

# Public Education

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## THE ROLE OF PUBLIC EDUCATION

Conservation scientists have a responsibility to disseminate the results of the work they do to the public. This is so not only because science is “public knowledge,” but also because doing so helps conservationists and scientists build approval and support for their work among the general public. Simply put, if raptor biologists and managers hope to continue being supported by the public and its institutions, they need to educate the public about birds of prey and the need to study and protect them.

Education is the product of a formal or informal learning experience. Public-education programs generally are informal learning experiences (Livingstone 2001), and it seems likely that most of the time most of

the public will be exposed to raptors and gain information about them in an *ad hoc*, informal, and passive manner.

Learning has been defined as an active process in which learners construct meaning as they interact with and internalize the substance of the teaching they encounter (Driver and Easley 1978, Driver et al. 1996). The importance of learners’ existing knowledge, skills, and attitudes are thus recognized as crucial, as they rely upon these when learning something new (Ausubel et al. 1978). Thus, learners bring with them the foundations upon which they construct further learning. These foundations may contain prejudices and misunderstandings, which may be difficult to reform in ways sympathetic to raptor conservation.

What sort of learning should be cultivated? Although undoubtedly there is a link between factual knowledge and conservation behavior (Ham and Kelsey 1998, Bradley et al. 1999), Ramsey and Rickson (1976) concluded that attitudes are one of the most important influences on “conservation behavior” (i.e., the way people behave with respect to conservation issues). Everitt et al. (2002) speculated that cultivation of positive public attitudes towards birds of prey is of paramount importance, more important than just distributing factual information, as positive attitudes towards wildlife appears to influence the public’s willingness to act in favor of wildlife conservation (Aipanjiguly et al. 2002).

Here we discuss why and how public-education programs can be used to create positive attitudes among the public towards raptors. We introduce several conceptual and methodological approaches used in educa-

tion programs to foster positive attitudes towards raptors and to encourage behavior that supports raptor conservation. We present case studies of raptor education programs that demonstrate how these conceptual and methodological approaches have been used. We also offer ways to design and evaluate education programs.

## INFLUENCING PUBLIC ATTITUDES

In order to influence attitudes we first need to understand what an attitude is. For our purposes, it is useful to think of an attitude as having three major components: a cognitive component (reason), an affective component (emotion), and a change in behavior as a direct consequence of the cognitive and affective elements (Manzanal et al. 1999). What creates an attitude turns out to be quite complex because many extrinsic and intrinsic variables influence the cognitive and affective components (Kollmuss and Agyeman 2002).

It may seem intuitive that public attitudes towards wildlife will be negative when people and raptors are in conflict, and neutral or positive when no such conflict arises. Neutral attitudes and indifference towards birds of prey may result in indirect negative effects through land-use practices, environmental contamination, habitat loss, electrocutions, and road deaths. The public may be unaware or simply not care enough to change their behavior. Conflicts of interest, particularly from competition for prey, may generate negative attitudes (Valkama et al. 2005) leading to direct persecution by shooting, poisoning, and trapping. This relationship between negative attitudes and persecution with large predators and other vertebrate “pests” has been observed in many situations (e.g., Bandara and Tisdell 2003 for Asian elephants [*Elephas maximus*], Marker and Dickman 2004 for cheetahs [*Acinonyx jubatus*], Treves et al. 2004 for wolves [*Canis lupus*], Verdade and Campos 2004 for pumas [*Felis concolor*], Woodroffe and Ginsberg 1999 for African wild dogs [*Lycaon pictus*]).

The apparent inverse relationship between human attitude and the frequency of negative interaction with another species is not inevitable. There is evidence that many cultures have different attitudes towards similar wildlife (e.g., Kellert 1991, Bjerke et al. 1998, Seddon and Khoja 2003). Stock farmers in the Indian Himalayas, for example, have different attitudes towards wolves, which they persecute, than towards snow leopards (*Uncia uncia*), which they do not, even though both predators prey upon domestic livestock

(Mishra 1997). Similarly Greek fishermen persecute cormorants (*Phalacrocorax* spp.), but not pelicans (*Pelecanus* spp.), even though both groups of birds are competitors for commercial fisheries (Daoutopoulos and Pyrovetsis 1990). Similar instances occur between farmers and wildlife in Florida (Jacobson et al. 2002).

The challenge, therefore, is to create learning opportunities that will influence public attitudes in the desired way. Even in the face of prior misconceptions and prejudices, education can, with care, help cultivate positive attitudes in the general public. New attitudes, ultimately, can result in behavior that supports raptor conservation (Broun 1949, Fraser et al. 1996, Bildstein 2001).

## CREATING AN EDUCATION PROGRAM

### Identifying Education Aims, Objectives, and Outcomes

Identifying your education aims provides you with the “big picture” of what you are trying to accomplish. As such, it is your overall mission or goal. Education objectives are specific goals relating to a particular program. Objectives should outline specifically what it is you want to teach or what kind of experience you want to provide, and to whom, geographically and demographically, you want to “target” as your audience. Different audiences require different approaches, so it is important to identify the audience prior to designing your program. *Outcomes* are the changes in behavior, attitude, and understanding that you wish to achieve as a result of your program. This includes determining how you will know (i.e., measure) whether or not your objectives have been achieved. It is important to be as specific as possible in stating your aims, objectives, and outcomes, as these will guide all other steps of program development. Also, the more explicit and clear your objectives are, the easier it will be for you to evaluate whether or not the program actually meets its objectives.

