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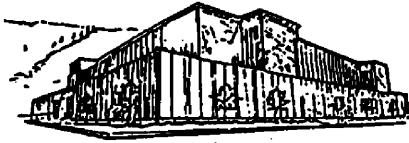
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BUILDING ECOLOGICAL LITERACY THROUGH  
ORNITHOLOGY-BASED FIELDTRIPS:  
EXPERIENCES FROM AN EDUCATIONAL PROGRAM  
IN PATAGONIA

By

Kimberly L. Olson

B.A. Carleton College in Northfield, MN, 1991

Presented in partial fulfillment of the requirements

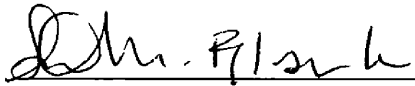
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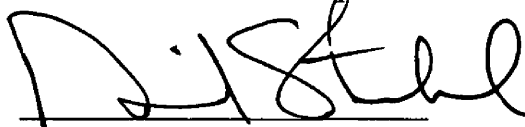
Master of Science for Teachers of Biological Sciences

The University of Montana

2003

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**Building Ecological Literacy through Ornithology-Based Fieldtrips: Experiences from an Educational Program in Patagonia****Director: Dr. Lisa M. Blank**

*Alumnos y Aves del Sur* (ALAS), “Students and Birds of the South (Wings)”, is a project in avian conservation education for school children in Andean-Patagonian region of Argentina. In the Patagonian region of Chile, over 1.5 million hectares of native *Nothofagus* forest have been converted to large-scale tree plantations of exotic pine and eucalyptus. Two million hectares of austral forest and ecotone habitats in southern Argentina may be potentially converted to plantations. Continued homogenization of the landscape has serious implications for endemic bird populations of Patagonia. Educational programs that build ecological literacy are needed to fortify conservation efforts. ALAS was designed to illustrate ecological concepts to students, such as plant-animal interactions, biodiversity, and the impact of exotic species through the study of birds. Classroom and schoolyard activities culminated with a 5-hour, investigative fieldtrip guided by a team of biologists. Students compared species diversity of birds and their habitat requirements on two sites: a native forest site and a neighboring pine plantation. In the process, students practiced basic skills in scientific investigation and biological fieldwork through guided inquiry. After the fieldtrip, students analyzed their data to conclude which site was more suitable for birds. To determine how participation in the ALAS program impacted students’ knowledge, understanding and attitudes about birds, pine plantations, and science, and their ability to identify local bird species, pre- and post-tests were administered. Pretest results of 421 schoolchildren from 6<sup>th</sup> to 8<sup>th</sup> grades in the Andean-Patagonian region revealed three important trends: 1) most students regarded pine plantations as ideal bird habitat, in spite of their awareness that pines are an exotic species, 2) most students could not identify common endemic forest birds by sight or song and 3) most students were concerned about bird populations and desired to learn more about them. Analysis of pre- and post-tests, student interviews, and participant observations suggested that the ALAS bird-centered curricula was an effective strategy for teaching children about forest ecology, improving their ability to identify target birds, and changing their perception of pine plantations as ideal wildlife habitat.

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## **Chapter One: Introduction**

### **I. Education as a Conservation Strategy**

Conservation initiatives that address environmental problems such as habitat destruction, exotic species and climate change rely upon information provided by sound scientific research (Estades 2001), the support of well-informed policy makers, business owners and politicians, and the participation of engaged and knowledgeable community members (Orr 1992, Schneider 2001). Ultimately, the long term success of conservation efforts depends upon good decision-making by an ecologically literate citizenry and their ability to modify and govern human behaviors that are deleterious to the environment (Schneider 1992, Orr 1992, Johns & Liske 1992, Bingle & Gaskell 1994, Chawla 1999, Eagles & Demare 1999).

Education is an inherent component and a critical strategy for promoting a conservation ethic. Nations world-wide have recognized the urgent need to incorporate environmental education into their school curricula (United Nations, 1992 cited by Manzanal, et al. 1999, Schneider 1992). As pinpointed by an educational bulletin for teachers in Argentina, "...the greatest problem in conservation is not habitat loss or over-exploitation of natural resources, but rather, human indifference towards these problems. Promoting a change of mentality among people so that they become actively involved in these problems is of fundamental importance." (*Cuadernillo de Divulgación No. 1, Dirección Provincial de Recursos Faunísticos y Areas Naturales Protegidas de Neuquén*)

While educational efforts must target a vast diversity of audiences across many cultures (Schneider 1992), it is critical to reach children at a young age when they are naturally curious about living things and eager to explore them (Carson 1965, Orr 1992,

Bogner 1998, Chawla 1998, Zelesny 1999, Arango et al. 2002). Children are naturally inclined to protect what they love and understand (Carson 1965). If they have formative experiences with nature, they will be more likely to have a conservation-oriented career and an environmental conscience as adults (Manzanal et al. 1999, Chawla 1998,1999). For those of us working in conservation, this truth is self-evident.

### Building Ecological Literacy

Ecological literacy entails a deep understanding of ecological concepts cultivated through diverse learning experiences that are inquiry-based, multidisciplinary, and experiential (Main 1984, Orr 1992, Koballa 1995, Bogner 1998, Caduto 1998). This enables students to develop an emotional affinity, intellectual curiosity, and sense of stewardship for the natural world (Carson 1965, Quinn & Scott 1997). Ecological literacy includes the ability to identify local species of native flora and fauna, and a working foundation of science process skills for problem-solving (Orr 1992, 1992, Crawford 2000). To build ecological literacy, educational curricula should be site-based, culturally sensitive, and tailored to the conservation issues and ecosystems where students live (Schneider 1984, Hale 1986, Orr 1992, Feinsinger et al. 1997a, Quinn & Scott 1997, Chodosh 1999, Pankratz 2000, Arango et al. 2002).

