health and the Importance of Full-Spectrum Light

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ABSTRACT

Full-spectrum light, either natural sunlight or artificial full-spectrum lighting, is vital for the health and well-being of developing birds. This article discusses the importance of ultraviolet radiation in the production of vitamin D_3 in the skin, the role of vitamin D_3 in the maintenance of the calcium and phosphorus balance and thus the formation of healthy bones and the prevention of metabolic bone disease. Different types of lighting are compared and optimum light fixtures are discussed. A brief history of "weak leg syndrome" and metabolic bone disease are discussed, as well as efforts that are being made in various rehabilitation centers and rehabilitators' homes to provide optimal full-spectrum lighting conditions.

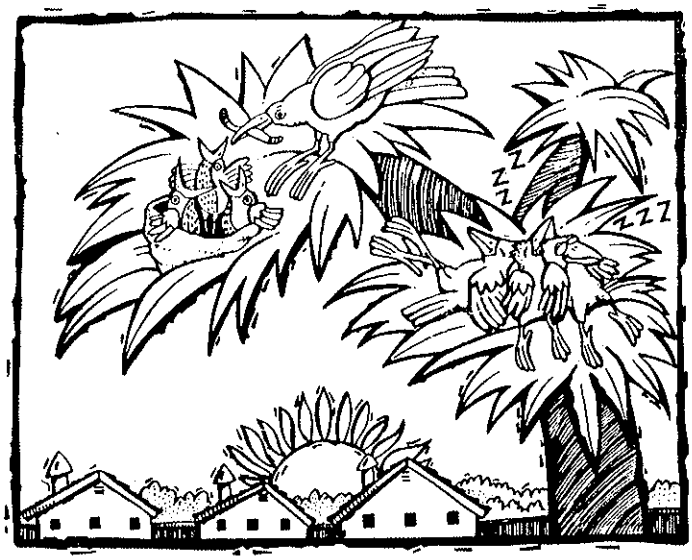
Key Words: sunlight; full-spectrum light; ultraviolet radiation; vitamin D_3 production; metabolic bone disease

Introduction

The maintenance of a bird's health depends on many things, including environment, diet and heredity. Environment is an all-embracing term which includes such factors as temperature, humidity, ventilation, injuries, the presence or absence of predators, and stress. One important factor is the intensity and nature of light in the environment (Arnall and Keymer, 1975).

Nearly every living organism requires light, and without it will die. Plants and animals have evolved over millions of years under full-spectrum natural sunlight (Hogan, 1987). Sunlight fuels photosynthesis which allows plants to synthesize energy from the chlorophyll in their leaves. This creates food not only for other plants but almost all other organisms on this planet. Light influences all animals whether they are active during the day or night. Birds are one of the animal groups most profoundly affected by light, because they rely on sensory input from their eyes as much as (if not more than) any other species (Palazzolo and Mader, 1992).

Light has a profound influence on the daily and yearly rhythms of birds—it affects their anatomy, physiology, behavior, and distribution. Many activities of birds are related to the influence of the sun. The beginning of daylight brings on the definite awakening times of most birds, which vary with different species (robins are among the earliest to awaken; jays and crows are relatively late risers), determines the beginning of morning song and its duration, the times of cessation of song in the evening, and the times of roosting. The rhythm of diurnal birds (those active during the day), e.g., passerines, is inverted in nocturnal birds (those active between dusk and dawn), e.g., owls and whip-poor-wills (Terres, 1982).



Cartoon drawing by Debbie Melmon

Why Light is Important in Raising Healthy Birds

Wildlife rehabilitators raising young birds need to be particularly aware of the need of sunlight on the good health of these birds especially as it affects production of vitamin D. Once birds are moved indoors out of their natural habitat, they often experience difficulties with growth, reproduction (as reported by aviculturists) and overall well-being and health. The main reason we see these problems is the inability of the indoor environment to duplicate the lighting conditions of natural sunlight (Hogan, 1987). Wildlife rehabilitators that raise passerine birds in their homes typically use the garage or a spare room to house these animals and often these are rooms that are not well lit. Even rehabilitation centers that keep birds "in-house" need to be aware of the light needs of the birds in their facilities. This presents a problem when the birds do not receive enough direct sunlight to manufacture vitamin D.

Vitamin D

Vitamin D is an important fat-soluble vitamin whose most important physiological role in the bird's body is the regulation of calcium and phosphorus levels. There are two main forms of vitamin D: vitamin D_2 (ergocalciferol), and vitamin D_3 (cholecalciferol) (Brue, 1994). Birds require vitamin D_3. Vitamin D_3 is transported to the liver where it is converted into an important compound called 25-hydroxycholecalciferol. Another step in the metabolic pathway occurs in the kidney where 25-hydroxcholecalciferol is converted to 1,25 dihydroxycholecalciferol. This is a hormone and is the active form of vitamin D, necessary for the absorption of calcium. This form enables the absorption of calcium from the intestine by producing a calcium-binding protein that actively transports calcium throughout the body. There is also evidence that vitamin D mobilizes bone mineral to help maintain blood serum levels of calcium and phosphorus, and plays a role in the deposition of calcium salts into the cartilaginous matrix of the bone (Burgmann, 1993).

(Readers wishing more information on the metabolism of vitamin D and its relationship to calcium:phosphorus should read Murray Fowler's excellent chapter on metabolic bone disease (Fowler, 1986). A more technical description of vitamin D can be found in Lawson, 1978).

Vitamin D and its Relationship to Light

Birds in captivity may obtain vitamin D_3 (cholecalciferol) from either diet (must be added), or sunlight, or both. Ultraviolet rays of direct sunlight are required to convert the precursor of vitamin D_3 (7-dehydrocholesterol), which is present in the skin, to activated vitamin D_3 (Burgmann, 1993). The synthesis of vitamin D_3 in the skin requires ultraviolet (UV) radiation of a specific wavelength, commonly called UV-B. UV light also stimulates the oils secreted by the uropygial gland (preen gland—a small gland near the base of the tail), to be converted to vitamin D_3. When birds preen, they ingest D_3 (Palazzolo and Mader, 1992). Early studies in poultry showed that sufficient vitamin D_3 could be formed to prevent rickets in growing chickens and maximize growth with 11–45 minutes of sunshine each day (Brue, 1994). No one has yet determined how much exposure is needed for wild birds. However, the current thinking is at least 30 minutes per day (White, 1992). It is important to remember that glass filters out almost all UV light and thus it is not enough to place our birds near a window.

Animals that receive exposure to enough ultraviolet irradiation have no dietary requirements for vitamin D. Obviously, many captive nondomestic animals require a dietary source. There is still great deal of confusion over the amount that constitutes adequate vitamin D intake (Fowler, 1986). Toxic overdose may occur if excess levels of fat-soluble vitamins like D_3 are administered (Burgmann, 1993).

The Clinical Signs of Vitamin D Deficiency

The clinical signs of vitamin D deficiency relate to its effects on calcium and phosphorus metabolism. Rickets is a metabolic bone disease of immature, growing birds. The problem occurs when the bones that need to be mineralized for normal skeletal growth, fail to be mineralized properly. This results in stunted growth, curved long bones, pathological fractures, and abnormal or impaired healing of those fractures (Burgmann, 1993). Rickets may also be caused by poor calcium:phosphorus balance in the diet, or by lack of calcium or phosphorus. As stated previously, 1,25 dihydroxycholecalciferol is essential for the absorption of calcium in the gut.

Birds which are housed indoors for most of their early development will produce very little vitamin D_3, and thus the majority of their vitamin

D_3 must be supplied in the diet. SuperPreen® is a good supplement as it contains vitamin D_3 and is especially formulated for birds. Vitamin supplements for mammals often contain vitamin D_2 and should not be used for birds. Vitamins are sensitive to heat and light, so overheated and outdated supplements or commercial foods may be vitamin deficient (Macwhirter, 1994).

Recent research on caged domestic birds has shown that when the normal balance of light in which birds evolved is altered, as by indoor artificial lighting, there are both short- and long-term effects on the birds' health, and reproduction (Black, 1990). As an example, the Bronx Zoo had for four years maintained their Tufted Puffins under artificial light. During this time the birds did not attempt to breed. However, when the zoo installed full-spectrum lighting, the puffins laid fertile eggs and produced offspring for the first time in captivity (Black, 1990).

Different Types of Lighting

We use a wide variety of artificial light bulbs and fluorescent tubes in our homes, and most of these produce a spectrum of light wavelengths that is far different from that of natural sunlight. The standard incandescent light bulb, for example, produces light heavily in the red and invisible infrared wavelengths (see Figure 1 for visible and near-visible light spectrum). These sources do not emit any light in the ultraviolet end of the spectrum. On the other hand, the commonly used fluorescent lighting tubes emit little or no light in the red or infrared ranges of the spectrum, and little or no UV light (Black, 1990). Fortunately, there are now special ultraviolet-emitting fluorescent tubes available that can be used as a substitute for natural sunlight. These light sources are referred to as full-spectrum lights as they simulate the full visible and UV spectrum of natural sunlight. One example of these is the Vita-Lite®. It is important to distinguish these full-spectrum lights from so-called "broad spectrum" or "wide spectrum". Broad- or wide-spectrum lights peak in the yellow range of natural light and do not offer the same advantages as full-spectrum lights, which produce healthful UV radiation (Palazzolo and Mader, 1992). The light from Vita-Lites® is neither "warm" nor "cool". Like daylight, it is neutral (Foster, 1990). Note there are also lights available to enhance the growth and flowering of plants. These specially-designed plant lights are not similar to natural lighting because they lack the even blend of primary colors and the UV emission (Hogan, 1987).

Kinds of Ultraviolet Radiation and Comparison of Bulbs

Sunlight (made up of different kind of rays) contains large amounts of ultraviolet (UV) radiation. UV light is classified as either near-UV (UV-A), mid-UV (UV-B) or far-UV (UV-C) (Fig. 1). UV-A, directly adjoining the violet end of the visible-light spectrum, is responsible for the tanning process in humans. UV-B also causes tanning, but more importantly, it activates the synthesis of vitamin D and thereby the absorption of calcium and other minerals. UV-C, mostly filtered out by the Earth's ozone layer, is germicidal, killing bacteria, viruses, and other infectious agents (Liberman, 1991).

The antirachitic (or "ricket-preventing") value of UV radiation has long been recognized and much research exists which deals with a variety of biological effects of light. As a result, a variety of lamps have been designed to mimic or exaggerate various features of natural light and various combinations of these lamps have been used in captive animal husbandry. These include sunlamps, blacklights, full-spectrum, standard visible and plant lights. Unfortunately, there is a lack of data showing actual irradiances from lamps for various wavelengths under specified conditions of measurement. In Gehrmann's paper titled "Ultraviolet Irradiances of Various Lamps used in Animal Husbandry" (Gehrmann, 1987), he compared a variety of lights including Vita-Lites®. As expected, sunlamps showed the highest UV-B irradiance but had little light from the visible light spectrum. Vita-Lites® produced more UV-B light than most regular fluorescent bulbs or plant-lights. Gehrmann did comment that the optimal dose

THE VISIBLE AND NEAR-VISIBLE LIGHT SPECTRUM

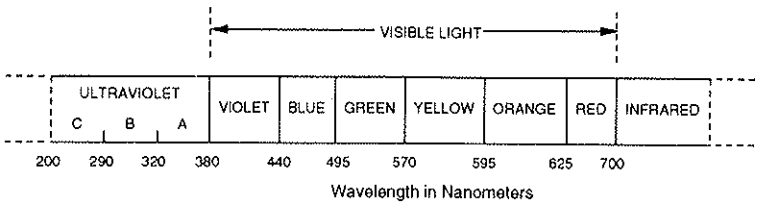


Figure 1

and/or wavelength for one biological process, for example vitamin D synthesis, may be different than that of another process such as reproductive behavior. This would suggest a light that simulated daylight would be more beneficial than just using a sunlamp for 15 minutes a day (Faulkner1, 1995). Until further studies are performed that describe the light requirements of various species the author would recommend that wildlife rehabilitators continue using Vita-Lites® (or similar full-spectrum bulbs) while rehabilitating passerine bird species. Even though sunlamps give off more of the vitamin D-producing UV-B radiation, these lamps could present dangers to people working near them. In fact rehabilitators would have to wear protective clothing, UV radiation-absorbing goggles, and make sure lamps were shielded.