For example, a raptor rehabilitator in India might want to reduce the number of cattle farmers using the veterinary drug, diclofenac, in a particular region because vultures in that region are dying from diclofenac poisoning. The rehabilitator’s education objective would be “to provide cattle farmers with information and understanding on how diclofenac kills vultures and to give them a positive experience with a living vulture to discourage their use of diclofenac.” In this case, the tar-

get audience is cattle farmers in the region, and the outcome would be to have farmers discontinue using diclofenac after experiencing the program.

In defining your aims, objectives, and outcomes, it is important to consider both the education and conservation needs in your region. Investing time, money, and other resources into an education program that is not needed can waste time and resources. Thus it is important to determine if there are other organizations or individuals providing similar types of expertise and experiences. For each organization, determine what they are teaching (i.e., their education objectives), whom they are teaching (i.e., their target audience), and how they are teaching (i.e., their education methods). Evaluating and understanding other programs at this stage allows you develop your own program in light of the existing education landscape. If similar programs already exist, you can tailor your program to complement them. This may mean choosing different objectives, targeting a different audience, using different methods, or all three. Sometimes it is useful to visit and experience the existing programs to get a better sense of what is being done and what works and what does not work, and so that you can meet the staff and, perhaps, collaborate with them.

### Identifying Organizational or Personal Strengths and Weaknesses

What special interests, skills, or experiences can you or your organization offer the public? For example, the strengths of a research organization might be the application of science or field ecology as an information resource. A rehabilitator may have expertise in animal health and biology, and may have access to special resources, such as unreleasable raptors that can be used as ambassadors for their species during education programs. A public school teacher has pedagogical skills, specialized knowledge, and access to individual students on a regular and repeated basis.

Along with identifying your strengths, it is important to recognize your weaknesses with regards to your program and to seek out expert advice and involvement where necessary.

It is often the case that people involved with informal education programs have not had formal training in education. In these situations, we recommend developing a small network of education specialists who are willing to advise you on the development of your program and review your education and evaluation plans and materials.

### Determining Conceptual and Methodological Approaches

*I hear, and I forget  
I see, and I remember  
I do, and I understand*

It seems almost superfluous to justify the wisdom of this proverb. Consensus from the education establishment supports this notion that understanding emerges as a result of participation in the process of learning. Merely receiving written or verbal information often fails to result in meaningful learning. Ham and Kelsey (1998) conclude that carefully targeted biodiversity education is far superior to mass-media campaigns designed to educate the general public. In reality, a public-education program often will be a compromise between what is desirable and what is practical given your abilities and the size of the intended audience.

Types of education programs can be grouped into two general categories: **passive participation**, in which learners merely receive information, and **active participation**, in which learners interact with the education experience. Both of these can be designed to operate *in-situ* (i.e., in sight or proximity of the raptors in their home range) and *ex-situ* (outside of such proximity). *Ex-situ* experiences include secondary (including virtual) learning opportunities, such as watching wildlife documentaries, reading books and journal articles and accessing web-based resources and simulation activities.

In *ex-situ*, passive program participants typically observe a bird of prey, perhaps while listening to an educator or reading interpretive information. Examples include live-raptor demonstrations, museum and zoo exhibits, and wildlife documentaries, especially on television. Active participatory programs, on the other hand, allow participants to actively engage in some aspect of the program, through games, projects, research, and other activities. Passive programs tend to be used with large audiences, and where it is not feasible to involve the audience actively in the program. Active participatory programs tend to work best with smaller groups. Both types of programs have a role in the “big picture” of raptor conservation. For example, a person might become interested in raptors for the first time by seeing a live-raptor demonstration at a zoo or bird of prey center. This type of one-time experience may not be enough to influence a person’s attitudes or conservation behavior towards raptors, however, it may spark enough interest to inspire them to call a local wildlife organization to see if they offer any educational programs about birds of



**Figure 1.** Flight demonstrations using falconry techniques can include diurnal (a) and nocturnal (b) birds of prey. Good demonstrations involve experts (c) who can provide general overviews of what is being seen as well as answer questions specific to the species involved. Properly conducted, a good flying display can be both an exhilarating and educational experience (Photos courtesy of J. Parry-Jones).

prey. Smaller, more active programs can provide a more personal experience that may have a more lasting influence on a person's attitude.

In designing an education program targeting attitudes, the approach should provide a combination of cognitive and emotional experiences. Keep in mind, however, that what may seem like an emotional experience to the educator, may not have the same meaning to the audience. Understanding existing attitudes is an important aspect of deciding how to provide an emotional experience to the audience. Likewise, understanding the existing knowledge-base in the population is important for deciding what information to include in the program, as learning is a process that incorporates both existing and new knowledge (Ausubel et al. 1978, Driver and Easley 1978, Driver et al. 1996).