### Schoolyard Ecology and Inquiry

Most students learn about ecology from textbooks and in the classroom environment (Orion & Hofstein 1994, Pankratz 2000, Brewer 2001). Consequently, they may learn very little about the native flora and fauna that characterize their bioregion (Orr 1992). An effective way for educators to counteract this trend is to bring children into direct contact with nature through hands-on, inquiry-based lessons in one of the most

accessible and familiar environments: the schoolyard (Schneider 1984, Gaylord 1985, Feinsinger et al. 1997a, Chodosh 1999). (See Appendix IV for more on inquiry.)

Schoolyards are filled with a variety of microhabitats and small creatures to explore, such as plants, ants, worms and birds (Manning 1996, Erickson 1997, Feinsinger et al. 1997b, Arango et al. 2002). As students observe these living things firsthand, they practice important science process skills. They learn to ask questions, measure and describe, formulate hypotheses, and seek answers through simple experimental designs (Johns & Liske 1992, Engelson & Yockers 1994, Bybee 1997, Feinsinger et al. 1997b, Barker 1998, Bogner 1998). By communicating their findings to classmates, parents, and community members, students become active agents in public outreach (Crawford 2000).

Students involved in experiential learning show higher motivation, cognition, and more positive attitudes towards science and ecology (Gaylord 1985, Oviedo 1997, Bailey & Watson 1998, Lieberman & Hoody 1999, Manzanal et al. 1999, Zelezny 1999, Crawford 2000). Ecological inquiry brings children closer to becoming empowered, life-long learners and critical thinkers (Bingle & Gaskell 1994, Kolsto 2001).

Schoolyard ecology is practiced by educators throughout the western hemisphere, particularly in Latin America (Feinsinger et al. 1997a, Oviedo 1997, Rozzi et al. 1997, Arango et al. 2002). In 1996, one of the first schoolyard ecology workshops in Latin America was held in San Carlos de Bariloche, Argentina. During this workshop, teachers were partnered with ecologists to learn how to explore ecology through inquiry (Feinsinger et al. 1997a, Arango et al. 2002).

Teaching by inquiry is recommended by the *National Science Education Standards* (1996) in the United States, and is a standard for public education in Argentina as outlined in



the *Contenidos Básicos Comunes para Educación General Básica* (1995). Though an established component of teacher accreditation programs for science education in both countries, inquiry is rarely practiced, and the outdoors remains underutilized by educators.

#### Field trips as an extension of schoolyard ecology

Ecology projects in the schoolyard may spark children's interest in their natural surroundings (Schneider 1984, Feinsinger et al. 1997a). Schoolgrounds that are dominated by exotic plants and few species of birds, however, limit what students can learn about their native flora and fauna. Investigative field trips to local habitats serve as a critical extension to schoolyard ecology lessons and may help foster a deeper connection to one's bioregion (Manzanal et al. 1999), particularly if designed under the framework of inquiry (Orion & Hofstein 1994).

Fieldtrips have the potential to provide indelible learning experiences, but they are costly, time-consuming and logistically intensive endeavors for schools, and therefore, are rare events for most schoolchildren (Orion & Hofstein 1994). By visiting nearby sites, time and expense of school outings can be reduced. Because many students tend to regard fieldtrips as recreational events (Falk 1983, Orion & Hofstein 1991), it is important to prepare students for fieldtrip activities beforehand to ensure they benefit cognitively from fieldtrips that are intended to be educational (Orion & Hofstein 1994).

Exploratory fieldtrips to local native habitats provide excellent opportunities for field biologists to mentor school groups in the field and become directly involved in pre-college conservation education (Brewer 2001). Partnerships between biologists and teachers facilitate the successful exploration of native habitats, as many teachers feel their

own knowledge and understanding is too inadequate to confidently guide their students on ecological fieldtrips (Feinsinger et al. 1997a, Chodosh 1999, Pankratz 2000).

## **II. Project Overview**

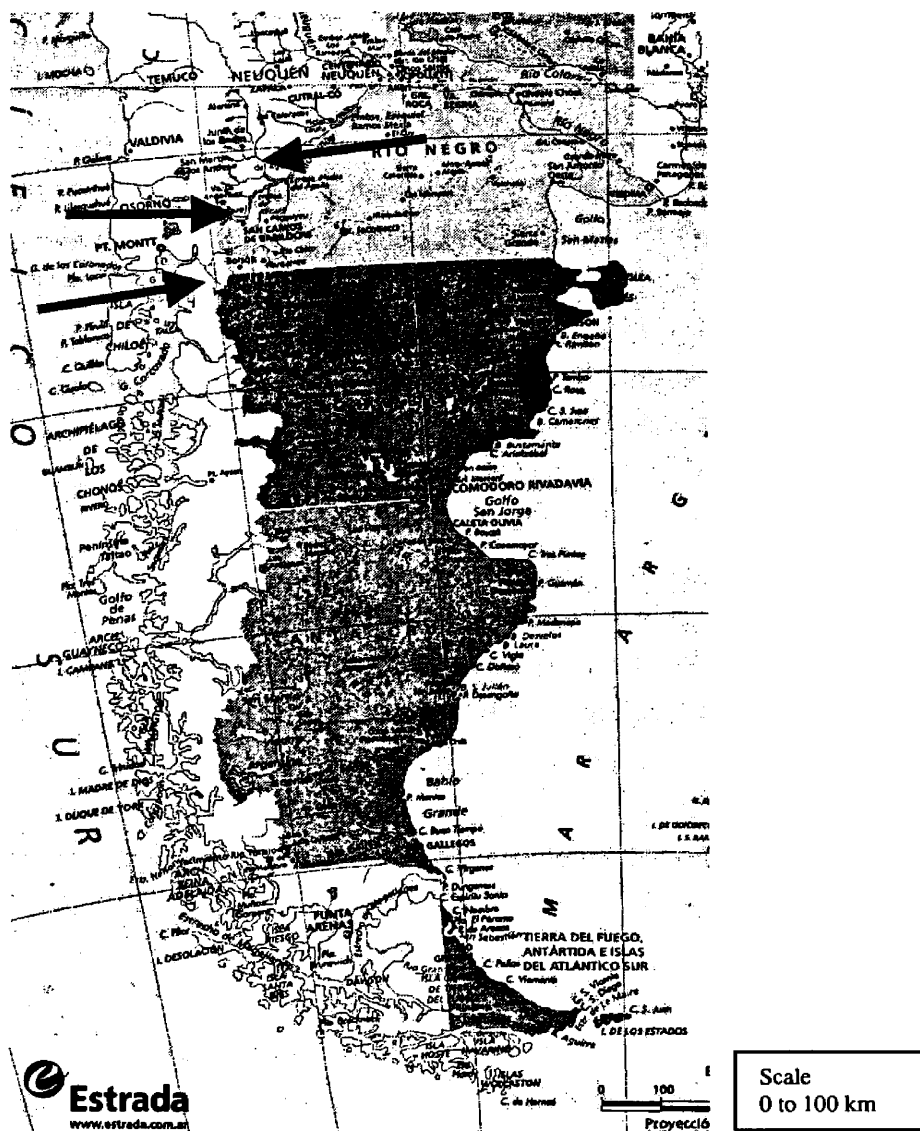
*ALAS: Alumnos y Aves del Sur* is an ecological education program in the Patagonian region of southern South America. ALAS was developed by the author in collaboration with biologists and educators from the United States, Argentina, and Chile to determine the efficacy of ornithology-based schoolyard and fieldtrip activities for teaching basic ecological concepts, for enhancing students' ability to identify local species of birds, and for impacting student attitudes towards avian conservation, pine plantations, and science. The acronym ALAS means "wings" in Spanish and stands for *Alumnos y Aves del Sur*, "Students and Birds of the South".