The full-spectrum light most commonly used by wildlife rehabilitators is the Vita-Lite®, whose spectrum closely matches that of natural sunlight. (See Figure 2a and b). The manufacturers claim that a Vita-Lite® bulb will last for up to 24,000 hours (they have a 30 month warranty) which might explain why they are much more expensive than regular standard fluorescent bulbs.

The importance of using full-spectrum lighting for birds is only now being realized. Aviculturists who are now using daylight-simulating Vita-Lite® full-spectrum lamps have noted that their breeding birds are more productive, have fewer egg-binding problems, produce healthier offspring and generally thrive under Vita-Lite's® balanced color spectrum (Foster, 1990). Owners of African Gray parrots are strongly advised to use Vita-Lites® by their avian veterinarians. In one case known to the author, an owner has been using these lights for her African Gray parrot for years. Prior to the use of Vita-Lites® her parrots had a very difficult time maintaining the proper blood-calcium level, even though they were given daily vitamin and calcium supplements. The blood level would become low enough to put the birds at risk of seizures. Her birds required regular calcium injections until she installed Vita-Lites® over their cages (Bailey, 1992).

There are also bulbs on the market known as Chromalux® bulbs that are designed to fit into incandescent light fixtures. These lights were originally developed in Finland, where light must be sustained in the total darkness of the Arctic winter. Bird-Safe Co. that sells these bulbs to aviculturists recommends placing the bulb in an ordinary socket 2–8 feet from the bird. They can also be used in track, spot or pole lights or any fixtures that do not have shade or glass between the light and the animal. The lifespan of these bulbs is 3500 hours. Note these lights give off heat as well as light, and thus birds should not be able to make physical contact with the bulb's hot surface. At Wildlife Rescue, Inc. one volunteer has installed Chromalux® approximately 2–3 feet above a brooder in which she raises ducks. One disadvantage to these bulbs is that if cold water is splashed onto them they may shatter (Faulkner1, 1995). To date the author is not aware of any data on the efficacy of these lights when raising wild birds.

"Weak Leg Syndrome" and Metabolic Bone Disease in Passerine Species

In the past years wildlife rehabilitators throughout the country have noticed that certain passerine species of birds seem more susceptible to limb fractures or " weak leg syndrome" than others. As recently as April 30 to May 4, 1995 discussion on this issue took place on the Internet (WLREHAB on LISTSERV@VM1.NoDak.EDU). Mockingbirds *(Mimus polyglottos)* are a particu-

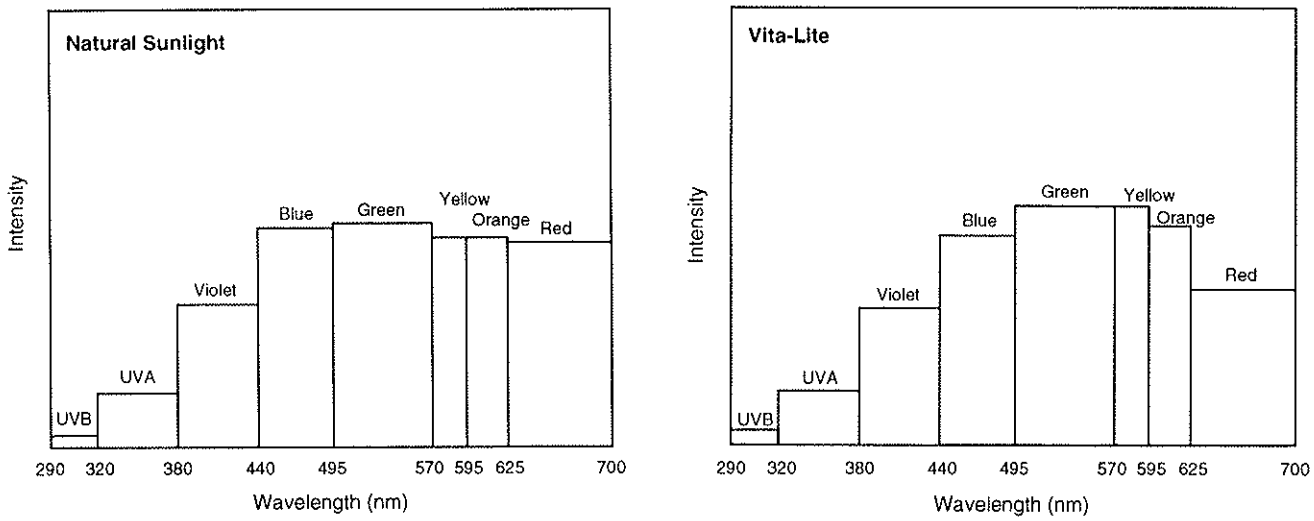


Figure 2a and b: Diagrams comparing Natural Sunlight and Vita-Lite®

larly difficult bird to raise because of the leg problems associated with the species. This was recognized by volunteers at Wildlife Rescue as long ago as the early to mid-1970s. At that time it was recommended that birds with weak legs be treated with vitamin B (Wildlife Rescue, Inc.' 1977). In 1991, Wildlife Rescue's in-house Mockingbird paper mentioned that "weak legs are a common problem with incoming fledglings" (Baldwin, 1991). In San Diego County, volunteers with Project Wildlife and other groups have seen occurrences of leg and wing fractures in young mockingbirds, orioles, kingbirds, and some heron species (Faulkner2, 1995). Even though the mockingbirds and other passerine species were fed an all-purpose nestling diet similar to that reported in Brain, 1985, which is believed to have adequate vitamin D and a balanced calcium:phosphorus ratio, sporadic outbreaks of "weak leg syndrome" or possible metabolic bone disease continued to occur. At Wildlife Rescue, Inc. during 1993, extensive volunteer time and effort was put into finding out why some mockingbird fledglings were developing this syndrome. Birds afflicted showed varying degrees of paralysis. Some birds could not walk and appeared to have no use of their legs while others had partial use but had difficulty perching. Suspecting selenium deficiency, selenium injections were administered but the birds did not respond or show improvement. Necropsies were performed and tissue samples were tested for bacterial and viral infection. These tests proved negative (Baldwin, 1995).

Why Full-Spectrum Lights are Important for Passerine Bird Rehabilitation

Thanks to research performed by Meryl Faulkner at Project Wildlife, rehabilitators may be one step nearer to finding out how full-spectrum light can prevent fractures in vulnerable passerine species (Faulkner2, 1995). It was through a process of elimination and consulting with other home care volunteers that led Faulkner to believe that light was critical to mockingbird development. In the past, most birds had been raised in sunny rooms in volunteers homes and had few problems. But when birds were being raised at the Project Wildlife facility, even though they were on the same balanced diet as the home care birds, serious leg weakness (or leg fracture) manifested itself. The conclusion was that because the facility had no natural daylight and only standard fluorescent fixtures, the ambient light had to be the critical factor in the healthy development of these birds (Faulkner2, 1995). To prove this point, in 1993 Faulkner performed a study on the amount of full-spectrum light required to prevent fractures. The results were startling. All nestling and fledgling mockingbirds were raised under Vita-Lites from day one. The lights were suspended approximately 6 inches above the wire cages and were switched on for 12–14 hours per day. The birds were subse-

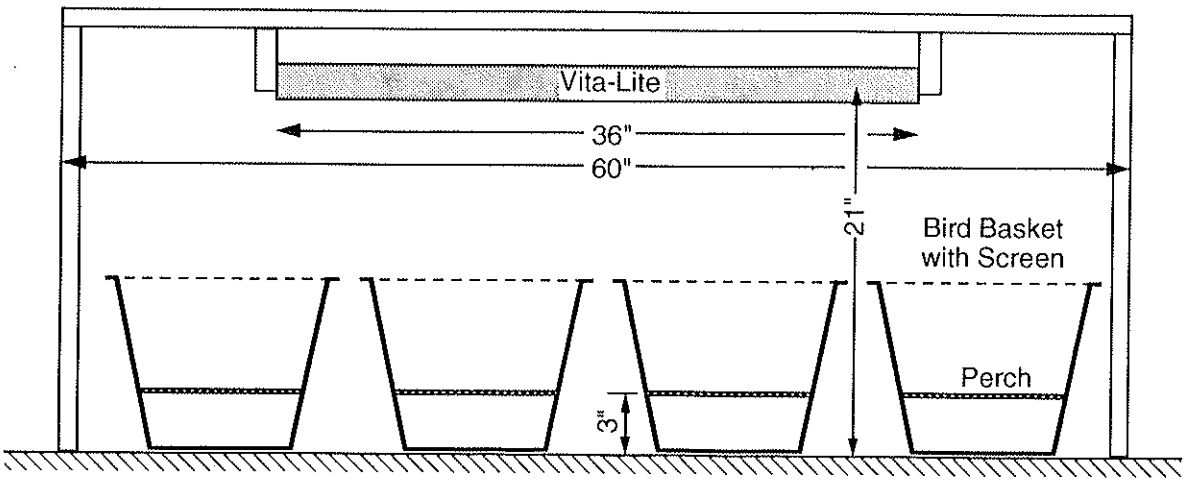


Figure 3: Diagram of Wildlife Rescues Vita-Lite® Set-up

quently housed in an aviary with natural lighting. Of 10 nestling mockingbirds, 3 kingbirds, and 4 nestling orioles only one mockingbird (a 6 gram bird that had been raised under low light conditions) and one kingbird (kept by a member of the public for 10 days) had any leg weakness. Birds were also found to have healthy normal eyes and eyesight as reported by a veterinary ophthalmologist. Project Wildlife now has replaced all lighting in the facility with full-spectrum lights.

Rehabilitators at Horsefeathers Farm Wildlife Center in North Carolina have started to use Vita-Lites® in their bird room in addition to exposing their passerine birds to an hour of dappled sunlight per day in two half-hour increments. In the first 6 months of 1995 they have achieved a 30–40% improvement of success rate in mockingbirds, thrushes, thrashers and bluebirds. Previously they had observed birds with weak and spraddled legs, with some birds displaying rigidity before subsequently dying (Ellesson, 1995).

At Wildlife Rescue, Inc., all mockingbirds during the 1995 season are being rehabilitated under full-spectrum lights. The birds are housed in laundry baskets (covered with fiberglass screening) beneath a 40 watt Vita-Lite® for approximately 12 hours per day. The diagram in Figure 3 shows the arrangement of the mockingbird housing and the position of the Vita-Lite® . Note that the light is not covered by a plastic fixture or housing of any kind. UV light will not pass through glass or most plastics. Some UV light will pass through UVT (ultraviolet- transmitting) plexiglass made by the Rohm and Hass Company, Philadelphia, PA (Liberman, 1991). For several years now, Wildlife Rescue volunteers (including the author) have been using these Vita-Lites® to illuminate bird rooms in their homes. We feel confident that we are providing the best possible light environment for the birds we are rehabilitating, at least until they are ready for outdoor aviaries that will provide natural light (Brain, 1992).

Other Effects Light Has On Birds

Glandular Development: The basis for the observed effects of various wavelengths of light on living things is not yet fully understood. However, research has shown that light affects glandular development. We also know that under light stimulation, the pineal gland, which is a primitive organ found in the birds brain, controls the synthesis and release of hormones (melatonin being one of them) and enzymes into the blood stream. Until recently it was assumed that this gland was a nonfunctional rudiment of the reptilian third eye (Palazzolo and Mader, 1992). Perhaps most important, light received through the eye stimulates the pituitary gland. Since this gland is the master balance gland of the endocrine system and of the body, light received through the eyes will influence all of the glands in the body (Black, 1990).