Here we provide a series of examples of the use of passive and active participatory programs, including case studies highlighting ways that they have been applied to public-education programs about raptors worldwide.

**Watching bird-of-prey flying displays in zoos and bird-of-prey centers.** Compared with many other countries, laws in the United Kingdom (U.K.) regarding captive raptors make it relatively easy to keep birds of prey and display them to the public. This and the ease with which raptors have been propagated in captivity have supported an enormous growth in specialist bird-of-prey centers (often and inappropriately called "falconry centers"). There are several hundred of these open to the public in the U.K., mostly in close proximity to large urban areas. Collectively, these facilities attract millions of visitors per year and, arguably, they are where the majority of the British public gain first-hand experiences with birds of prey (Fig. 1, Box 1 and 2).

Creating education exhibits involving predators is notoriously difficult, as many predators, including raptors, do not move much except when hungry. Not surprisingly, zoo exhibits that involve active, moving animals increase the amount of time zoo visitors spend observing the exhibit (Wolf and Tymitz 1981, Marcellini and Jenssen 1988). Zoo Atlanta (U.S.), for example, found that allowing the public to observe training sessions with Asian small clawed otters (*Aonyx cinera*) with an interpretive narration, resulted in longer "stay-times" and increased positive perceptions by the public compared with passive exhibition (Anderson et al. 2003).

Most bird-of-prey centers have their origins in falconry practice rather than traditional zoo animal management. Falconry techniques provide the means by

which birds of prey can be trained for free flight, and bird-of-prey flying demonstrations for public view have occurred in the U.K. since the late 1960s (Fig. 1). A good flying display can be an exhilarating experience and will ideally focus a roving zoo audience. This, in turn, increases the opportunity for providing a meaningful educational experience. Furthermore, a flying display provides the ideal opportunity for verbal interactive communication, serving to interpret what is being seen. Such interpretation has been found to be of considerable importance in the educational value of zoo exhibits (Marshdoyle et al. 1982). The flying demonstration, with associated commentary, therefore, provides an unusual opportunity both to entertain and to convey positive attitudes.

### Box 1. National Birds of Prey Centre.

**Country:** United Kingdom

**Organization:** National Birds of Prey Centre

**Program:** Educational flying demonstration

**Methods:** Use of free-flying trained birds to teach about different species and their flying and hunting techniques, habitat requirements, threats and species status worldwide

**Target audience:** Variety of audiences, casual, drop-in visitors, booked parties, specialist groups, schools and colleges

**Summary:** Four to five different species of raptors are flown at each demonstration, and demonstrations throughout the day differ (Fig. 1). The birds are trained in natural behavior patterns. Falcons, for example, are trained to stoop to a swung lure representing a bird, kestrels are trained to hover, owls and buteos are asked to show typical flights from tree to tree, eagles are encouraged to soar if the environment is right for them, and vultures are trained to show their habits on the ground and in the air. Specialist birds such as Burrowing Owls (*Athene cunicularia*) disappear down artificial tunnels, and caracara's exhibit the digging and scratching behavioral pattern natural to them. Each demonstration is commented upon by the individual flying the bird. They describe the species, its particular flight and individual characteristics, and its needs and habitats. Two or three trainers take turns flying birds to bring a different pace to the commentary. Individual personalities of the birds are described to give the audience a personal interest in the bird, but this is handled carefully so as not to detract from the bird or the information given. The demonstration moves along with plenty of birds and action; too much standing with a bird and just talking can lose the audience quickly. There is no doubt that attitudes can be changed dramatically. Vultures, in particular, are misunderstood, and when seen up close and in flight, attitudes can turn 180 degrees in a few minutes.

Visitors are encouraged to ask questions at the end of each demonstration, and digital photography is now so popular that photographic opportunities are useful to create. There is no doubt that the flying demonstrations are the highlight of visits, and regular customers will become attached to certain birds and make special visits to see them fly.

That said, bird-of-prey flying demonstrations must be designed carefully and thoughtfully. Despite providing the viewing public with a spectacular, sometimes exhilarating display, the "human dominion over nature" interaction between handler and hawk may predominate in the public view and lead to misunderstandings of the role of captive collections in bird of prey conservation. Cromie and Nicholls (1995) and Horrocks (in Nicholls 1999) assessed the potential conservation educational value (Table 1) of both static and flying displays in zoos and bird-of-prey centers in the U.K. In general, they concluded that although the "potential" was used to good effect by many centers, others missed education opportunities, or sacrificed them in favor of sensationalist exploitation of birds of prey. Indeed, Foulds and Rubin (1999) showed that at one bird-of-prey center in the U.K., the experience of watching a flying display did nothing to persuade the viewing public to change their lack of intention to support bird-of-prey conservation.