In April 2001, ALAS was piloted in San Carlos de Bariloche, Argentina with two eighth grade classes. As more teachers heard about the project by word of mouth, they expressed interest in participating. By December 2002, two ALAS teacher workshops had been held and the project was functioning in eight towns and cities of three provinces: San Martín de los Andes, Junín de los Andes, Villa Angostura in the Neuquén province; El Bolsón, El Hoyo, Lago Puelo and Epuyén in the province of Chubut; and San Carlos de Bariloche of the Río Negro province (Figure 1.1). These towns lie within or adjacent to national parks in the austral temperate forest biome, and in the transitional ecotone that lies between the austral forest and the Patagonian steppe. (See Appendix I for site descriptions.)

During the two years of this study (April 2001 to December 2002), over 2,100 primary and secondary schoolchildren participated in ALAS learning activities, the core of which was a five-hour, investigative fieldtrip to compare avian habitat requirements in a

native forest habitat site and a neighboring pine plantation. Pre- and post-tests of 421 public and private school students from 6<sup>th</sup> to 8<sup>th</sup> grades were analyzed to assess any changes in knowledge and attitudes as a result of participating in ALAS educational activities. ALAS was funded by grants from the National Audubon Society, Partners in Flight of the National Fish and Wildlife Foundation, and the Disney Conservation Fund, with donations of birding equipment from Birders' Exchange, the Alaska Bird Observatory, and Optics for the Tropics.

Figure 1.1 Map of Patagonia with ALAS project locations marked by arrows.



### **III. Rationale**

#### **A. Conservation of the Patagonian Austral Temperate Forest**

The austral temperate, or subantarctic, forest is a biogeographically isolated ecosystem that lies along the narrow Andean cordillera of southern South America between the latitudes of 35° -55°S (Veblen et al. 1995, Paruelo 1998). Due to its high incidence of endemic flora and fauna, it is considered to be of high conservation priority (Rozzi et al., 1995, Aizen & Ezcurra 1998, Armesto et al. 1998, Posadas et al. 2001, Barnosky et al. 2001). Thirty percent of the bird species of this biome are endemic (Villeumer 1985) and play critical ecological roles in seed dispersal (Rozzi et al. 1995) and pollinization (Aizen & Ezcurra 1998).

Current threats to the subantarctic forest include global warming, the introduction of exotic species, and the establishment of large-scale tree plantations (Lara & Veblen 1993, Veblen et al. 1995, Frank & Finckh 1997, Armesto et al. 1998, Schlichter & Laclau 1998). Since the early 1970s, pine and eucalyptus plantations in central and southern Chile have replaced 1.4 million hectares of native habitat for the exportation of wood products (Lara & Veblen 1993).

Under the frameworks of the new Chicago Climate Exchange (AP release 2003, <http://www.chicagoclimatex.com>) and the Kyoto Protocol, an international treaty drafted in 1997 to regulate and reduce industrial emissions of greenhouse gases, such as carbon dioxide, industries have been investing in carbon sinks to offset their emissions in order to mitigate global warming and earn carbon credits (Bush 2000, Chiappe 2000, Lohman 2000, Sathaye et. al. 2001). The Protocol and the Chicago Climate Exchange define tree plantations as legitimate carbon sinks; through photosynthesis, trees take in carbon dioxide from the

atmosphere. The quantity of carbon dioxide sequestered is estimated by the number of hectares of trees planted, and thus equates to the number of carbon credits that industries can accrue and trade at market value (Chiappe 2000, Lohmann 2000, Sathaye et al. 2001). Currently, 2,500,000 hectares of ecotonal habitat in the Andean region of Argentine Patagonia are being promoted for the establishment of pine plantations to serve as carbon sinks (Schlichter & Laclau 1998, see Appendix IV).

Studies on carbon sequestration have shown that the ability of pine plantations to capture excess atmospheric carbon is dubious, ephemeral and very limited (Davidson & Hirsch 2001, Oren et al. 2001, Schlesinger & Lichter 2001). Reich et al. (2001) found that areas of high plant diversity sequester more carbon dioxide than areas of low plant diversity. Moreover, the adverse ecological effects of large-scale, single-species tree plantations throughout the southern hemisphere have been extensively documented. These effects include alteration of hydrological systems, fire regimes, soil pH, nutrient cycling, and the decline of biodiversity (Driscoll 1977, Clout & Gaze 1984, Mitra & Sheldon 1993, Estades 1994, Frank & Finckh 1997, Pomeroy & Dranzon 1998, Schlichter & Laclau 1998, Estades & Temple 1999, Figueroa et al. 2001). These findings strongly suggest that the negative impacts of tree plantations outweigh their presumed economic and climatic benefits (Lara & Veblen 1993, Chiappe 2000, Lohmann 2000, Noss 2001).