Behavior: Various types of avian behavior are dependent on light. Male songbirds sing at a higher rate when exposed to more daylight. Sunlight is necessary to stimulate the amount of foraging or hunting that diurnal species can accomplish as well as the cue to roost. Light also affects molting, navigation and the ability to migrate. Sunbathing may be an important avian behavior as it may cause skin and feather parasites to move to more accessible areas where they can be removed (Palazzolo and Mader, 1992).

Reproduction: As noted earlier, aviculturists have realized light profoundly effects avian reproduction, especially the amount of light on a given day or the photoperiod. It is known that if male birds are deprived of light, their testes will not develop and even if both sexes have developed normally but are deprived of light they will not exhibit normal sexual behavior or egg production (Palazzolo and Mader, 1992).

Conclusion

This paper has discussed how sunlight is critical to many bodily processes and the overall development of birds. If we wish to release birds under optimum health conditions, many of which may not manifest themselves until after the birds have been released (poor reproductive success; inability to migrate at the correct time) then we should use the best possible lighting available.

Research so far suggests that light has a critical role in a bird's metabolism and if natural light is not available (because birds are being housed indoors) then full-spectrum lighting that duplicates both the visible and non-visible spectrum of natural light should be used as a substitute.

Unfortunately, there appears to be little data available to recommend how much and for how long artificial full-spectrum light should be used when rearing nestling birds. Much of the information so far available is purely anecdotal. Conditions such as "weak leg syndrome" could be caused by a variety of factors and until further scientific studies are performed, e.g., bone density testing, we should not form conclusions that might prove erroneous. Controlled studies are required to compare and evaluate why some species seem more prone to leg problems and may have greater light needs than others. Questions which need investigation include: why (or whether) gray birds

are more prone to problems; why some species appear to have less light needs than others in regard to healthy bone development, e.g., whether cavity-nesters require less light than those in open nests; and why some passerine species are more obviously affected by the lack of full-spectrum light. Besides detailed studies into the raising of wild birds under artificial light conditions, research in the field could provide us with valuable information on their light requirements. We are in the early stage of knowledge of this subject and in view of this, the author recommends that all rehabilitators use full-spectrum lighting.

Acknowledgements

I wish to thank my husband Sam, for the invaluable assistance he has given me in critiquing this paper. His background in physics greatly helped my understanding of the light spectra and his editorial experience helped me make a rather complicated paper more easily understood. Thanks also to Meryl Faulkner for the countless discussions we have had on light, diet, and mockingbirds, and for her endless enthusiasm to find solutions and give suggestions.

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Product Information Listings

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Author Profile

Susie Brain has been a wildlife rehabilitator with Wildlife Rescue, Inc. in Palo Alto since 1981. During that time she has served as President of the Board of Directors, served on various committees including the "Quality of Life" committee, and more recently established an intern program at Wildlife Rescue. She has also served on the board of IWRC and has assisted with editing the journal. She has attended both basic and advanced IWRC skills seminars. In 1989 she was one of the recipients of the Geraldine Dodge Foundation-sponsored two-day Leadership Program in Wildlife Medicine and Rehabilitation at Tufts University, School of Veterinary Medicine. Her speciality species are the Columbiformes and precocial birds Killdeer and California Quail. She has a B.S. in Zoology and a Post Graduate Certificate of Education, from the University of Wales, Swansea, U.K. She is currently Director of Volunteer Services at the City of Palo Alto Animal Services Center.

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Fatal Light Attraction

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ABSTRACT

Members of the Fatal Light Awareness Program (FLAP) rescue migratory birds that have hit Toronto's lighted office towers during their night-time movements. FLAP volunteers have developed standard procedures for dealing with stunned or injured birds. In those cases where a bird appears to be suffering from head trauma, swift treatment with a corticosteroid such as dexamethasone can be useful in reducing swelling and returning birds to a fully alert state. The birds are handled as little as possible to minimize stress and speed the natural healing process.

Key Words: Songbirds, passerines, trauma, window strikes

Introduction

Numerous studies and anecdotal data point to the attraction that lights from tall structures have for night-migrating birds. Guided in part by the constellations, the birds are irresistibly drawn to lights shining from skyscrapers, broadcast towers, lighthouses, monuments and other tall structures. The birds either flutter about the light until they drop from exhaustion or actually hit the object. Fog, rain or low cloud cover tend to make the problem worse.

The Fatal Light Awareness Program (FLAP) is a volunteer organization whose members patrol the downtown core of Toronto, Canada to: a) rescue any hapless migrants that are still alive after their plunge to the pavement, b) document the number of deaths, casualties and releases, c) determine what factors (percentage of lights left on in the towers, weather conditions) conspire to bring down large numbers of birds. Armed with the information gathered during these missions, FLAP hopes to develop a strategy to convince all those responsible to turn off the lights in Toronto and other urban centres where the problem exists.

Standard Rescue Procedure

Most FLAP volunteers head to Toronto's downtown at around 4 am. If they have reason to believe that the avian casualties will be particularly high that night (i.e., if prevailing winds favour migration and there's heavy cloud cover or fog) they may go earlier. Someone may even scout out the area at midnight.

Typically they will be greeted with the sight of birds in varying postures: some lying on their sides (usually dead, although the occasional live one has been picked up this way), a few fast asleep, others sitting in deep shock and yet others fully alert attempting to flee at the approach of humans. Those that try to fly away are gently herded into a corner where it's easier to capture them. Needless to say, since these are wild birds who see humans as potential predators and will do anything to escape, these attempts at capture are not always successful.

FLAP is anxious to get the birds out of the downtown core due to their extreme vulnerability in this foreign "habitat". Toronto's cluster of tall buildings (some as high as 60 stories) makes escape a very confusing, if not impossible, affair. The birds start to panic at dawn when gulls (and sometimes crows, grackles and other predators) swoop down for a quick meal. Later in the morning when office workers start streaming by, the birds will try to take cover in the nearest tree or shrub. Quite often the plant they are headed for is behind a wall of glass or reflected in it. It is quite likely that sooner or later they will strike a window so fast or so hard that the impact will kill or seriously injure them.

When volunteers find a live bird they stop to give it a quick examination. They look for

obvious signs of injury — blood (especially in the eyes or around the beak), a broken body part, evidence of extreme shock (e.g., head tilt, fluffed feathers, "droopy" eyes or a bird lying on its side). They also check to see if the bird is entangled in spider webbing or is in some other way incapacitated (e.g., with tar on its wings). If the bird is wrapped in webs the offending material is gently pulled off, with care taken to protect delicate joints in legs and wings. Some volunteers carry a pair of suture scissors which can be used to cut off human hair or other tough material tightly wrapped around legs.

If the bird appears to be in good condition the rescuer will pop it into a brown paper bag and let it recuperate in peace.

Several "FLAPPERs" are now equipped to administer dexamethasone sodium phosphate to birds that are suffering from severe trauma (see signs of shock described above). Using a list prepared by the Toronto Wildlife Centre they give the prescribed dosage of 4 mg/kg of dexamethasone as an intra-muscular injection into the pectoral muscle. If the bird cannot remain upright of its own accord, the volunteer will create a "donut" from a piece of soft tissue, place it inside the paper bag and position the bird so that it sits inside the donut. Then they leave the bird in a quiet corner of their car until it's time to transport it to the rehabilitation centre where the bird's condition will be assessed and fluids given, if this is deemed necessary. Although there is little hard data to back this up, it would seem that the sooner the dexamethasone is given, the better the bird's chances of survival.

Rehabilitation

In 1994 FLAP picked up 1,960 birds in total of which slightly less than half (930) were released. Approximately 18% of these live birds were sent for rehabilitation with a variety of injuries including head trauma, broken beaks, multiple contusions, damaged legs or wings or unusual problems such as tar stuck to the feathers.

Most of the species FLAP members pick up (woodpeckers, woodcocks, rails, native sparrows, warblers and other passerines) are easily stressed birds. Therefore, we try to minimize handling, and sights or sounds that could further stress the birds. The Toronto Wildlife Centre has found placing an injured bird (especially one that has had to endure the usual noisy, bumpy car ride to the facility) inside its paper bag into an old computer printer silencer can help to calm it. By reducing stress we substantially increase the odds that a bird's condition will improve. If, as is the case with some birds, it will not eat in captivity, the sooner it can be released the better.

Of the 215 tower casualties sent to rehabilitation in 1994, approximately 60% were released (the others died or were euthanized). As FLAP members become more skilled in handling birds and identifying those in need of longer-term care we hope to see the number of releases increase.

Start a Program

The Fatal Light Awareness program has prepared a manual to help orient new volunteers. If you would like a copy, contact FLAP at the address on this article or by phone at (905) 831-FLAP. Volunteers will gladly offer any advice they can. A copy of our newsletter *Touching Down* is also available upon request (ask for the spring 1995 issue which has articles on rehabilitation).

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Author Profile

Irene Fedun is one of the founding members and currently Secretary of the Fatal Light Awareness Program. She has been visiting Toronto's financial district in search of "hapless migrants" for the past three years. Her previous experience with birds had been simply as a watcher. She has done volunteer work for Avicare Bird Rehabilitation Centre, the Toronto Humane Society and the Toronto Wildlife Centre, but focuses most of her volunteer efforts on rescuing tower casualties and editing FLAP's biannual newsletter Touching Down. *Irene works for the Recycling Council of Ontario as the coordinator of the library on the 3Rs and composting. Her phone number is (416) 762-8889 or using Internet: rcoirene@web.apc.org.*

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Instructions for the Creation and Use of Ribbon Snap Jesses in Non-Raptorial Species

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Introduction

Snap jesses are currently used by our Avian Activity Team. This team consists of volunteers working closely with staff toward the common goal of supplying alternatives and enrichment in the day-to-day lives of our permanent resident display birds. In our quest for supplementing the lives of our permanently injured non-raptor bird residents, we pursued a vehicle for getting these birds outdoors safely, uncaged, and with enough freedom to allow them to perform supervised activities such as flutter climbing, glove walking, tree drilling, limited flight, ground explorations and the opportunity to dig, cache, bathe.....to be a bird. Many residents of our collection have tender legs and small feet, not conducive to any type of permanent equipment, even if most of the equipment could be removed when the bird is returned to the cage. Time was spent using a leather bracelet/grommet system, or traditional jesses on a select few birds, but the conclusion was that this type of equipment was too cumbersome for the birds. Experiments using ribbon and fabric store snaps have resulted in quite a few successes for our birds and a system that appears to be user friendly for both the bird and handler. The system has been modified over time to fit the needs of particular birds. Our design as it appears at the current time is described in this article.

It should be mentioned that unless you have a bird that is accustomed to sitting on a gloved hand due to imprintation or training, a "manning" procedure must accompany introduction of equipment requiring a bird to feel comfortable on the glove. For some animals, this procedure can be accomplished with only a few glove experiences, and for others, time must be spent establishing a trust relationship without equipment and then further work with the equipment on. In short, the procedure requires patience, an understanding of the natural history of the animal involved, and short working sessions.