It is quite easy to send unintended negative messages to an audience about the value of raptors because the attitude of the handler towards the captive raptor becomes a reflection of the value of raptors in general. For example, if a captive raptor appears uncared for (e.g., overgrown beak and talons, broken feathers, dirty

### Box 2. The Hawk and Owl Trust.

**Country:** United Kingdom

**Organization:** The Hawk and Owl Trust

**Methods:** Experiential, inquiry

**Target audience:** School students and visitors of all ages

**Summary:** The Hawk and Owl Trust Conservation and Education Centre provides an exhibition for visitors on raptor ecology plus an outdoor trail showing nesting boxes for different raptor species located in the relevant habitat. Educators provide activities for visitors and school groups. Students visit the site for day visits and take part in activities that encourage them to experience and investigate habitats that are important for raptors. They might spend time in woodland or grassland experiencing the sounds, smells and sights of the habitat, investigate the creatures that live there through close observation, and construct food chains to see how raptors depend on other animals and plants. Other activities, including nest-building or pellet dissection and evening owl prowls, help to explain other aspects of raptor ecology. A closed-circuit camera provides a window for visitors into the lives of a Barn Owl family during the breeding season. Educators also travel to schools and youth groups and give activity workshops such as nest-box building or pellet dissection. The education service also supplies educational support materials for teachers and youth group leaders for use in their own settings.

**Table 1.** Scoring criteria used to evaluate the conservation-education value of bird-of-prey centers in the United Kingdom (adapted from Cromie and Nichols 1993).

Score	Broad education value of aviary exhibits	Interpretation of aviary exhibits	Education content of flying display commentary	Conservation content of flying display commentary
1 = poor	Aviary barren, giving no indication of the bird's natural habitat or ecology (e.g. Burrowing Owls on solid substrates with no opportunity to burrow), or presenting a potential health risk (e.g. Barn Owls [ <i>Tyto alba</i> ] in a simulated barn with straw floor covering, which is an <i>aspergillosis</i> risk).	Information is provided, but is wrong or misleading (usually a redundant label from a previous exhibit) or highly anthropomorphic (e.g., "Harry the Harris's Hawk [ <i>Parabuteo unicinctus</i> ] enjoys watching TV").	Commentary wholly misleading or anthropomorphic or sensationalist (e.g., "This Ferruginous Hawk [ <i>Buteo regalis</i> ] can 'take out' any other bird here."). Attitude towards birds may be poor, with jokes at the bird's expense (e.g., the bird is said to be "scared of heights" or "educationally sub-normal").	No mention of conservation of birds of prey. Alternatively, boasts of a conservation role without merit, uses the word "conservation" without explanation or conservation is used inappropriately to justify the captivity of rare and endangered species.
2 = unsatisfactory	Enclosure contains some features or furnishing, but these are unsympathetic to or inappropriate for species displayed.	Label with species name, a simple distribution map or a few words of description.	Information is inaccurate or irrelevant. Difficult to separate fact from fiction. There is a set script irrespective of the audience.	Commentary may trivialize ease of keeping raptors as pets and imply that captivity is in the animal's best interest, (i.e., it is safer in captivity than in the wild).
3 = moderately good	An attempt to present the bird in a background that conveys aspects of the bird's natural history, but falls short of the ideal (e.g., an enclosure for a fishing owl [ <i>Scotopelia</i> spp.] has a small pond, but the pond water has feces and debris in it).	Species name given, with distribution map and some information of natural history and conservation status, but style and format not readily assimilable by all ages and abilities.	Accurate information presented in an easily assimilable form. Popular topics were related to how birds hunt and how well they can fly, see or hear. However, may emphasize ease with which raptors may be kept as pets and is followed by an advertisement for the center.	Accurate information that informs public of threats to wild raptor populations and the role of zoos in conservation. However, information is not presented in an entertaining way or is not appropriate for all audiences.
4 = excellent	Attempts to recreate habitats from which species originates (e.g., appropriate trees for a forest species, approximation of a desert for a desert species). Clean enclosures.	Imaginative or interactive interpretation, perhaps using information technology. Information is accurate, relevant, and transferable for all ages and abilities.	Accurate and entertaining, commentary suited to audience and species of raptor flown without being patronizing. Makes audience feel privileged to share their world with raptors.	Accurate and honest information, commentary accompanies demonstration or display of suitable species whose captivity is wholly justifiable.

living conditions, handled roughly, etc.) then, irrespective of the content of the associated commentary, the message to the public may be, "this raptor is not worth my care, time or attention." If an educator gives a prepared 40-minute talk with a bird on the arm or in an exhibit, without notice or mention of any of the behavior the bird may exhibit during the lecture (muting, preening, rousing feathers, watching the audience), the unintended message may be, "this raptor is not really interesting."