## **B. Avian Conservation and the Impact of Pine Plantations**

Research on migratory birds and their seasonal habitat requirements has demonstrated a critical need for international cooperation in avian conservation. Habitat loss and the introduction of exotic species pose the greatest threats to populations of migratory and

resident bird species, resulting in the decline of several bird populations throughout the western hemisphere in the past forty years (Terborgh 1989).

### Impacts of Pine Plantations on Birds

Continued homogenization of the landscape by large-scale monocultures such as tree plantations has serious implications for bird populations of the southern cone (Estades 1994, Estades & Temple 1999, Armesto et al. 1998). Strong declines in avian diversity have been documented in pine plantations throughout the world, particularly in the southern hemisphere (Estades 1994, Estades & Temple 1999) where all *Pinus* species are exotic (Veblen et al. 1995, Richardson 1998). Favored for their rapid growth, Ponderosa pine (*Pinus ponderosa*); Monterey pine (*P. radiata*); and lodgepole pine (*P. contorta*) (Lara & Veblen 1993, Schlichter & Laclau 1998) are the dominant plantation species in Patagonia. Frank and Finckh (1997) suggest that native forest habitats in southern Chile are unlikely to recuperate from conversion to pine plantations.

Pine plantations lack the structurally diverse strata of vegetation that characterizes native habitats which drastically reduces the quantity of niches and associated avifauna (Frank & Finckh 1997). Several endemic bird species in Patagonia use only native vegetation for nesting sites and materials, and depend on food sources provided by native plants (Estades 1994, Estades & Temple 1999). Species of the endemic *Rhinocryptidae* family, such as the Chucao Tapaculo (*Scelorchilus rubecula*), Churrín Andino (*Scytolopus magellanicus*) and Huet-Huet (*Pterotochos tarnii*), require the dense understory vegetation of the austral temperate forests for food and shelter (Rozzi et al. 1995, Frank & Finkh 1997).

Cavity nesting birds of this region are especially impacted (Estades 1994, Estades & Temple 1999, Rozzi et al. 1995, pers. comm. V. Ojeda). Pine and eucalyptus plantations do not provide suitable habitat for primary cavity nesters, such as the Magellanic Woodpecker (*Campephilus magellanicus*), the largest woodpecker in South America and resident of old growth southern temperate forests (Donaire 2001, pers. comm. V. Ojeda). Unlike primary cavity nesters (i.e. woodpeckers), secondary cavity nesters, such as the Austral Parakeet (*Enicognathus ferrugineus*), Thorn-tailed Rayadito (*Aphrastura spinicauda*), or Rufous-legged Owl (*Strix rufipes*), lack the structural adaptations to excavate their own cavities in tree trunks. Instead, they utilize abandoned woodpecker nests and/or natural cavities found in old-growth trees. Plantation trees are generally harvested at a young age before natural cavities can form, and before the infestation of arboreal fungi can sufficiently rot the interior heartwood which facilitates nest excavation by primary cavity nesting birds.

### **C. The Potential of Birds in Ecological Education**

#### **Why Birds?**

Investigating birds and their habitat requirements throughout the school year can be an important stepping stone towards ecological literacy. Dynamic, ubiquitous, and inspirational, birds capture the curiosity and enthusiasm of children (Erickson 1997). Wild birds are seen and heard almost everywhere everyday, forming a predictable part of children's daily life. Children's newly acquired knowledge about these animals can be constantly reinforced by frequent encounters with birds near their homes, neighborhoods,

and parks. Learning to identify local bird species may help students form a sense of bioregional identity that is grounded in natural history (Erickson 1997).

Numerous ecological concepts such as biodiversity, plant-animal interrelationships, adaptations, food webs, and niche specialization are illustrated as birds are observed flying, foraging, communicating, nesting, defending territories, and avoiding predators. Avian behavior and species richness and abundance cycle with the change of seasons. The impact of habitat modification on wildlife and the importance of stewardship may become more apparent to children as they study birds.

Some students may be inspired to become lifelong birders, whose potential role in conservation is not to be underestimated. As Terborgh (1989) remarks, "the leaders in ecological monitoring have not been scientists, but amateur ornithologists". Estades (2001) recognizes the potential of the growing cadre of amateur birders in Chile for contributing valuable scientific information to support critical conservation efforts in Latin American countries. Educating children about birds and how to collect data on them will help increase the number of amateur birders with a heightened sensitivity to changes in local bird populations.

Observed changes in bird populations have been strong indicators of the state of the environment (Terborgh 1989). The decline of eagle and ospreys in the 1950s, for example, revealed the cascading ecological effects of DDT, a toxic agricultural pesticide now banned in the United States, and the threats posed to human health as these toxins passed through the food chain (Carson 1962). Over the past decade, several species of neotropical migratory songbirds have been returning to their breeding grounds weeks earlier and their home ranges have been expanding to higher latitudes, providing further



evidence of global warming (numerous references cited within McCarty 2001). In Patagonia, more baseline data on bird populations are needed to track population changes, predict trends, and support avian conservation efforts in response to large-scale habitat modifications and global warming impacting in this region (Rozzi et al. 1995, Armesto et al. 1998, Estades 2001).

### Why ALAS?

By incorporating educational programs into school curricula, large numbers of children can be efficiently educated about birds and avian conservation, particularly through applied, investigative science activities in the outdoors. As award-winning teacher and author Laura Erickson (1997) writes, “The more understanding we bring to any problem, the wiser our solutions will be. When we teach children the names of birds, they begin to recognize and understand some of the rich variety of the natural world, which will ultimately help them appreciate the truth and value of Aldo Leopold’s maxim, ‘To keep every cog and wheel is the first precaution of intelligent tinkering.’”

Scientific and political efforts that address avian conservation must be fortified by educational programs that are tailored to the local avifauna and ecosystems in which schoolchildren actually live (Pankratz 2000, Arango et al. 2002). For these programs to be truly meaningful, children must connect with wild birds in their native habitats (Erickson 1997, Quinn & Scott 1997). Ideally, these experiences would involve the side-by-side participation of local conservation biologists (Brewer 2001).