Equipment

Listed below are the materials that we have on hand to create various types of snap jesses:

3/8 inch width Grosgrain™ ribbon (polyester, 2% shrinkage, washable), lengths of at least 24 inches

5/8 inch width Grosgrain™ ribbon, lengths of at least 24 inches

Ultra Suede (can be purchased in a fabric store; it's washable and maintains its softness over repeated use)

scissors

disposable lighter or matches

pen or fabric marking pencil

string

hammer

cord or draw string stops (we use Dritz™ brand; available in fabric stores)

Snap Fastener "Easy Attacher" Kit (featuring a plastic "GRIPPER™ Snap Fastener Easy Attacher" that accommodates #15 and #16 metal snaps; available at fabric stores; Dritz™ Brand)

Size 15-3/8 inch (9 mm) metal Snap Fasteners™ (Dritz™ brand; available at fabric stores; we find the snaps with the white anchor ring backing attract less pecking since birds are attracted to "shiny")

Size 16-7/16 inch (11 mm) metal Snap Fasteners™ (Dritz™; white backing)

plastic hooks (plastic hooks are lighter in weight than conventional metal swivel bolt snap hooks)

Procedure for fitting the jesses

The more you fit and use ribbon snap jesses, the easier it will become for you to create them. The basic rule of thumb is that you want the circumference of the snapped material around the leg to be slightly larger than the leg circumference, but not so big that it slips off the bird's foot. Here's

That "Finchy" Look

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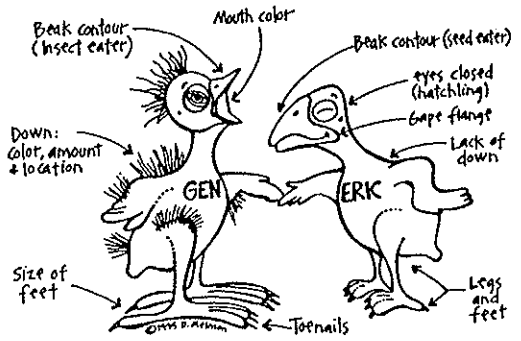

IDENTIFICATION FEATURES OF A GENERIC HATCHLING

Introduction

Years ago, when a seasoned volunteer identified a nest of hatchlings as house finches simply because they had that "finchy" look, I knew I was in trouble. That "finchy" look? What could that possibly mean? Very young birds all looked pretty much the same to me. Further prodding revealed that the highly subjective "finchy" look was actually comprised of specific elements, e.g. a red mouth and lots of fuzzy down. I began to develop an identification chart for my own use-my little hedge against looking stupid I suppose. I gathered data from personal observations, books, and other volunteers. I was amazed to discover that young birds are virtually bursting with tiny identification clues-little differences that positively differentiate one species from another.

The Guide to Identification of Hatchling and Nestling Songbirds is a listing of these clues in organized form. The clues (columns) in the chart are arranged in descending order of importance. The guide focuses on hatchlings and nestlings since the youngest birds are always the hardest to identify. A hatchling is defined as a young nestling (newly hatched, eyes closed, naked or sparsely downy, 0-5 days old, no voice). A nestling is a hatchling a week or so later (partially feathered, eyes open, 6-12 days old, distinctive feeding call).

Mouth Color

The first and most important clue to a bird's identity is the color of his mouth. Color refers to the hue of the soft membranes inside his mouth. As you contemplate mouth color, do not consider the color of the bird's beak or gape flanges. You should be looking at the inside of the mouth. It must be open. All birds have either a yellow/orange mouth or a pink/red mouth. By pinpointing the mouth color of an unknown hatchling, you can immediately narrow the possibilities down by fifty percent. You must begin by making your best guess. You can then refer to either the yellow/orange chart or the pink/red chart for further differentiation of clues. As a rule of thumb, most insect eaters have yellow/orange mouths. Most seed eaters have pink/red mouths. Complete lists of species by mouth color appear across the bottom of each chart.

Gape Flanges

Gape flanges are the hinges of the beak. You can assess gape flanges for their color and prominence. Most gape flanges are white, cream or yellow colored. They may be pale or bright. Gape flanges tend to fade as birds get older. The prominence of gape flanges also varies from species to species. Some birds have thin flanges; some are more pronounced. Flanges can be sharp or rounded.

So far, using just the first two columns of the chart, you might describe a hatchling as having a red mouth with thin, white gape flanges-a Brewer's blackbird, perhaps. Conversely, your bird might have a yellow mouth with bright yellow, very prominent flanges-possibly a starling. Already you are beginning to zero in on the bird's identity by the use of a few small, but revealing, clues.

Beak Contour

Distinctive beak contours develop as the bird ages. The beaks of tiny, just-hatched songbirds look pretty similar. As the nestling becomes older, however, his beak takes on distinctive characteristics. Beaks may be narrow or wide, flat or conical, short or long, delicate or heavy.

With beaks, form follows function. Seed eaters, like towhees and finches, develop heavy, conical beaks. They will need to crush a variety of seeds for their subsistence. Insect eaters, like phoebes and flycatchers, have beaks that tend to be wide and flat because they will need to be able to catch insects on the wing.

Down

Natal down consists of single hairlike spines with short side spines. It doesn't have the substance of a proper feather. It gives a young bird a fuzzy or wispy look. A few birds have no down at all. Having no down is a giant clue to identification. The "nudies" include bushtits, wrentits, sparrows, jays and crows.

Most young songbirds, however, have some kind of down. You can assess it for color, amount, location and pattern. Down colors include white, cream and various shades of gray. The amount can be sparse or plentiful. Down can be located on the head, back,

GUIDE TO IDENTIFICATION OF HATCHLING AND NESTLING SONGBIRDS

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1995

Yellow to Orange Mouth Birds

SPECIES	*MOUTH COLOR*	*GAPE FLANGES*	*BEAK CONTOUR*	*DOWN*	*LEGS /FEET*	*APPROX. WEIGHT in grams*			*FEEDING CALL*	*FEATHERS*	*SPECIAL FEATURES*
						Hatchling	*Nestling*	*Adult (F)*			
STARLING	bright yellow	bright yellow, very prominent, lower larger than upper	very wide	grayish-white, long and plentiful on head, back, and wings	long legs	5.5-30	40-60	80	hatchling-single squeaky note	gray-black	
MOCKINGBIRD	yellow	yellow	wide	dark gray, plentiful	long legs	5-18	20-32	43	hatchling- single, clear, piping note; then throaty bark	gray and white striped wings and tail	gray irides, crescent markings on roof of mouth
ROBIN	yellow to yellow-orange	pale yellow	wide	sparse, cream on head, back, and legs	long legs	5-35	40-60	77	hatchling - staccato trill	rust-tipped speckly chest	skin often yellowish
BLACK PHOEBE	bright yellow-orange	bright yellow	wide, flat tapering to a point	gray and sparse	long, thin legs	2-5	7-15	18	peep-peep	brown-tipped black feathers	insect eater
PACIFIC SLOPE FLYCATCHER	bright yellow-orange	yellow	flat, wide, pointy tip, "arrowhead" look	white, on head, back, and wings in "star" cluster	long, thin, delicate, dark blue-gray, white toenails	2-6	7-8	11	insistent crow-like squawk, frog-like when older	buff abdomen, buff and white striped wings	insect eater
CLIFF SWALLOW	orange-yellow	flesh	very wide, flat pointy beak	light gray head and back	short legs, small, chubby feet	2-13	13-15	22	barking type chirp -/-/-/	nestlings-light tan on back by tail, otherwise adult	insect eater cavity nest
VIOLET-GREEN SWALLOW	orange-yellow	cream	very wide, pointy beak	cream on head, shoulders and back	short legs	1.5-8	8-10	14		white eyebrows	insect eater cavity nest
CALIFORNIA THRASHER	orange-yellow	cream	curves down as nestling grows	dark gray on head, back, wings, thighs plentiful	long legs	6-35	40-60	84		medium gray	
CHESTNUT-BACKED CHICKADEE	orange-yellow	very yellow prominent	flat, wide	gray on head and back	long, pale bluish-purple	1-4	6-8	10	squeaky cheep	buff abdomen, black head, buff-white circles on side of head	insect eater
BEWICK'S WREN	orange	yellow	flat, wide, pointy	long, gray on head only	long, delicate	1-4	6-8	10			
BUSHTIT	deep orange-yellow	yellow	short	none	long, delicate	1-3	3.5-4	5	3 syllable "locater" call "mohawk" look	gray, first feathers on crown of head,	females have blue eyes, cavity nesters
WRENTIT	deep orange	yellow	poiny	none		1.5-6	7-11	14		gray-brown	yellow irides

YELLOW TO ORANGE MOUTH SONGBIRDS INCLUDE: Bushtits, Chickadees, Creepers, Dippers, Flycathers, Mockingbirds, Robins, Shrikes, Starlings, Swallows, Thrashers, Thrushes, Titmice, Wrens, and Vireos.

GUIDE TO IDENTIFICATION OF HATCHLING AND NESTLING SONGBIRDS

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1995

Pink to Red Mouth Birds

SPECIES	*MOUTH COLOR*	*GAPE FLANGES*	*BEAK CONTOUR*	*DOWN*	*LEGS /FEET*	*APPROX. WEIGHT in grams*			*FEEDING CALL*	*FEATHERS*	*SPECIAL FEATURES*
						Hatchling	*Nestling*	*Adult (F)*			
HOUSE SPARROW	pink	med. yellow, prominent	short, cone-shaped	none	short, chunky	2-13	14-20	27	melodic single chirp	smooth, gray-white chest	
RUFOUS-SIDED TOWHEE	pink	pale yellow	conical and pointed	dark gray	long legs, big feet	3-18	20-29	39		dark back, white spots on wings and tail	
CALIFORNIA TOWHEE	pink to red	pale yellow not prominent	conical and pointed	long, brown-gray on head, back, and wings	long legs, big feet	4-20	25-39	52	high-pitched re-peated, like crickets, changes to single peep	brown	
BROWN-HEADED COWBIRD	deep pink	white to cream not prominent	heavy, to a point narrower than a towhee's	long, snow-white	long legs, big feet blk. tipped nails	3-20	25-30	39	continuous high-pitched vibrating sound	breast yellowish when coming in	bald face, parasitic, often found in nests of towhees
NORTHERN ORIOLE	deep pink	pale yellow	long, pointed narrow	long, white-lt.gray on bk, wngs. 2 rows on head	long, slate-gray legs	2.5-18	20-25	33	high, staccato, repeated notes, similar to blackbird	yellow breast, gray back, white wing bars	insect eater
LESSER GOLDFINCH	red	pale yellow	similar to finch	grayish	short, pink, stubby	1-6	7-8	10		green to rust back, yellow abdomen	red dot at corner of gape flanges
RED-WINGED BLACKBIRD	red	yellow, not prominent	long, pointed	scant, white on back, lower wings, and thighs	long legs	3-15	20-30	42			bald face, similar to cowbirds
BREWER'S BLACKBIRD	red	white, not prominent	long, pointed	blackish-gray, fairly plentiful	long legs, white toenails	3-15	20-30	42	raucous, repeated call, sounds like a rusty hinge	black	
SCRUB JAY	red	white not prominent	long and wide	none	long legs, grabby feet white toenails	6-30	35-70	87	hatchling - short repeated peeping, later a single squawk	furry gray head, blue wings and tail	ruddy skin
HOUSE FINCH	red	white to yellowish	short, conical,	white, long and plentiful 4 rows on head	short, stocky	1.5-8	10-15	21	none when newly hatched, then high-pitched peeping	stripey, gray/white chest	
CROW	red	white	very long, large heavy	sparse, gray-brown on head, underparts	long, heavy	18-70	70-328	438		black	ruddy skin

PINK TO RED MOUTH SONGBIRDS INCLUDE: Blackbirds, Cowbirds, Crows, Finches, Goldfinches, Grosbeaks, Jays, Orioles, Sparrows, Tanagers, Towhees, and Waxwings

wings, thighs or some combination of those locations. Patterns include star clusters and "corn rows" on the head.

House inches, for example, have a plentiful amount of long, white down on their backs and wings including four corn rows on their heads. Bewick's wrens, on the other hand, have long, gray down located only on their heads.

Legs and Feet

As is true of beak contour, a just-hatched bird does not have distinctive legs and feet. Give him a few days, however, and differences begin to appear. Legs become short or long, slender or stocky. Several species, like orioles, develop slatey-blue or especially dark tarsometatarsi. Towhees have very big feet in relation to their leg length. Bushtits and sparrows are both totally naked. At first glance they might be mistaken for one another. Yet bushtits have long delicate legs, while sparrow legs are short and stocky. Of course a clever rehabilitator (using the chart in proper sequence) would have already noticed that the mouth color of the bushtit was orange, whereas the sparrow's mouth was pink!

Even something so minuscule as a nestling's toenails can be an indicator. Most songbirds' toenails are black. Blackbirds, however, have white toenails. Cowbirds have black tips on their toenails.

Weight

A good gram scale is the single most important piece of equipment a rehabilitator can own or have access to. Weights are often ignored, or at least undervalued, as a clue to identification. Volunteers are reluctant to weigh hatchlings, yet with proper precautions hatchlings can be weighed with no adverse affects (to either the bird or his handler).