Therefore, it is essential that the utmost care and thought be given to the management, health, and treatment of captive raptors in educational programs. Regardless of whether they are flown free, all captive raptors should have a period during each year where they are put into an enclosure sufficiently large enough for them to move round comfortably, rest from educa-

tion work and given a chance to molt, or even to breed. Birds should not be flown in displays year in and year out without a decent rest period, untethered in a large aviary. Nor should birds be kept away from natural light and air for long periods. Cromie and Nicholls (1995) showed that health and welfare practices in bird-of-prey centers in the U.K. were extremely varied and ranged from excellent to very poor. Hawks, falcons, and, sometimes, owls, for example, often were kept tethered in the pretext that they were flown free each day, whereas evidence suggested that they were not. Of particular concern was the correlation between poor management and welfare practice and poor education involvement. It seemed that those centers with poorest record of care and management were those that invested least in creating and conveying meaningful educational experiences. Arent and Martel (1996), Parry-Jones (1991, 1994,



**Figure 2.** View to the east from Hawk Mountain Sanctuary's North Lookout in the central Appalachian Mountains of eastern Pennsylvania, U.S.A. Hawk Mountain Sanctuary hosts 70,000 visitors annually, many of which are introduced to free-ranging raptors and their conservation needs for the first time (Photo courtesy of Hawk Mountain Sanctuary Archives).

1998, 1999, 2003) and Naisbitt and Holz (2004) provide excellent information on captive raptor care and management.

The use of live raptors in a program may not be suitable in all situations or in all countries. The laws of the country need to be known and understood, as it may not be legal to involve live animals for education. Live animals often provoke emotional responses, sometimes positive and sometimes negative. It is important to understand which type of response is likely in any given culture or audience so that the program can address and respond to the emotional reaction of the audience to the raptor. Discussions with falconers, rehabilitation groups, zoos, conservation organizations, and government departments may well help identify the values, dangers, or advantages of using live birds in a particular country.

**Organized raptor watchsites.** From a public-education point-of-view one advantage of zoos and bird-of-prey centers is that the public is guaranteed of seeing birds of prey. Furthermore, such collections of live birds of prey and other animals are usually sited close to large urban human populations, and traditionally are visited for entertainment rather than for education. This represents an opportunity to deliver a conservation education message to a true, cross-section of the general public. On the other hand, the spectacle of raptor migration as observed at raptor migration watch-sites provides an *"unparalleled opportunity to introduce the public to these secretive and normally widely dispersed birds of prey"* (Zalles and Bildstein 2000) (Fig. 2, Boxes 3–5).

### Box 3. Hawk Mountain Sanctuary migration counts.

**Country:** United States

**Organization:** Hawk Mountain Sanctuary

**Program:** *Autumn and spring migration counts*

**Methods:** Flight interpretation and scheduled programs associated with the passage of thousands of migrating raptors

**Target audience:** General public, school groups

**Summary:** Hawk Mountain Sanctuary, the world's first refuge for birds of prey, is a 1,000-ha nature reserve in the central Appalachian Mountains of eastern Pennsylvania, United States, 170 km west of New York City. The "Mountain" is part of the Kittatinny Ridge, an internationally significant migration corridor for hawks, eagles, and falcons breeding in northeastern North America. Hawk Mountain was founded in 1934 by New York conservationist Rosalie Edge, who created the refuge to stop the slaughter of migrating raptors at the site. Each autumn, tens of thousands of raptors migrate past the watchsite. Occasionally, spectacular migrations of thousands of birds are recorded on single days. In the 62-year period from 1934 to 1995, an annual average of >17,000 diurnal raptors, representing 16 species, was recorded at the watchsite.

In the 1920s and early 1930s, hunters traditionally gathered on the ridge-tops of eastern Pennsylvania each autumn to shoot migrating hawks and eagles. Raptors were considered vermin at the time, and the state game commission had established bounties on several species. Each year, thousands of birds were killed as they traveled south along the central Appalachian Mountains. Hawk Mountain, in particular, became a favored shooting site. All of this changed in August 1934 when Maurice Broun, the sanctuary's first warden, posted the property and confronted local shooters. The next autumn, birdwatchers and naturalists began to flock to the new refuge in large numbers.

Today, Hawk Mountain exemplifies what grassroots conservation, environmental education, and ecological monitoring and research together can accomplish. The sanctuary maintains the longest and most complete record of raptor migration in the world. Its annual counts of migrating hawks and eagles have proved to be essential tools in assessing long-term trends in raptor populations throughout eastern North America. The extensive database played a key role in exposing first-generation organochlorine pesticides, including DDT, as causative agents for the precipitous declines in populations of several species of birds of prey that occurred earlier in the 20th century, as well as in measuring subsequent rebounds in raptor populations following decreases in the use of contaminants.

The sanctuary's extensive on- and off-site education programs, which have touched >1 million people, include weekend interpretive programs for the general public, weekday guided programs for primary and secondary school children, fully accredited college-level courses offered in cooperation with local colleges and universities, a science and mathematics based education curriculum focused on Turkey Vultures, and workshops for local educators (Fig. 2; Zalles and Bildstein 2000).

On spring and autumn weekends Hawk Mountain offers education programs about raptors and the phenomenon of migration for the public. Program subjects include hawk identification, the use of binoculars, the Sanctuary's culture and natural history, and raptor study techniques, all of which are conducted outdoors at various overlooks at the Sanctuary. At its two primary lookouts, interns and biologists spend the day interpreting the flight for the public, including spotting birds, highlighting interesting flight behavior, helping with identification, and answering questions. One of the most popular events is a live-raptor program in which the public has the chance to observe one or two local raptors up close and learn more about their biology, ecology, and conservation. The variety of approaches used and content levels available increases the number of visitors that can be reached during a visit to the Mountain.