### **III. The Problem**

In North America, there is an abundance of well-designed bird curricula for educating schoolchildren about neotropical migratory songbirds and shorebirds that

migrate between the Americas. These programs include Birds Beyond Borders (Chodosh 1999, pers. comm. R. Petty), Songbird Blues (Manning 1996, pers. comm. R. Petty), and the Shorebird Sister School Project of the U.S. Fish and Wildlife Service (<http://sssp.fws.gov>). All have a strong international component that link North American schools with schools in Latin America through pen pal or e-mail correspondence.

While teachers in the United States and Mexico report the success of bird curricula and educational materials for enhancing attitudes and awareness of conservation issues regarding birds (Erickson 1997, Chodosh 1999, pers. comm. M. Manning & R. Petty), little is known about how ornithology-centered curricula is transferable to understanding the ecology of local native habitats and the actual ability to identify local bird species by sight or song. In short, there is a deficit of research that quantitatively evaluates the efficacy of ornithology in the context of ecological literacy.

### Implementing ALAS

The Andean-Patagonian region of southern Argentina provided an ideal setting for exploring the effectiveness of a new, site-based ornithology-centered educational program called ALAS that advocates the conservation of native habitats. In Patagonia, the need for education has been recognized as an important conservation strategy for the austral temperate forest (Rozzi et al. 1995, Armesto et al. 1998). Little is known about schoolchildren's attitudes, knowledge and understanding towards avian conservation, local bird species, and native and exotic plants, and tree plantations in this region.

Due to the lack of resources and funding in southern Argentina, there are few environmental education activities about birds in the Andean-Patagonian region (Bielsa 1996, pers. comm. A. Yanniello). Though numerous teachers in San Carlos de Bariloche

had attended schoolyard ecology workshops since 1996 (pers. comm. L. Margutti, , Oveido 1997, Arango et. al. 2002), none had incorporated the study of birds in their curriculum (per. comm. L. Margutti, R. Oveido, M.E. Cuello, A. Kreiter). No studies have documented the extent to which ornithology-centered programs in Patagonia impact schoolchildren's attitudes, knowledge and understanding about birds and native forest ecology.

Guided by the conceptual framework of inquiry and schoolyard ecology, the ALAS program served as a model for teaching local schoolchildren about conservation of the austral temperate forest through inquiry-based, comparative fieldtrips centered on the identification of local bird species and the investigation of their habitat requirements. The specific research questions addressed by ALAS were intended to fill important gaps in research regarding the efficacy of ornithology in the context of ecological education.

#### **IV. About ALAS**

Most teachers have never taught about birds before and know little about them. The ALAS program enabled time- and resource-strapped teachers to include birds in their curriculum with much greater ease. As an organized program, ALAS relieved teachers from the logistical burden of fieldtrip planning and allowed them and their students to gain exposure to basic field research techniques under the guidance of local biologists.

Piloted in San Carlos de Bariloche in April 2001, ALAS was site-based and provided about ten hours of interventional instruction; that is, ALAS educators visited classrooms to teach schoolchildren about local birds and prepare students for the investigation of avian habitat requirements on a comparative fieldtrip to native habitat

and an adjacent pine plantation. More than half of the total instruction time took place in the field at nearby sites.

The fieldtrip is the core component of ALAS and served as a practical introduction to the method of guided inquiry for both students and teachers. The fieldtrip sites were selected by local biologists. If possible, the trip site included native habitat with a neighboring pine plantation that shared the same aspect and elevation to strengthen the comparison. ALAS provided transportation to the fieldtrip site for public schools and loaned educational materials to teachers upon request, such as data collection sheets, bird field guides, posters, maps, flash cards, props for games, cassette tapes of bird songs, binoculars, and spotting scopes. Project coordinators provided teachers with help analyzing fieldtrip data with students if needed.

#### ALAS Program Objectives

- Increase schoolchildren's knowledge, understanding, and appreciation of native forest ecology through the study of Patagonian migratory and resident birds, avian ecology, and local conservation issues.
- Provide teachers with necessary skills, educational materials, and confidence to integrate the study of birds in their curriculum.
- Foster teacher-scientist partnerships to provide teachers with professional support and to provide biologists with a venue for direct involvement in pre-college education.

- Create a sustainable, site-based educational initiative that would effectively reach a large number of schoolchildren in Patagonia.
- Engage teachers and their students in long-term research projects to contribute meaningful information for their communities as well as international citizen-science projects, such as monitoring the migration of the Fio-fio (*Elaenia albiceps*).
- Build a network of schools that will compile and share data to monitor seasonal shifts in Patagonian bird species along the north-south latitudinal gradient.
- Establish pen pal correspondence between students in the northern and southern hemispheres to exchange information on their respective biomes and cultures.

### Content of the ALAS Program

The overarching theme of ALAS centers on bird-plant interactions and the impact that exotic species and habitat modification have on those interactions. The primary bird-plant interactions of Patagonia emphasized in ALAS are:

1. “the nest web”— the interrelationship of primary cavity nesting birds, old growth trees, and secondary cavity nesters.
2. the endemic resident species of *Rhinocryptidae* family, and their dependence on dense understory coverage.

### 3. the migratory Fíofío and its habitat needs along its migration route.

To understand these interactions firsthand, students need to have a foundation of basic skills. They need to be able to make detailed observations and employ their keen senses of hearing and seeing in order to identify common birds. Numerous factors influence one's success in birding, such as the habitat use and behavior of different species at different times of the day and year, current weather conditions, and one's skill level, persistence and patience.

Developing good birding skills by ear and eye is essential. As students practice identifying birds in the field, they begin to observe behavioral characteristics that define particular species and families of birds. They learn to distinguish different species and their conspecifics from one another. For example, in the Andean-Patagonian region, the closely related *huet-huet* and *chucao* are mostly heard calling from dense bamboo understory in which they are hidden. The distinctive songs of each clearly distinguish the two species from one another, as much as their similar behavior, phenotypes, and tonal characteristic of their songs define them as members of the endemic *Rhinocryptidae* family. Once familiar with these species, students will be able to understand and appreciate the complex interrelationships between and among organisms and their environment. Students will become aware of the cascading ecological effects of habitat modification and the introduction and invasion of exotic species.