The chart has three weight columns-Hatchling, Nestling, and Adult. The Hatchling and Nestling columns are ranges of weights. The Adult (f) column tells you where each species is going to end up. How can this information help you nail down your ID?

First you have to make a guess as to the age of your bird. Next you must weigh him in grams. Finally, you can look at the chart to determine what species are a possible "fit" for that weight.

The basic principle is: a lightweight hatchling is going to grow up to be a lightweight adult. A four gram hatchling is never going to grow up to be an 87 gram adult. He's too small. He might, however, turn out to be a mid-range adult like a towhee (52 grams). Conversely, a six gram hatchling is never going to grow up to be a bushtit. He's too big. A full grown adult bushtit would be lucky to weigh six grams.

Weights really can be the deciding factor in making an identification. Robins and mockingbirds are often mistaken for one another. But at every stage of his life, a robin will weigh almost twice as much as a mockingbird.

Further Clues

Sometimes nestlings give us auditory clues in the form of feeding calls. They make a sound as they beg for food. The chart has a range of descriptions of feeding calls, all of them very subjective. What one person hears as a "chirp" might be a "cheep" to another. Information about whether the feeding call is a single or repeated note can be helpful.

As down is replaced by feathers, birds are easier to identify. The pattern of growth can be important. Some birds get their first feathers on the top of their heads. Others have bald eyes. Older nestlings often have distinctively speckled breasts or colored feathers.

Some species have special features unique unto themselves. Robins have a very yellowish skin. Goldfinches sport a little red dot next to the hinges of their beaks. Bushtit females have blue eyes. Bewick's wrens have down only on their heads.

Conclusion

Why does identification of young birds matter? After all, they are going to grow up to be something aren't they? Maybe, maybe not. For centers that euthanize non-native species, proper ID's are obviously crucial. Diet is a second justification for making the effort. In most centers insect eaters are given a different diet than seed eaters. Feeding nestlings the wrong diet can be hazardous to their health.

Housing is another factor. Incoming avian patients have already had an upsetting day. Putting them in the wrong kind of housing (e.g., open nesters in a simulated cavity nest and vice versa) can greatly increase their trauma.

For many of us, however, normal human curiosity is the driving force for nestling identifications. It certainly is for me. Who, when faced with a nest of mysterious strangers, can resist playing Sherlock Holmes? The chart has been an ongoing project thanks to the input of many dedicated volunteers. It has proven a trusty aid. Hopefully, you will find it useful, too.

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Author Profiles

Marty Johnson has been a wildlife rehabilitator for over fifteen years. She specializes in raising robins and has written an article for the IWRC Journal on that subject (Vol. 9, No. 3). She is the editor of the Wildlife Rescue, Inc. newsletter.

Artist Deborah Melmon is a freelance illustrator living in Menlo Park. She also specializes in raising robins. She is a three-time past president of Wildlife Rescue, Inc.

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where knowing your bird comes in. Some species, like doves, can at times pull toes tightly together so that their foot becomes quite narrow and may slip through a jess that is slightly large. Place a piece of string around the circumference of the bird's lower leg, joining the two ends of string and marking with a pen where you wish the bracelet of ribbon to be created by the snaps. Birds with small feet will need a pretty snug fit. The "bracelet" area (area between the outer circumference of male and female snapper parts) could have an ultra suede lining to create a soft but secure fit. There must be enough room so that the snaps do not touch the legs when being pressed together, and so the bracelet is easily movable on the leg. The length of the string between pen marks will be the distance between the snaps, male and female, installed on each of the two jess ends of the snap jess apparatus. Remember to measure to the outer circumference of each snap, or else you will snap the bird's leg in the snap.

bracelet circumference

As you design equipment for more and more species, you will have various size sets on hand that can simply be tried on a bird with somewhat similar legs. Small adjustments can then be made from the measured circumference on the trial bracelet and used in making a new bracelet.

Procedure for making the jesses

Once you have determined the bracelet circumference for a particular bird, you are ready to assemble the one piece snap jess apparatus. The length of the apparatus should be dependent on the type of bird and the plan for using the equipment. For a magpie or a jay, glove work can be accomplished easily with a 12 to 18 inch apparatus, whereas flying to a perch or ground foraging might require 3 feet or more.

For a simple ribbon snap jess:

1. Cut twice the length of ribbon you wish for the final product plus approximately 3 inches.
2. Thread the ribbon through the solid eye of a plastic hook.
3. Match the ends of the untwisted ribbon together with the hook in the center of the ribbon strip and thread the ends of ribbon together through a cord stop. The hook should now be on one side of the cord stop and two equivalent lengths of ribbon on the other.
4. Individually heat seal the cut ribbon edges with the lighter.
5. Snaps should be installed on the two ribbon ends to create bracelets using a hammer, Dritz™ Gripper Snap Fastener Easy Attacher (see photo on pg 14) and the following instructions:
6. Each snap set forming the bracelet has a "female" button portion and a "male" snap portion backed and held on to the ribbon by an anchor ring. The ring, ribbon and male or female snap portion are placed in the Gripper Attacher, which is then hit with a hammer to permanently affix the portions to the ribbon, much like a grommet would be hammered onto leather. Please refer to the step wise pictures and diagrams to help visualize how to properly install the snaps.
7. Install the male snap portion first on each of the ribbon ends. To do this, fold over the heat sealed edges of the two ribbon ends, thus doubling the ribbon where the male snap portion will be installed. The ribbon edges should be folded towards one another, and should be on the same side of the ribbon as where the anchor ring will be placed (Diagram 1). The position of the male snap portion should be 1/4" to 1/2" from the fold, between the fold and the heat sealed edge, giving the person working with the finished apparatus small "pull tabs" to use to open and close the snaps forming the bracelets. The finished apparatus should have the anchor rings on the two ribbon ends directly opposite one another, with the male and soon to be installed female portions facing

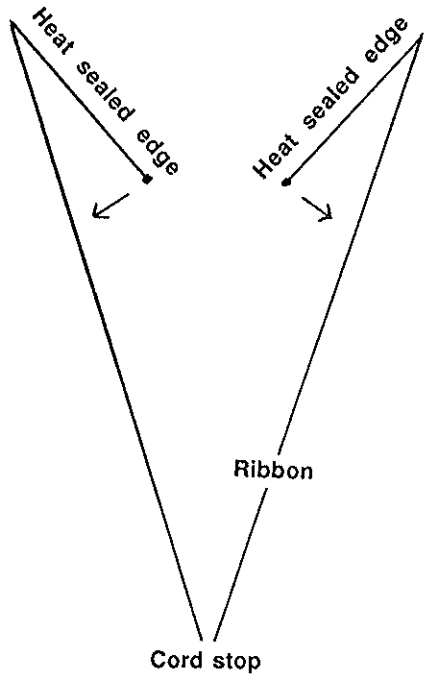


Diagram 1

outward and away from each other (Diagram 2).

8. Now on each end install the female button portion between the male snap portion and the cord stop, with the distance between the outer circumferences of the male and female portions being the desired bracelet size as determined in the procedure for fitting the equipment to the bird.

9. The jess apparatus is now complete and ready to be used. Refer to the "Instructions for snap jess use" to understand how this equipment is placed on the bird.

Our most common ribbon/snap combination is size 15 snaps with 3/8 inch width ribbon. We've accommodated birds ranging from magpies down to shrikes using this combination. When we feel a bird might need more support from a bate off the glove, or we have a larger leg or unusual glove position like a woodpecker, we have tried a size 16 snap 5/8 ribbon combination. Birds with tender feet or legs, or unusual glove position are aided by lining the inside of the ribbon under the snaps with a strip of Ultra Suede cut slightly larger than the ribbon surrounding the snap for extra padding. If Ultra Suede is used, it is not necessary to fold the ribbon ends under the snaps. Please note under "Patterns for various types of birds" that when making a pattern from a finished snap jess, and using that pattern to create a new snap jess, we measure from the center of the male snap portion to the center of the female button portion to determine the snap length to accurately reproduce bracelet size.

Instructions for snap jess use

The snap jess is a one piece apparatus, with parts, if you use your imagination, similar to more traditional types of falconry equipment, but

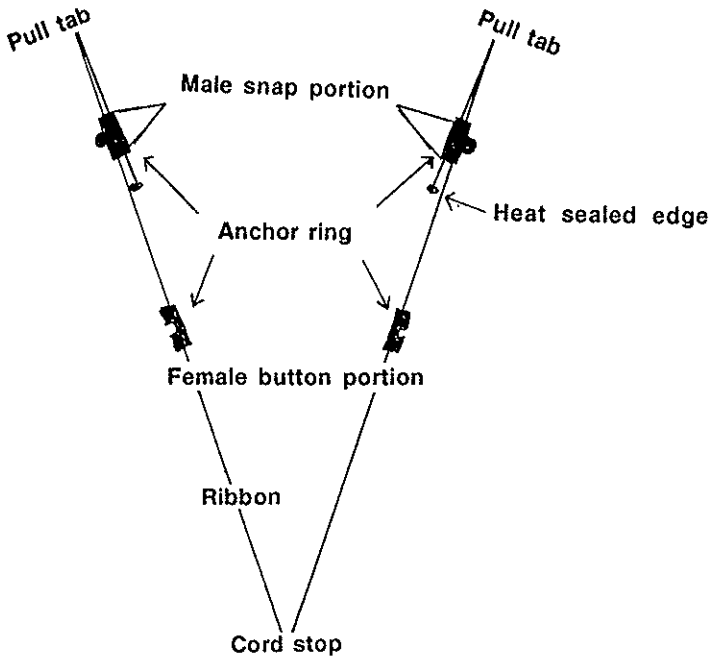
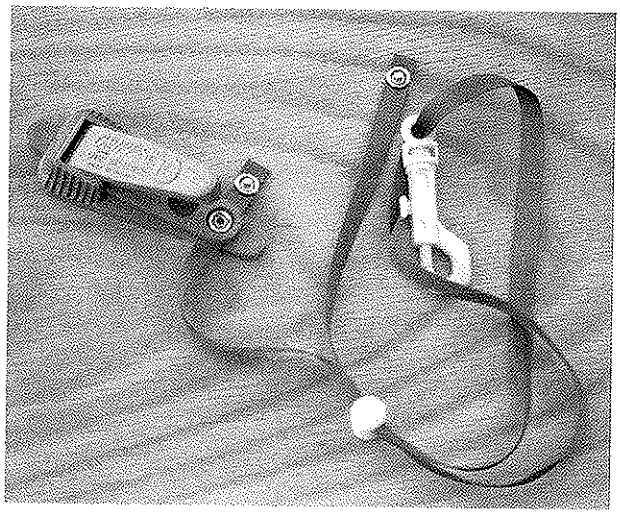
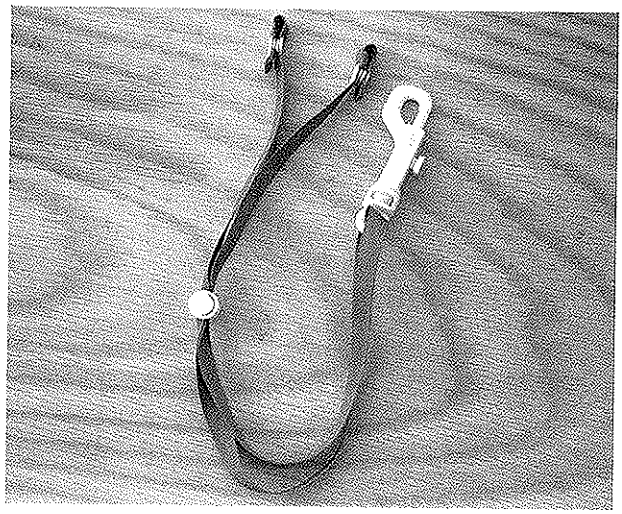


Diagram 2

overall, easier for the bird to live with. The snappers form bracelets when snapped on the bird's legs. If the equipment is made correctly, with snap male and female parts facing outward and away from the opposite matching part, the ribbon ends can be placed between the bird's legs, around the back of each leg and snapped on the outside of the leg to prevent irritation. The cord stop determines how long the jesses extend from the bracelets. The cord stop position is adjustable. The cord stop also acts, just like the swivel on leather jesses, as an anchor, preventing the equipment from slipping through fingers. The remaining ribbon loop, whether it be long for ground or flying work, or short for glove work, ends with a plastic hook for ease of attaching the bird temporarily to a perch or other anchor.