**Box 4.** Peregrine-viewing point at Symonds Yat Rock.**Country:** United Kingdom**Organization:** Royal Society for the Protection of Birds (RSPB) and Forest Enterprise**Program:** *Peregrine-viewing point at Symonds Yat Rock***Methods:** Guided observation with some interpretation**Target audience:** General public

**Summary:** The Peregrine-viewing point at Symonds Yat Rock is a joint project run by the RSPB and Forest Enterprise, who own the site. Between April and August, telescopes are set up to give close views of the nesting peregrines. The rock is a spectacular site high above the River Wye. The location is in rural Gloucestershire, but is in close proximity to Bristol and Birmingham.

**Box 5.** Aren't Birds Brilliant.**Country:** United Kingdom**Organization:** Royal Society for the Protection of Birds (RSPB)**Program:** *Aren't Birds Brilliant***Methods:** Guided observation with some interpretation**Target audience:** General public

**Summary:** In the U.K. a scheme called *Aren't Birds Brilliant* (ABB) ([www.rspb.org.uk/birds/brilliant/index.asp](http://www.rspb.org.uk/birds/brilliant/index.asp)), which is managed by the Royal Society for the Protection of Birds (RSPB), invites the public-at-large to view birds during spring and summer at selected sites. These sites, often nesting areas, are distinct from RSPB-managed nature reserves and access to them depends on the cooperation of a range of landowners and other organizations. High-quality optical equipment is provided and the public is coached by a team of staff and volunteers in its use and both written and verbal information are provided on the species viewed. During 2005, 22 of 50 ABB sites featured birds of prey, including Ospreys (*Pandion haliaetus*), Red Kites (*Milvus milvus*), White-tailed Eagles (*Haliaeetus albicilla*), Northern Harriers (*Circus cyaneus*), and Peregrine Falcons (*Falco peregrinus*). Some sites, such as eagle-nesting sites on Isles of Skye and Mull off the west coast of Scotland are in relatively remote locations. However, other sites, such as Peregrine Falcon nests in central London and near to other major cities, are accessible to the public-at-large.

Aside from refining skills of observation, the public largely is passive in this kind of directed bird-watching. That said, an evaluation of the impact of the ABB scheme indicated that during 2006, the 22 ABB raptor sites were visited by nearly 384,000 people (P. Holden, pers. comm.). As a measure of the intention of these visitors to support raptor conservation, nearly 37,000 (10%) left contact details to receive additional information, and almost 1,500 (0.4%) joined the RSPB. The same pattern emerged at other ABB sites, which are devoted to sea birds, waders and passerines, and in total, the 50 sites attracted 480,000 visitors in 2006. Finally, over the past few years, just under 7% of AAB visitors joined the "Big Annual Bird watch" which is an annual census of garden birds carried out by volunteers.

That some members of the public are willing to visit more remote areas may mean such sites are visited by a self-selected sub-group of the public, a sub-group already with empathy for nature and living things. To persuade this group to support birds of prey may therefore be an easier job, but this does not detract from the opportunity to deliver accurate information and present a high-quality learning experience.

***Inquiry-based learning activities.*** There is evidence that actively engaging participants during an educational experience increases learning outcomes and is more likely to influence attitudes than passive programs (Heimlich 1993, DeWhite and Jacobson 1994, Leeming et al. 1997, Manzanal et al. 1999). Here we briefly outline several approaches that can be used to create active educational experiences.

In many raptor-education programs, participants are given facts about raptors that are meant to capture their interest, inform them about an issue, or provide a knowledge base for other aspects of the program. One way to make this transfer of information more active is by using an inquiry-based learning approach. Inquiry learning is a process in which students address their own curiosity by seeking answers to their own questions (Pearce 1999, Minstrell and Van Ze 2000). This approach is perfect for exploration of the natural world. For example, rather than being told what is the most common prey for Barn Owls (*Tyto alba*), participants discover for themselves by dissecting Barn Owl pellets. Participants actively engage in the learning process, rather than simply being passive recipients of information. This is an important aspect to consider for conservation education, because there is a certain power to discovery, and a person may be more likely to have an emotional attachment to conclusions they came to through their own discovery process, than by simply being told.

Tafoya et al. (1980) define four types of inquiry-based activities: confirmation, structured, guided, and open. Confirmation activities require participants to verify concepts learned by participating in a given procedure. Structured inquiry activities provide participants with a guided question and procedure to follow. Guided inquiry activities are similar to structured activities in that they provide participants with a guiding question and suggested materials, but they allow participants to direct the investigation. Open-inquiry activities allow students to generate their own questions and design their own research project (Box 6).