To prepare students for learning in the field, *ALAS* team members visited classrooms to familiarize students with bird species they were most likely to encounter

during the fieldtrip (Table 1.1). Through an interactive classroom memory game and a schoolyard bird identification activity, students learned how to identify eight species by their field marks and song characteristics, and how to use a field guide and binoculars (See Appendix III).

### Birds Represented-- What Species and Why?

There are about 950 species of birds in Argentina and about a fourth of them inhabit Patagonia (Narosky & Yzurieta 1993). Similar to the *Songbird Blues* curricula, ALAS lessons and activities focus on a few representative bird species that typify the austral temperate forest. Nine target species were chosen using the following criteria: 1) likelihood of being observed, 2) ease of identification, 3) representation of resident, migratory, and cavity nesting birds, and 4) endemism and ecological role.

Table 1.1 ALAS target bird species. The list includes both migratory (M) and resident (R) species that are most likely to be affected by land use changes in their native habitats.

Common English Name	Common Spanish Name	Scientific Name	Characteristic
White Crested Elaenia	Fio fio Silbón	<i>Elaenia albiceps</i>	<i>Flycatcher (M)</i>
Patagonian Sierra Finch	Comesebo Patagónico	<i>Phrygilus patagonicus</i>	<i>Forest bird (M)</i>
Magellanic Woodpecker	Carpintero Grande	<i>Campephilus magellanicus</i>	<i>Primary Cavity nester (R)</i> <i>(Woodpecker)</i>
Patagonian Flicker	Pitio	<i>Colaptes pitius</i>	<i>Primary Cavity nester (R)</i> <i>(Woodpecker)</i>
White-Throated Tree Runner	Picolezna	<i>Pygarrhichas albogularis</i>	<i>Primary Cavity nester (R)</i> <i>(Passerine)</i>
Thorn-tailed Rayadito	Rayadito	<i>Aphrastrus spinicaudea</i>	<i>Secondary Cavity nester (R)</i>
Austral Parakeet	Cachaña	<i>Enicognathus ferrugineus</i>	<i>Secondary Cavity nester (R)</i>
Green-backed Firecrown Hummingbird	Colibrí Rubí	<i>Sephanoides sephanoides</i>	<i>Major pollinator (M)</i>
Black-throated Huet Huet	Huet huet	<i>Pteroptochos tarnii</i>	<i>Dense understory bird (R)</i>
Chuco Tapaculo	Chuco	<i>Scelorchilus rubecula</i>	<i>Dense understory bird (R)</i>

## **Investigation of Avian Habitat**

The ALAS project has focused primarily on comparing native *Nothofagus* (southern beech) forest and monocultural exotic pine plantations by investigating various habitat components:

- A. species richness/abundance of invertebrates found in the leaf litter and soil (food source for birds).
- B. number of natural and constructed cavities found in tree trunks (shelter for primary and secondary cavity-nesting birds and animals—the “nest web”).
- C. species richness/abundance of birds.
- D. diversity and quantity of understory plants, and arboreal lichens and mosses.

These components provided the basis for three comparative activities that students conducted in both habitats, with the ultimate goal of drawing a conclusion: which habitat type is more suitable for birds? The pine plantation or the native forest? In the process, students observed and identified the unique yet common birds and plants of southern temperate forests as they practiced basic skills in scientific investigation.

### **The Sequence of the ALAS Program**

Through classroom and schoolyard activities, students were familiarized with eight to ten species of common, endemic birds to prepare for the comparative fieldtrip to a nearby native forest site and a pine plantation to investigate avian habitat requirements. Students were divided into six small research groups (4 to 6 students) each bearing the name of a focus bird: the Rayaditos, Huet-huets, Chucaos, Pitios, Picoleznas and Fiofios. Students predicted if more or the same quantity of invertebrates, cavity nests, and

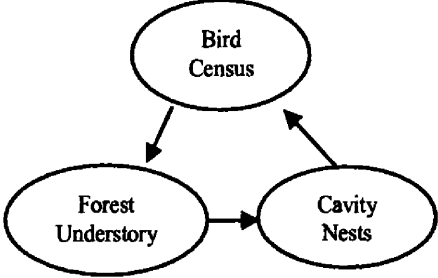


birds would be found in the pine plantation versus the native forest habitat. They recorded their predictions and rationales in their workbooks (Appendix III).

The fieldtrip began in the native forest. Each group spent the first twenty minutes recording what they perceived by sight, hearing and smell. Then they rotated through three, thirty-minute, investigative activities: a bird census, a cavity nest activity and a forest understory activity (invertebrate and plant diversity). Each activity was led by an adult guide. After the native forest, students visited the pine plantation site where they conducted the same three investigations in the same order with the same biologists to directly compare the two sites. An ALAS fieldtrip lasted about five hours, including transportation time. (See Appendix I for an example of the organizational fieldtrip schedule.)

In the classroom, students reflected upon their findings. They compiled and graphed class data, discussed their results, drew conclusions and generated more questions. Class results consistently showed compelling differences between the two habitats. A schematic table of the ALAS program is outlined in Figure 1.2. Due to time constraints, the schoolyard bird census was not conducted.

Figure 1.2 A schematic table of the ALAS educational program.