Attaching the female button between the male snap and cord stop.



Completed jess apparatus.

Patterns for various types of birds

In our little more than a year and a half of experimenting with this type of equipment, we have found it to be reliable and durable through the use of a team of about 25 handlers. Experience has shown that a bird such as a magpie can be temporarily perched using this equipment without the snaps coming undone and with little immediate wear and tear on the ribbon. Even a determined shrike was unable to release itself while being manned to the glove. We have found the most reliable way to store and reproduce our snap jess bracelet sizes for particular birds to be as follows. Once a snap jess proves to be successful, we note the size snaps and ribbon width used as well as if Ultra Suede was used for a lining and label the ribbon with the bird's species. The snap length, the distance between the centers of the male and female snap parts, is also recorded.

We have created a chart to give the reader some guidance in the creation of snap jesses. Please remember when using our sample patterns that every bird's leg is slightly different and the measurements are only beginning guidelines.

BIRD	*Snap Size*	*RibbonWidth*	*Snap Length*	
Magpie	*#15*	*3/8*	*25.0 mm*	
Shrike	*#15*	*3/8*	*21.0 mm*	*Ultra Suede lining*
	#15	*3/8*	*20.0 mm*	
Acorn Woodpecker	*#16*		*27.0 mm*	*Entire jess made with 5/8 inch strip of Ultra Suede, doubled under snaps*
	#16	*5/8*	*25.0 mm*	*Ultra Suede lining*
Flicker	*#16*	*5/8*	*26.0 mm*	*Ultra Suede lining*
Band tailed Pigeon	*#16*	*5/8*	*34.5 mm*	
Yellow Billed Cuckoo	*#15*	*3/8*	*26.5 mm*	
Mourning Dove	*#15*	*5/8*	*24.0 mm*	
Cedar Waxwing	*#15*	*3/8*	*19.5 mm*	
Scrub Jay	*#15*	*3/8*	*25.5 mm*	

Job Line

Rehabilitation Manager
Manage animal care operations, supervise staff, work closely with staff veterinarian, coordinate intern program, maintain records. *Salary:* $24,000/yr, health ins. & 4.5 wks vacation/yr. *Requirements:* Min. 2 yrs rehabilitation experience at a large center; 1 yr of supervision.

Wildlife Shift Supervisor
Wildlife shift supervisor to manage daily care and treatment of wildlife, supervise volunteers, interns and seasonal staff. *Salary:* $19,975 & full benefits. *Requirements:* Min. 1 yr experience; 6 mons. supervisory experience. Send resume to Jeanne Wasserman, Howl Rehab Ctr. P.O. Box 1037, Lynnwood, WA 98046. (206) 787-2500 ext. 815 Fax: (206) 742-5711

New Raccoon Standards Proposed

A change in the minimum cage sizes for raccoons has been proposed for the IWRC/NWRA Rehabilitation Standards. Presently, there is no minimum square feet requirement per animal. The proposed change is 30 square feet per animal which is equivalent to 5' x 6' per raccoon. Under this standard, a cage 40'L x 20'W (800 sq. ft.) could adequately house 26 raccoons.

All members are invited to comment on this proposal on or before December 31, 1995. Comments should be send to the Jan White, DVM, Standards Chair, 4437 Central Place Suite B-4, Suisun, CA 94585.

J. Wildlife Rehab 18(3):16-20

Considerations for the Successful Release of Rehabilitated Migratory Songbirds: The Importance of Accurate Species Identification and Knowledge of Regional Migration Patterns, A Case Study

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ABSTRACT

Migratory bird species tend to follow specific migration routes between their wintering and breeding sites (Lincoln, 1979). Therefore, in order to successfully release migratory birds back into the wild, wildlife rehabilitators need to accurately identify these species and must know their regional migration routes, times, and destinations. If inaccurately identified, migratory bird species will probably be released into the wrong places at the wrong times, thus reducing their chances for survival. This paper examines the importance of accurate species identification and knowledge of regional migration patterns for the successful release of rehabilitated Swainson's Thrushes (*Catharus ustulatus*) and Hermit Thrushes (*Catharus guttatus*) in Santa Clara County, California.

Key Words: rehabilitated migratory songbirds, Swainson's Thrushes (*Catharus ustulatus*), Hermit Thrushes (*Catharus guttatus*), regional migration patterns, release, Santa Clara County/Valley.

Introduction

Upon quick glance, Swainson's Thrushes (*Catharus ustulatus*) and Hermit Thrushes (*Catharus guttatus*) look almost identical to each other with their brown backs and speckled breasts. Both sing ethereal, flute-like songs; feed on insects, spiders, and fruit; and tend to inhabit moist, coniferous woodlands (Ehrlich et al., 1988). Hence, wildlife rehabilitators may easily confuse these two species and/or merely recognize them as "thrushes" during treatment. However, rehabilitators in the Santa Clara Valley must always distinguish between patients of these two thrush species because their different migration patterns and destinations determine the optimal times and locations of their release.

Swainson's Thrushes' Migration Patterns and Destinations

Swainson's Thrushes are Neotropical migrants who travel through Santa Clara Valley's riparian corridors and deciduous forests during their fall and spring migrations: from August to October and from April to June, respectively (Shields and Katano, 1994; Figure 1). Swainson's Thrushes never spend their winters in the Santa Clara Valley, nor do spring migrants typically

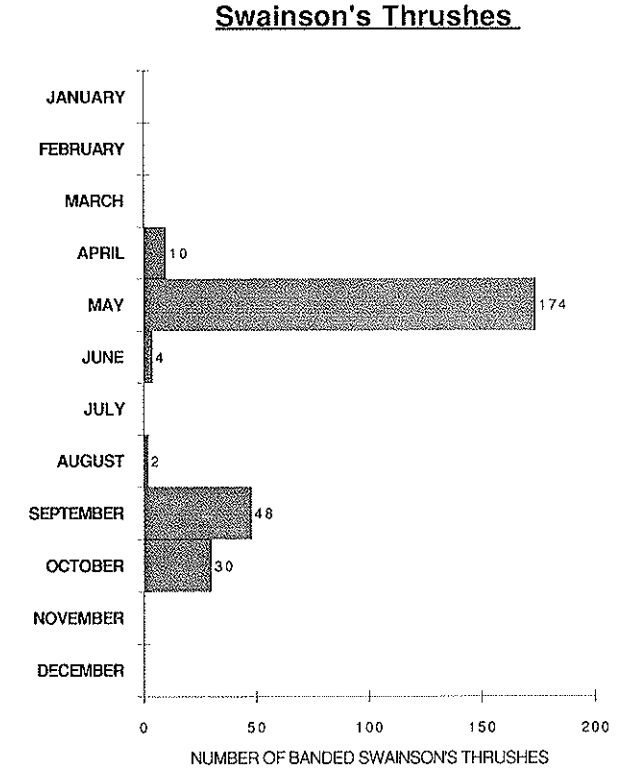

Figure 1. Number of banded Swainson's Thrushes, per month during 1993, at Coyote Creek Riparian Station, Alviso, California (Shields and Katano, 1994).

remain there to breed.

During spring migration, Swainson's Thrushes move northward into higher elevations and latitudes of North America, where they breed in moist woodland, spruce forests, coniferous forest edges, orchards, swamps, and riparian thickets (Ehrlich et al., 1988; Peterson, 1990; National Geographic Society, 1992). In southwestern Santa Clara County, Swainson's Thrushes are rather uncommon to fairly common breeders along riparian corridors flowing down the eastern slopes of the Santa Cruz Mountains (Bousman pers. comm., 1995). Swainson's Thrushes are more common and abundant breeders in coastal riparian areas of nearby, western Santa Cruz County (Bousman pers. comm., 1995). Figure 2 shows breeding areas of Swainson's Thrushes in Santa Clara County.

During fall migration, Swainson's Thrushes travel long distances southward from their North American breeding grounds to spend wintertime in tropical forests of Central and South America, from central Mexico to northwest Argentina (Ehrlich et al., 1988). Rarely, when their migration has been hampered by bad weather or by other factors, a few Swainson's Thrushes will appear in the Santa Clara Valley during unexpected times, such as late fall.

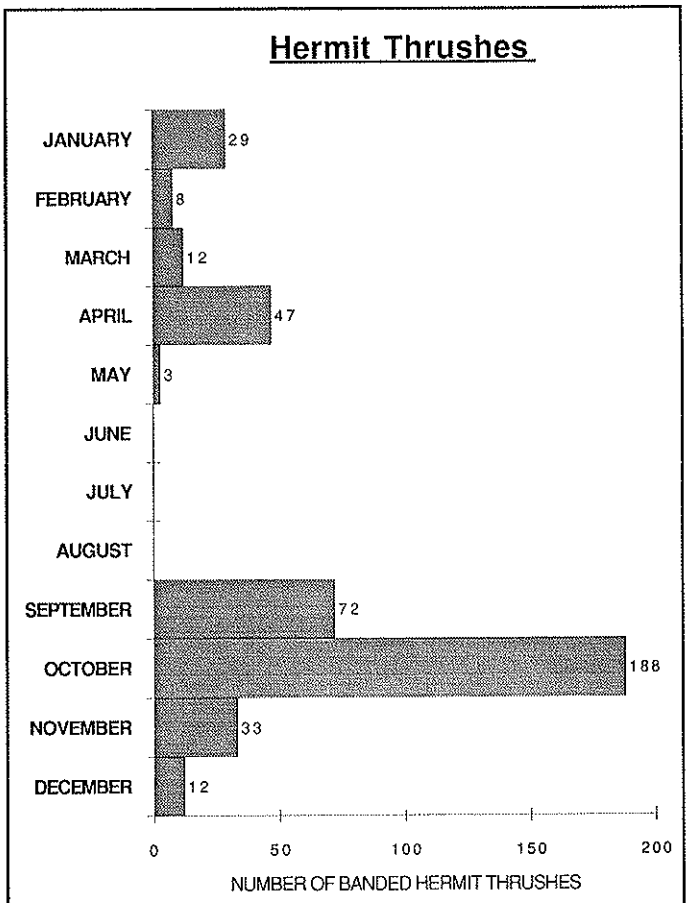

Figure 3. Number of banded Hermit Thrushes, per month during 1993, at Coyote Creek Riparian Station, Alviso, California (Shields and Katano, 1994).

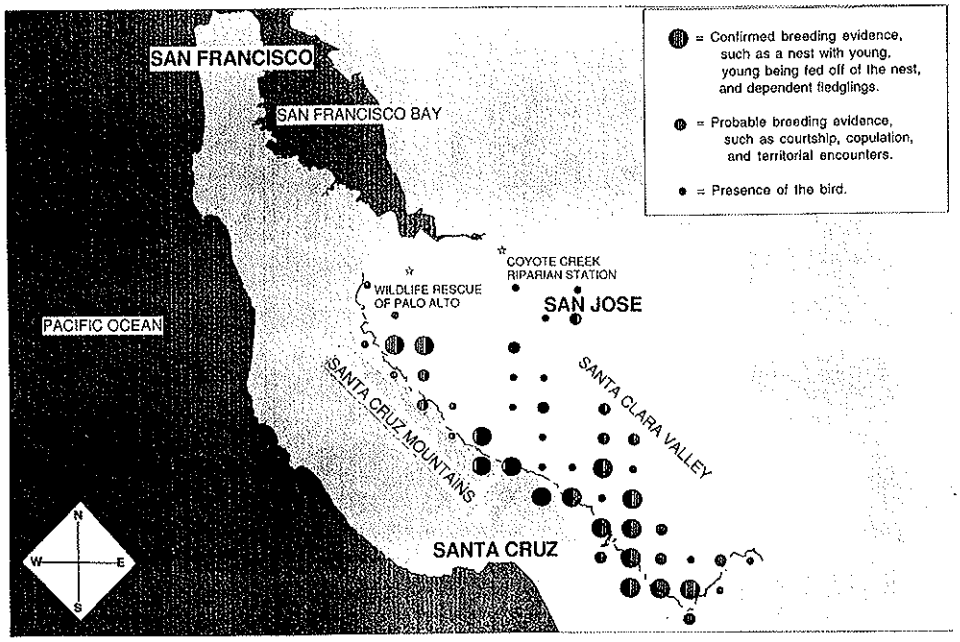

Figure 2. Breeding areas for Swainson's Thrushes in Santa Clara County during 20 May to 21 July (1987 to 1993) according to a preliminary report of the Santa Clara County Breeding Bird Atlas (Bousman pers. comm., 1995).