***Field projects and "citizen science."*** Positive experiences in nature predict positive attitudes towards



**Box 6.** Migrating Birds Know No Boundaries.**Country:** Israel**Organizations:** International Centre for the Study of Bird Migration, Museum for Technology, Science and Space, and the Davidson Institute for Scientific Education**Program:** *Migrating Birds Know No Boundaries***Method:** Inquiry-learning**Target audience:** 7th and 9th grades

**Summary:** Students participating in this program conduct research on migrating raptors (and other birds) using satellite telemetry and radar monitoring. Participants track raptors on their migrations from Israel to their winter nesting grounds in Africa, and back northward, via Israel, to their summer nesting grounds in Europe. During their projects, students are faced with solving real-world dilemmas, such as how to conserve nesting habitat or how to prevent dangerous collisions between migrating birds and man-made aircraft. The program uses technology and science to connect students to raptors and other students all over the Middle East and Africa.

**Box 7.** Starr Ranch Junior Biologists.**Country:** United States**Organization:** Audubon California, Starr Ranch Sanctuary**Program:** *Starr Ranch Junior Biologists — Raptor Research***Methods:** Inquiry, field projects**Target audience:** 8 to 14 year-olds

**Summary:** Starr Ranch Junior Biologists is a summer camp where children participate in field-ecology. During the raptor-research program, children spend 5 days learning about the biology and ecology of raptors by actually studying them. The Junior Biologists meet raptor biologists, and are introduced to why biologists study raptors and the different techniques they use. Participants then conduct their own study addressing an ecological question about raptors on the Sanctuary. During the summer of 2004, for example, the children wanted to know how many of the raptors that were nesting on the Sanctuary actually reused their nest from the previous year. The Junior Biologists visited nest sites from the previous year, determined whether they were active, used GPS and GIS to make a map of the nests on the Sanctuary, and compared their results with data on nesting raptors from the previous year. This not only increases the children's awareness of how raptors use the environment but, by actually studying raptors, students also gain a sense of intimacy with their subjects.

nature (Bogner 1998, Kals et al. 1999, Monroe 2003), although this may only be true in the absence of direct conflicts of interest. Positive experiences in nature, which involve repeated experiences that are personally rewarding, seem to have the most impact when they start during childhood and continue through adulthood (Kals et al. 1999). Nature-based programs can be made more active by engaging the participants in field projects. Manzanal et al. (1999) measured the effect of fieldwork on the ecological knowledge and environmental attitudes of 14–16 year-old students in Spain and found that fieldwork helped to clarify ecological concepts and directly improved attitudes in defense of the ecosystem wherein the students were working (Box 7).

Projects can be designed simply for education purposes (an inquiry-based field project), or they can be designed for long-term monitoring of local raptor populations, where there is a dual goal for conservation education and direct conservation output. Community members can be engaged as volunteers for raptor monitoring projects, such as local nest monitoring and local population monitoring (road surveys, etc.). This notion of using citizen scientists as a means to engage the public actively in conservation has been successfully employed by organizations such as the Audubon Society, The Peregrine Fund, Cornell Lab of Ornithology, HawkWatch International, Hawk Mountain Sanctuary (Bildstein 1998), the Hawk Migration Association of North America, the Royal Society for the Protection of Birds (RSPB), and the British Trust for Ornithology.

Coordinators of many raptor-migration watchsites have trained local community members to be volunteer counters (Bildstein 1998). During the first trans-continental raptor migration count in Panama in 2005, dozens of local community members and high school students participated as volunteer counters. Such experiences provide volunteers with an introduction to raptor biology and migration ecology, an opportunity to contribute to the understanding and conservation of raptors in their area, and the opportunity to continue participating year after year.

**Action competence.** Although it is important to inform and interest the public in raptor-conservation issues, it also is essential to empower them to act in favor of raptors. Recall that the third component of an attitude is “behavior as a direct consequence of the cognitive and affective elements.” Action competence is an approach that aims to increase a person’s belief in their participation and influence on solutions of environmental problems (Jensen and Schnack 1997, Bishop and

**Box 8.** Philippine Eagle Community-based Project.**Country:** Philippines**Organization:** Philippine Eagle Foundation**Program:** *Philippine Eagle Community-based Project***Methods:** Action competence**Target audience:** Adults and their families

**Summary:** The Pulangi Watershed Integrated Community-based Resource Management Project was established in 2001 to help build self-reliant and sustaining communities in the Upper Pulangi Watershed in Bukidnon and to protect pristine Philippine Eagle nesting habitat. The program adopts a participatory approach to local area planning, project development and management. Foundation staff facilitates training, planning, capacity building, and development of livelihood projects in consultation with partner communities. Since its inception, the community-based program has overseen the restoration of over 25 ha of denuded forest, all potential Philippine Eagle nesting habitat.

Scott 1998, Jensen 2002, Jensen and Nielsen 2003). Programs generally involve learning about a conservation problem, perhaps through an inquiry-based activity. On the basis of their conclusions, participants decide upon some type of social, political, or environmental action directed towards a solution of the environmental problem or a change in the conditions that caused it (Jensen and Schnack 1997, Bishop and Scott 1998, Jensen 2002, Jensen and Nielsen 2003). The leader of this type of program acts as the facilitator for enabling the group to act on their ideas (Box 8).