Stage	PRETRIP					FIELDTRIP	POST-TRIP	
Learning Phase	Meta-cognitive Phase	Knowledge and Skill Building			Meta-cognitive Phase	Applied, Experiential Component	Analysis and Reflection	Meta-cognitive Phase
Location	Classroom	Classroom	Schoolyard		Classroom	Field Native Forest      Pine Plantation	Classroom	
Activity	Pretest	Memory Game	Using Binoculars	Schoolyard Bird Census	Pre-trip Predictions and Fieldtrip Preparation		Data Analysis	Post-test
Objectives	<p>Assess students' prior knowledge and attitudes.</p> <p>Introduction to ALAS activities and target birds.</p>	<p>Identify target species by sight and sound, and characteristic fieldmarks.</p> <p>Learn to use a field guide to identify birds and to find information on each species.</p>	<p>Practice using binoculars and field guide to identify birds in schoolyard.</p>	<p>Introduction to sampling methods and data collecting.</p> <p>Practice observational skills.</p> <p>Become familiar with species around schoolyard.</p>	<p>Foment curiosity about fieldtrip and reflect upon knowledge by making predictions.</p> <p>Prepare students with explanation of field trip activities.</p>	<p>Investigate bird species richness and abundance and avian habitat requirements (understory cavity nest availability) in three guided activities.</p> <p>Rotate through the three activities in both sites to allow for direct comparison of native forest and pine plantation and to test predictions.</p> <p>Collect data and practice common field research techniques alongside biologists.</p>	<p>Compile, analyze, and graph fieldtrip data.</p> <p>Discuss results.</p>	<p>Assess change in students' knowledge and attitudes.</p>
Time Frame	45 min.	1 hr.	1 hr.	1 hr.	45 min.	5 hrs	1 hr	45 min.

## **Chapter Two: Measuring the Impact of the ALAS program**

### **Introduction**

In collaboration with biologists and educators from Argentina, Chile, and the United States, this research developed a new bird-centered, inquiry-based ecological educational program in Patagonia called *ALAS: ALumnos y Aves del Sur* that advocated the conservation of native habitats. The goal of this project was to create a long-term, self-sustaining project that would 1) reach a large number of school children and 2) raise their awareness and appreciation of biodiversity, avian habitat requirements and the impact of monocultures in a positive, pro-active manner.

### **The Research Questions and Methodology**

The following research questions were explored:

- 1) Do bird-centered schoolyard and inquiry-based fieldtrip activities significantly enhance students' knowledge of local bird species, their understanding of native forest ecology, and their ability to identify birds by sight and song?
- 2) To what degree do these activities impact students' knowledge, understanding, and attitudes towards:
  - birds
  - native forest ecology
  - pine plantations
  - native and exotic plants
  - science
  - avian conservation
  - biodiversity
  - sense of place

This study assessed the program's impact on 6<sup>th</sup> to 8<sup>th</sup> grade students (n=421) from three Argentine provinces who participated in the ALAS fieldtrip in the austral fall season (March to May) of 2001 and 2002. Forty-six percent of the students (n=195) were from five public schools, and 53% (n=226) from four private schools (Table 2.1)

Table 2.1 Description of schools in the treatment group.

City, Province	Public or Private	School	Date of Participation	U.S. Grade Level Equivalent	Average Age	Number of Students
San Carlos de Bariloche, Río Negro	Public	CEM 20	Fall 2001	8 <sup>th</sup> grade	13.6 $\pm$ 0.8	38
		Antu Ruca	Fall 2002	6 <sup>th</sup> grade	11.5 $\pm$ 0.8	22
				7 <sup>th</sup> grade	12.3 $\pm$ 0.7	25
				8 <sup>th</sup> grade	13.4 $\pm$ 0.8	24
	Private	Dante Algeiri	Fall 2002	8 <sup>th</sup> grade	12.0 $\pm$ 1.1	64
		Primo Capraro	Fall 2002	7 <sup>th</sup> grade	11.9 $\pm$ 0.9	35
				8 <sup>th</sup> grade	12.9 $\pm$ 0.5	42
		Siglo XXI	Fall 2002	7 <sup>th</sup> grade	12.0 $\pm$ 0.3	26
El Bolson, Río Negro	Private	Munduna	Fall 2002	6 <sup>th</sup> grade	10.9 $\pm$ 0.3	16
				7 <sup>th</sup> grade	11.9 $\pm$ 0.5	14
El Hoyo, Chubut	Public	Escuela No. 734	Fall 2002	7 <sup>th</sup> grade	13.2 $\pm$ 1.4	32
Epuyen, Chubut	Public	Escuela No. 9	Fall 2002	6 <sup>th</sup> and 7 <sup>th</sup> grade	12.2 $\pm$ 1.3	31
San Martín de los Andes, Neuquén	Public	Escuela No. 5	Fall 2002	7 <sup>th</sup> grade	12.4 $\pm$ 0.8	25
					12.0 $\pm$ 1.0	421

Each student completed a pre- and post-test to test for significant changes in knowledge, understanding and attitudes, and ability to identify target birds by sight and song after participating in ALAS. The quantitative assessment was supported with student interviews (n=8) conducted before and after the fieldtrip experience, feedback from teachers (n=3) and participant observations. The content, design, and analysis of the pre- and post-tests and interview questions are described in the following sections of this chapter.

## **A. Quantitative Assessment—The Pre- and Post-Test**

Pre- and post-testing is a common method for reliably quantifying the impact of educational programs on student attitudes, knowledge, and understanding (Borg & Gall 1983, Sudman & Bradburn 1987, Orion & Hofstein 1991). Pre-test results provide a control against which to measure the impact of the treatment, or educational intervention (Borg & Gall 1983, Orion & Hofstein 1991, pers. comm. J. Graham). A comparative, statistical analysis of pre- and post-test results reveals whether or not changes from baseline attitudes, knowledge and understanding are significant.

### **Content and Design of the Pre- and Post-test**

Based on techniques used in similar studies (Orion & Hofstein 1991, Bogner 1998, Chodosh 1999, Warner 2000, Pankratz 2000) and recommendations by Sudman & Bradburn (1987), a thirty-eight item pre- and post-test was developed to assess students' attitudes, knowledge, and understanding before and after participating in ALAS. The following concept domains were assessed: local bird species, native forest ecology, pine plantations (a local conservation issue), native and exotic plants, science, avian conservation, biodiversity, and sense of place. Some of these concepts have been identified as key components to building ecological literacy (Rozzi et al. 1995, Feinsinger et al. 1997a, Orr 1989, Orr 1992, Quinn & Scott 1997, Arango et al. 2002). To increase test reliability, content domains were evaluated by more than one test item (Borg & Gall 1983, Sudman & Bradburn 1987).