Hermit Thrushes' Migration Patterns and Destinations

Hermit Thrushes, on the other hand, are common winter residents in woods, parks, and thickets of the Santa Clara Valley from September to May (Peterson, 1990; Shields and Katano, 1994; Figure 3). During spring migration, many Hermit Thrushes ascend to the Sierra Nevada Mountains, where they breed in moist coniferous, mixed, or deciduous forests or forest edges (Ehrlich et al., 1988; National Geographic Society, 1992). Some Hermit Thrushes also breed in higher elevations of the Santa Cruz Mountains, where they commonly associate with wet, coniferous forest rather than with riparian areas (Bousman pers. comm., 1995). Relatively few and scattered breeding pairs occur in the Santa Cruz Mountains of southernmost Santa Clara County (Bousman pers. comm., 1995). Figure 4 shows breeding areas of Hermit Thrushes in Santa Clara County. Table 1 compares Swainson's and Hermit Thrushes' wintering and breeding grounds and their migration patterns through the Santa Clara Valley.

Identification of Swainson's and Hermit Thrushes

During rehabilitation, Swainson's and Hermit Thrushes are most easily distinguished by their plumage colorations. Swainson's Thrushes have uniformly olive-brown upperparts and tail feathers, whereas Hermit Thrushes' brown upperparts contrast with their rufous rump and tail feathers (Pyle et al., 1991). Swainson's Thrushes also have a conspicuous, buff eye-ring and have buff on their cheeks and on their upper breasts, unlike Hermit Thrushes (Peterson, 1990).

Specific Release Criteria

Once Swainson's and Hermit Thrushes have been accurately identified, wildlife rehabilitators in Santa Clara County will consider these issues regarding their release: Does the survival of rehabilitated Swainson's Thrushes become jeopardized when they are released in the Santa Clara Valley during winter (while they should be in Central and South America) or during summer (while they should be breeding at higher elevations)? How will a rehabilitated Hermit Thrush survive and reproduce in the Santa Clara Valley, if it is released during summer, while its conspecifics (individuals of the same species) have already moved to higher elevations to breed? Will food sources be available to a rehabilitated thrush at the time and location of its release? Are conspecifics currently inhabiting or migrating through the Santa Clara Valley? If released during its migration period, will a rehabilitated thrush be physiologically prepared for migration? Does it have enough fat reserves? Has it undergone its prebasic (late summer) molt? Are appropriate visual cues and stimuli, such as the photoperiod, landmarks, and seasonal star patterns, present so that a

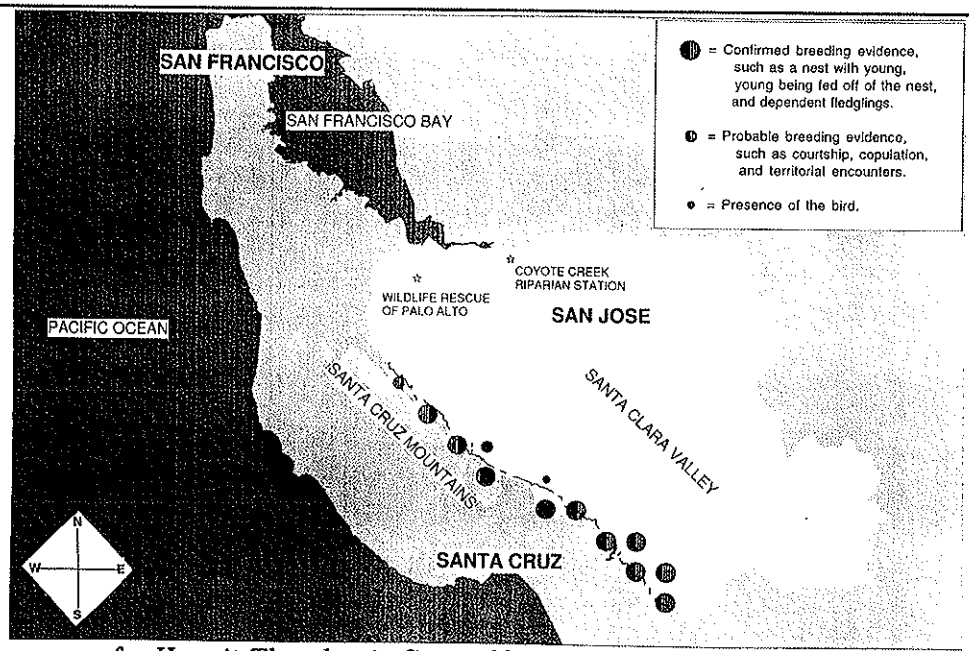

Figure 4. Breeding areas for Hermit Thrushes in Santa Clara County during 5 May to 18 July (1987 to 1993) according to a preliminary report of the Santa Clara County Breeding Bird Atlas (Bousman pers. comm., 1995).

released thrush will properly orient itself for migration? Is the weather favorable for migration? Or, are there storms and/or strong, adverse winds occurring along a thrush's migration route?

Rehabilitated Swainson's or Hermit Thrushes should be released into riparian areas, or other wooded habitats, when flocks of thrushes are presently stopping over during migration and where insects and/or berries are already plentiful. Both Swainson's and Hermit Thrushes migrate nocturnally in loose flocks, which guide them to their destinations, and are occasionally accompanied by migrating Wood Warblers, sparrows, and flycatchers (Pettingill, 1970; Lincoln, 1979). After travelling all night, thrushes stop during the daytime to feed on rich food sources, primarily insects and/or berries (Ehrlich et al., 1988). These stopovers enable migratory birds to restore their fat reserves before another long flight (Lincoln, 1979). Before releasing a rehabilitated thrush during its migration, it should already have accumulated fat deposits around its body. Fat is usually most noticeable as a yellow layer or lump in the area between the furculum, around the cloaca/vent, and/or under the shoulders.

Both Swainson's and Hermit Thrushes undergo one molt per year, during the late summer: the prebasic molt. Swainson's Thrushes complete their prebasic molt from July to September on their summer grounds and/or during the early part of fall migration (Pyle et al., 1991). Hermit Thrushes complete their prebasic molt from August to September on their summer grounds, before fall migration (Pyle et al., 1991). Hatching-year (hatched during the current year) thrushes of both species molt their body feathers, but no flight feathers; whereas after-hatching-year thrushes molt all of their feathers, including wing feathers (Pyle et al., 1991). Molt takes place symmetrically on a bird's wings. Therefore, asymmetric molt, or molt along only one wing, is usually indicative of accidental, or "adventitious," loss and is not considered to be molt (Pyle et al., 1991). A rehabilitated thrush should have completed most of its prebasic molt prior to fall migration. If a rehabilitated thrush is just beginning to molt when it is released during fall, it may migrate with difficulty, especially if its wing feathers are very old and worn.

There are several theories about how birds are able to orient and navigate during migration. Birds may use memory of visual landmarks to guide them on their journeys (Bellrose, 1972; Lincoln, 1979). Sauer (1957, 1958) postulated that nocturnal migrants, like thrushes, use the pattern of the stars to help them navigate. Later, Emlen (1969) hypothesized that the seasonal characteristics of the photoperiod (duration of daylight) may influence birds' physiological states and trigger their orientation toward either north or south. During rehabilitation, daily exposure of a thrush to environmental conditions, such as natural daylength and celestial patterns, may physiologically prepare this bird for proper orientation and navigation during its migration.

	Swainson's Thrush	Hermit Thrush
Presence in Santa Clara Valley		
time	August to October (fall migration) April to June (spring migration)	September to May (wintertime)
location	riparian corridors and deciduous forests	woods, parks, and thickets
Wintering Grounds		
range	central Mexico to northwest Argentina	includes the Santa Clara Valley
habitat	tropical forests	woods, parks, and thickets
Breeding Grounds		
range	Alaska, British Columbia, Washington, and Oregon; locally in the Santa Cruz Mountains, primarily along the western slope.	Sierra Nevada Mountains; locally in higher elevations of the Santa Cruz Mountains, primarily along the western slope.
habitat	moist coniferous woodland, forest edges, orchards, swamps, and riparian thickets	moist coniferous, mixed, or deciduous forests and forest edges

Table 1. A comparison of Swainson's and Hermit Thrushes' presence in the Santa Clara Valley and their breeding and wintering grounds.

Conclusions

As shown by the rehabilitation and release of Swainson's and Hermit Thrushes in Santa Clara County, California, optimal times and locations for release are dependent on accurate species identification and on knowledge of regional migration patterns. Careful consideration of these important criteria, before any release, may improve rehabilitated, migratory birds' chances for survival in the wild. Rehabilitators of migratory passerines may find the following sources useful for developing their own release strategies: *Migration of Birds*, a U. S. Fish & Wildlife Service Circular, explains the principles of avian migration, using many bird species as examples. *Identification Guide to North American Passerines* (Pyle et al., 1991) provides scientifically-based criteria for species/subspecies/racial identification, molt, fat reserves, and age and sex determination (crucial for species whose sexes and/or ages travel separately during migration). Field guides with range maps give general information about bird species' breeding and wintering grounds. County Breeding Bird Atlases indicate regional locations and habitats for each breeding bird species, and Audubon Societies' Christmas Bird Counts establish the presence and abundance of bird species in their regions during winter. Lastly, avian monitoring programs of biological research stations, of universities, of state wildlife agencies, and/or of the U. S. Fish & Wildlife Service may have data concerning bird species' fall and spring migrations and stop-over sites. Hopefully, this paper will encourage other wildlife rehabilitators to devise their own protocols for successful release of rehabilitated migratory birds.

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Author Profile

Susan Sandstrom performed wildlife rehabilitation for about two years at Wildlife Rescue, Inc., of Palo Alto, California, after graduating with a BA in Biology from the University of California, Santa Cruz. Since that time, she has also been a subpermitted bird bander at Coyote Creek Riparian Station in Alviso, California. As a bird bander, Susan helps p scientifically monitor the demographics of migratory landbirds, such as Swainson's and Hermit Thrushes, and their utilization of riparian habitat during migration.

During Susan's 1994 internship at Wildlife Rescue, she conducted several independent research projects. Her primary research project was a survey of cat-caught birds and of the domestic cats who attacked them. As a result of this research, Susan produced a public outreach pamphlet, " Protecting Wildlife From Domestic Cats". She also wrote a proposal for educational pamphlets which would provide local residents with preventive measures and solutions to urban wildlife issues. Susan produced this paper about Swainson's and Hermit Thrushes after wondering about how accurate identification and regional migration patterns impact the release of migratory birds.

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Passerine Rehabilitation: What About Habitat?

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ABSTRACT

Providing appropriate natural habitat for passerines in wildlife rehabilitation is reviewed. Specific native plant foods are discussed with details on housing for various types of songbirds (Chipping Sparrow, Mockingbird, Common, Green-backed or Lawrence's Goldfinches, and flycatchers, kingbirds and phoebes). The reader is given tips on how to apply this kind of information to other species not included in the article.

Key Words: passerines, Chipping and Lark Sparrow, Mockingbird, Common, Green-backed or Lawrence's Goldfinches, Scrub Jay, California Thrasher, Cedar Waxwing, Western Meadowlark, Red-winged Blackbird, Bullock's Oriole, Brewer's Blackbird, Western Tanager, House-Finch, Pine Siskin, Brown Towhee, captive housing, captive/natural foods.