To engender action competence effectively, programs should provide a critical and thorough understanding of the problem in question, and of the nature of the action involved (Jensen and Schnack 1997). Furthermore, participants must be motivated enough to follow through on their solution. In some instances, participants will be self-selected and will likely come with the necessary motivation. In other instances a major goal of the program will be connecting the participants to the conservation problem and trying to inspire in them a drive to act. Once the action has been completed, the participants should be asked to evaluate the effectiveness of the action and critically examine reasons underpinning success or failure of the action (Bishop and Scott 1998).

**Evaluating Program Effectiveness**

To be effective, education programs should be developmentally dynamic. That means they should undergo constant evaluation and revision. Having an evaluation procedure enables an educator to determine how well their program is achieving their educational goals, and guides the revision process. If a program aims to encourage local landowners to adopt certain land-use practices that benefit birds of prey, then effectiveness may be relatively easy to measure in terms of the proportion of landowners who adopt these practices after participating in the program. Similarly, a program that involves school children building and monitoring owl nest-boxes could be assessed in terms of the proportion of schools in a region active in the program, average period of involvement in the program (1–3 years, 4–7 years, etc.), and so on. However, many public-education programs reach people in a passive and ephemeral fashion, and it is unlikely that individual responses to such programs can be tracked through time. Thus, the chance of following changes in attitudes is limited. In such cases measuring effectiveness in real terms may be impossible.

According to the Theory of Planned Behavior (Ajzen and Fishbein 1977) it may be practical and sufficient to question individuals to determine their “behavioral intention” (i.e., whether the educational experience has influenced the way they are likely to behave in the future). By asking participants about their perceived attitudes, subjective norms, and perceived behavioral control, behavioral intention may be predicted. Recently, this approach has been used to predict the efficacy of interpretive centers on modifying the food-storage behavior of visitors hoping to see black bears (*Ursus americanus*) (Lackey and Ham 2003), the watershed use of farmers (Beedel and Rehman 2000), and the behavior of boaters toward Florida manatees (*Trichechus manatus latirostris*) (Aipanjuguly et al. 2003). Questionnaires or other semi-quantitative surveys given at the time of the educational program can often be relied upon to give a good indication as to whether the experience has been effective.

Designing an evaluation procedure should be carefully researched and considered; the better the design, the better the feedback on a program. Many resources are available to assist with evaluation design. Nowak (1984), Patton (1990), Jacobson (1991) and Marcinkowski (1993) provide good suggestions and strategies in this regard.

**Table 2.** Currently available raptor-curriculum guides.***Eye of the Falcon***

Real-time satellite tracking projects are used as vehicles for people to learn about the ecology, behavior, evolution, and geography of raptors around the world. Inquiry based.

Earthspan, Inc., U.S.A.  
michellefrankel@earthlink.net  
Available on the web at: [www.earthspan.org/Education.htm](http://www.earthspan.org/Education.htm)  
(305) 604-8802

***First Flight with Raptors***

Raptor-based biology activities for kindergarten and grade one.

Education Specialist, Hawk Mountain Sanctuary,  
1700 Hawk Mountain Road, Kempton, PA 19529 U.S.A.  
Available on the web at: [www.hawkmountain.org/education/  
resources\\_for\\_learning.htm](http://www.hawkmountain.org/education/resources_for_learning.htm)  
(610) 756-6961

***The Peregrine Project***

Six-month unit on Peregrine Falcon biology and conservation for grades one to five.

Maria Dubois, Conserve Wildlife Foundation of New Jersey,  
P.O. Box 400, 501 East State Street, Trenton, NJ 08625 U.S.A.  
(609) 984-0621

***Hunters of the Sky***

Science-based activity guide for birds of prey.

Science Museum of Minnesota,  
120 West Kellogg Boulevard, Saint Paul, MN 55102 U.S.A.  
[schooloutreach@smm.org](mailto:schooloutreach@smm.org)  
(651) 221-4748 or (800) 221-9444 ext. 4748

***Raptor Ecology***

Raptor ecology curriculum guide for grades four through eight.

HawkWatch International, 1800 South West Temple,  
Suite 226, Salt Lake City, UT 84115 U.S.A.  
Available on the web at: [www.hawkwatch.org](http://www.hawkwatch.org)  
(801) 484-6758

***One Bird, Two Habitats***

Migration ecology and research curriculum guide for grades five to eight.  
Not raptor-based, but can be applied to raptors.

Illinois Department of Natural Resources,  
One Natural Resources Way, Springfield, IL 62702 U.S.A.  
Available on the web at: [http://dnr.state.il.us/lands/education/  
CLASSRM/birds/1B2HFULL.PDF](http://dnr.state.il.us/lands/education/CLASSRM/birds/1B2HFULL.PDF)  
Teacher's Guide available on the web at: [http://dnr.state.il.us/  
lands/education/CLASSRM/birds/onebird\\_activities.pdf](http://dnr.state.il.us/lands/education/CLASSRM/birds/onebird_activities.pdf)

**Available Resources**

There are several good raptor-curriculum guides that can be modified and used in a variety of education contexts (schools, parks, watch-sites, etc.). Table 2 provides a list of curricula that we are most familiar with.

Finally, if you develop a program that has been successful, do not hesitate to share your success by publishing the program for others to use, particularly in a regions where raptor education resources are limited.

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