Introduction

The rehabilitation of passerines not only involves the maintenance of these birds but also includes providing as natural an environment as possible while in our care. As rehabbers, our historically standard approach of examining, weighing and then placing the already stressed bird in an unnatural sterile environment of a tissue-lined plastic nest with paper towel flooring, seems to defeat our whole purpose. We place these orphaned birds in a foreign environment instead of the more natural setting to which the bird is accustomed.

Detail

At our facility we employ a natural approach to housing, designed to be ultimately less stressful and healthier for the orphaned young and injured adults in our care. The one vital and critical question that we ask ourselves with every species is "what about habitat?"

The most effective way to construct the proper housing is to study the individual passerine's habitat, niche and feeding habits. Knowing where the bird lives, its niche and feeding habits greatly assists us in determining what will be a complementary habitat for a specific species. To further clarify this, rehabbers must be willing and ready to ask themselves a series of questions. Is this bird a canopy or a ground dweller? Where specifically does this bird live? What are the food habits at any given time of the year? Are there any obvious or subtle behaviors or sensitivity to certain colors or sounds? Is this a solitary or communal species? Does this species have a mutualistic or symbiotic relationship with a specific animal or plant? The more experienced the rehabber becomes, the greater the list should be. The point being—"Know your species!"

By implementing a few extra, sometimes tedious steps in the housing of a particular species of passerine, the rehabber will achieve monumental rewards and reap higher success rates.

The room in which our passerines are housed is equipped with Vita-lites® to promote Vitamin D_3 production in captive birds. We have discovered that our habitat enclosures (see housing section) do not necessarily have to be completely cleaned every day, thus minimizing the stress factor and contact with the birds. Since birds don't have a well-developed olfactory nerve, their sense of smell is minimal. Visual recognition of food items is essential to the learning process and can be accomplished with the introduction of appropriate habitat into their enclosures.

We have chosen four (4) species/families of passerines to use as examples of how we set up their housing. (Other Bird/Plant Relationships and Tips are shown in the tables below following this discussion).

Chipping Sparrow (*Spezella passerina*)

Diet:	(live invertebrates) - grasshoppers, caterpillars, beetles, leaf-hoppers, true-bugs, ants, wasps, spiders.
Plant food:	filaree, pigweed, bristlegrass, oats, chickweed, needlegrass, blue grass, redmaids, minerslettuce.
Habitat:	forest floor dwellers, open woodlands.

Mockingbird (*Mimus polyglottis)*

Diet:	(live invertebrates) - beetles, ants, bees, wasps, grasshoppers, weevils, cabbageworms, cutworms.
Plant food:	grape, pepper tree, fig, cedar, poison oak, toyon, elderberry, nightshade, laurel sumac, blackberry, Virginia creeper.
Habitat:	scrub, forest understory. Uses low-to-dense vegetation as cover, forage on the ground.

Goldfinches: **Common Goldfinch** (*Carduelis tristis*)
Green-Backed Goldfinch (*Carduelis psaltria*)
Lawrence's Goldfinch (*Carduelis lawrencei*)

Diet:	(live invertebrates) - aphids and caterpillars.
Plant food:	(varies for species) sunflower, star-thistle, filarees, tarweed, oak, pigweed, turkey mullein, mayweed, oats, miners lettuce, nightshade, sage, selene, fiddleneck, chamise, redmaids, Russian thistle, chickweed, peppergrass, knotweed, shepherd's purse, cryplantha.
Habitat:	riparian woodland, brush, roadsides, patches of weeds and thistle.

Flycatchers, Kingbirds, Phoebes (*Tyrannidae*)

Diet:	(live invertebrates) flies and other winged insects. True flies are the leading item. Mosquitoes, small moths, flying ants, small beetles.
Plant food:	phoebes and kingbirds use small fruits as a minor part of their diet (blackberry, mulberry, elderberry, grape).
Habitat:	streamside environments, riparian communities, riparian woodlands. Flycatchers spend most of their time on leaves.

Housing of Passerines

The following is standard procedure for all passerines:

Hatchlings/Nestlings: An aquarium is lined with paper toweling. While we still use a tissue-lined nest for a hatching, this nest is surrounded by grasses and specific foliage indicative of the specific species. A small cup is filled with wet paper towels to provide humidity and a heating pad is placed under the aquarium.

STAGE I

Fledglings: Once the passerine has begun to perch on his nest, it is graduated to a larger housing unit. This is where the creativity and knowledge of the rehabber comes into play. Each cage unit is replicated to resemble a mini-habitat that is specific to the individual species.

1) The Chipping Sparrow cage is complete with streamside tree branches and grasses. A dirt dish is added for bathing and foraging. Mealworms, bird seed and grasses are placed on top of the dirt. The dirt dishes allow the sparrow to become familiar with eating off the ground.

2) Mockingbird cages are filled with berry-bearing shrubs and trees that are native to our area. Toyon berry branches and laurel sumac shrubs are overflowing in their cages. Grapes and berries are hung from the cage unit to encourage

natural feeding. Since mockingbirds are very territorial, their numbers are limited in cage units. A grass area is provided by using a square shallow pan filled with clumps of grass wedged together. Mealworms are put in the grass area for the birds to find.

3) Goldfinches are very difficult to raise. Their finicky eating habits can be quite trying. The Goldfinch's nest is placed into the cage unit to reduce the stress level. Color recognition is vital here. Sunflowers, thistle, mustard weed, and fiddleneck engulf the goldfinch cage. Small flowers with aphids are also added. The wide variety of yellow foliage allows the nervous finches to be camouflaged and gives them a sense of security. Providing a wide variety of foods helps stimulate self-feeding.

4) Flycatchers, kingbirds and phoebes need a totally different environment from the above-mentioned species. When these species are ready for a cage we place the unit in a vertical position so there is plenty of height. Branches of cottonwoods, Arizona ash and other trees of the riparian communities are placed in the enclosure. Feeding cups filled with mealworms and other insects are attached to the sides of the unit, high up. Berries are hidden toward the bottom of the cage in the foliage.

A benefit of added foliage in the cage is that the birds cannot see you anymore than you can see them. A word of caution should be noted at this point: The birds that you are still feeding will be and should be hard to find in the habitat enclosures. Remember how many you have graduated to this set-up so that none are missed at feeding time.

STAGE II

Fledglings: Once completely self-feeding, the birds are moved to our outdoor aviary to complete the rehabilitation process. The transition of being moved from our medical center to the outside aviary can be quite stressful to the birds. However, we have mitigated the stress level by providing the same habitat with which birds are familiar.

Conclusion

The bottom line in dealing with passerines is to study and know the species. It is the rehabber's responsibility to go beyond the traditional basic

Common Bird/Plant Relationships

Species	*Habitat*	*Plants*
Scrub Jay	oak, pine woods, groves, suburbs	Oak, pine, corn, raspberry,oats, elderberry, manzanita, sumac, cherry, plum, blueberry, wheat huckleberry
California Thrasher	scrub, brush, woodland borders, chaparral	Poison oak, laurel sumac, elderberry, oak, raspberry, buckthorn, grape, bearberry, black nightshade, mistletoe, wheat
Cedar Waxwing	open woodlands, orchards	Peppertree, cherry tree, grape, mistletoe, strawberry, filaree, gooseberry
Western Meadowlark	meadows, fields, prairies	Pacific oats, wheat, corn, filaree, tarweed, fiddleneck, California poppy
Red-Wing Blackbird	marshes, swamp, meadows, pastures, wetlands	Oats, wheat, rice, barley, corn, knotweed, redmaids, filaree, tarweed, millet, bristlegrass
Bullock's Oriole	Oak woodlands, riparian	Cherry, fig, raspberry, sorghum, peach, apricot, elderberry, grape, mulberry
Brewer's Blackbird	marshes, swamp, meadows, pastures	Oats, wheat, barley, filaree, corn, rye, chickweed, tarweed
Western Tanager	woodlands, oak	Cherry, raspberry, mulberry, elderberry, serviceberry
Black-headed Grosbeak	groves, woods, pine forests	Fig, elderberry, cherry, oats, raspberry, filaree, wheat, prune, milkthistle, redmaids

Common Bird/Plant Relationships

Species	*Habitat*	*Plants*
House Finch	ubiquitous, chaparral, deserts, coastal valleys	Filaree, turkey, mullein, mustard, knotwood, star thistle, chickweed, wild radish, tarweed, minerslettuce, elderberry, corn, spurrry, sedge apple, pine
Pine Siskin	coniferous/mixed woods, forests, shrub fields	Filaree, pine, alder, star thistle, eucalyptus, minerslettuce, sunflowers, chickweed, Douglas fir
Brown Towhee	chaparral, scrub, brushy woodland edges, scrub communities	Oats, barley, ryegrass, fescue grass, tarweed, minerslettuce, nightshade, filaree, elderberry, laurel sumac, blackberry, fiddleneck
Lark Sparrow	open woodlands, mesas	Redmaids, oats, knotweed, wheat, tarweed, turkey mullein, filaree, chickweed, pigweed

Tips

1. Get to know your native plants. Contact native plant societies and botanical gardens for further information.
2. If native plants are not available, the use of any type of foliage is better than none at all.
3. Try to apply the habitat concept to all of the animals. Use small logs and branches and hollowed out logs for the creatures who like to hide. Rocks, dirt and grasses in shallow pans help stimulate foraging.
4. Plant specific trees and shrubs around your house or property that you can use for habitat
5. Study natural history books of your given area. They are extremely helpful in creating habitat.

approach of rehabilitation. As the rehabbers delve deeper to seek the knowledge necessary to assist in the caring of the passerines, they will begin to discover and understand how critical is the interdependent relationship between animals and plants, and how the incorporation of foliage into their housing is vital to the ultimate goal of successful release. The paramount and solitary goal of rehabbing is not for the animal to become accustomed to a contrived human environment, but for the species to become familiar with and comfortable in their own natural habitat.

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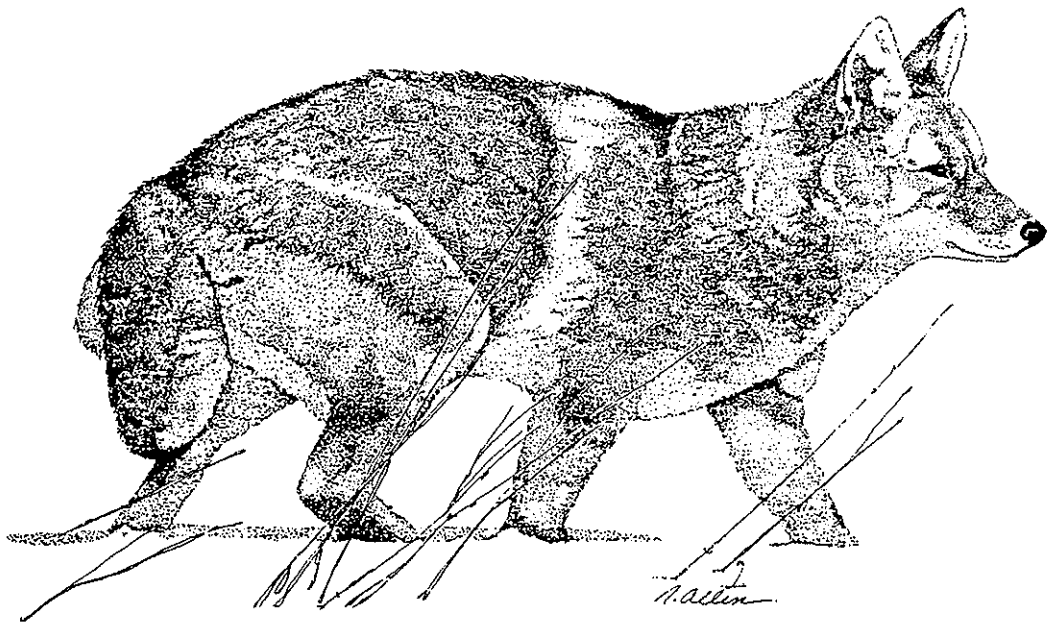

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