The pre- and posttests were identical except for two extra multiple choice items on the post-test used for student feedback about the ALAS fieldtrip. Three native Spanish speakers in Argentina proofread the test to ensure the test items had been clearly

translated from English to Spanish. On average, the test took students about forty minutes to complete.

The pre- and post-test consisted of a combination of eight open-ended questions to test knowledge, understanding, and sense of place, fourteen scaled items to assess attitudes, and twenty-six Yes/No items to determine students' experience and their ability to identify target birds by sight and song. The thirty-eight test items are described below as they mainly correspond to: 1) knowledge and understanding, 2) attitudes, 3) experience, and 4) ability to identify target birds. The assessment tools and grading rubrics are in Appendix II.

### Assessing Student Knowledge and Understanding

Eight open-ended questions were used to assess 1) students' knowledge of native and exotic plants, pine plantations, local bird species, and biodiversity and 2) students' understanding of pine plantations, native forest ecology and avian conservation (Table 2.2). Seven of these items were scored numerically, averaged, and categorized as novice, intermediate or advanced responses according to evaluation criteria detailed in the grading rubrics. Averaged scores were rounded up or down to the nearest whole number for the purposes of describing whether they ranked as novice, intermediate or advanced.

To determine knowledge of exotic and native plant species, students were asked to name two native and two exotic plants of Patagonia. The frequency of students who named pine either incorrectly as a native plant or correctly as an exotic was calculated. To test their knowledge and understanding of pine plantations, they were asked to define a pine plantation and explain why we have them.

For assessing knowledge of local bird species and biodiversity, students were asked to list up to eight birds of the region. Another item asked students to list three birds on their schoolyard to indicate their awareness of birds in a familiar environment. Students were asked to describe a picture of a common bird, the Rufous Collared Sparrow (*Zonotrichia capensis*), displayed for twenty seconds by the individual administering the test, to assess their ability to describe field marks.

An understanding of a basic concept of native forest ecology, the interdependence of organisms, was tested by a short answer question “If woodpeckers disappeared from the forest, what changes would there be?” The item “Name two things you can do to help birds” assessed understanding of avian conservation.

To reveal what bird species appealed to a student’s sense of place, students were asked “When you think of Patagonia, what bird comes to mind?” Responses were coded by species and tallied.

**Table 2.2** Eight open-ended assessment items for testing ecological concepts.

<b>Concept</b>	<b>Test Item</b>	<b>Points</b>
Native and Exotic Plants	Name two species of plants that are native and two that are exotic. (adapted from Warner 2000)	4
Pine Plantations	What is a pine plantation and why do we have them?	3
Avian Conservation	Name two things you can do to help birds.	3
Native Forest Ecology <i>Interdependence of Organisms</i>	If all of the woodpeckers disappeared from the forest, what changes would there be?	3
Biodiversity/Sense of Place	Name up to eight species of birds that are in this region.	4
General Bird Identification	Name three kinds of birds you have seen on your school yard.	3
	You will see a picture of a bird for 20 seconds. Describe what it looks like in the space below.	6
Sense of Place	When you think of Patagonia, what bird comes to mind?	Responses tallied

### Assessing Student Attitudes

Attitudes towards learning about birds, avian conservation, pine plantations, and science were assessed with one Yes/No statement, ten Likert-scale items, and three items with responses based on a scale of 1 to 10 (Table 2.3). Likert-scale items are a standard method for assessing attitudes (Likert 1939). They are simple statements to which students indicate their degree of accordance on a scale of 1 (total agreement) to 5, from (total disagreement). A response of 3 is neutral, indicating neither agreement nor disagreement. Student responses for each item were averaged.

Table 2.3 Test items used to assess attitudes.

<b>Attitude Towards</b>	<b>Test Statement</b>	<b>Item Type</b>
Learning about birds	I would like to learn more about birds. (adapted from Chodosh 1999, pers. comm. L. Blank)	Likert Scale
	I don't care about birds. (adapted from Chodosh 1999)	
	Learning about birds is..... (Blank 1999) Boring (1) to Fun (10) Very Hard (1) to Easy (10) Not Important (1) to Very Important (10)	Scale of 1 to 10
	I like to observe birds.	Yes/No
Avian Conservation	I don't like that bird populations are declining. (pers. comm. L. Blank)	Likert Scale
	Killing birds for fun doesn't affect the environment. (adapted from Chodosh 1999)	
	A pine plantation is an ideal place for birds to nest.	
	Many of the birds and animals that live in the native forest can live in a pine plantation	
Science	Natural science is one of my favorite subjects.	Likert Scale
<i>Learning Science</i>	I consider myself a scientist. (adapted from Pankratz 2000)	
	I like to study science in the outdoors. (adapted from Chodosh 1999)	
<i>Nature of Science</i>	I won't/didn't learn anything on the fieldtrip.	
	Scientists have discovered most of the things there are to know about birds by now.	



To ensure consistency and reliability of individual student responses, often two or three items stated differently or negatively tested the same concept. For example, attitude towards learning about birds was tested by three different types of items (Table 2.4).

Table 2.4 Similar test items used to assess attitudes about birds.

Similar Test Items on Attitudes towards Birds	Type of Item
I would like to learn more about birds. (adapted from Chodosh 1999, (pers. comm. L. Blank)	Likert Scale
I don't care about birds. (Chodosh 1999)	
Learning about birds is..... (pers. comm. L. Blank) Boring (1) to Fun (10) Very Hard (1) to Easy (10) Not Important (1) to Very Important (10)	Scale of 1 to 10
I like to observe birds.	Yes/No
I don't like that bird populations are declining. (pers. comm. L. Blank)	Likert Scale

Some attitudinal test items directly reflected knowledge and understanding (Borg & Gall 1983, Sudman & Bradburn 1987). For example, whether or not students agreed with the Likert-scale items "Pine plantations are an ideal place for birds to nest" and "Many of the birds and animals that live in the native forest can live in a pine plantation" was based on their level of knowledge and understanding of avian habitat requirements, native forest ecology, and biodiversity.

### Assessing Student Experience

The pre-tests were used to determine students' prior experience to provide possible insight for their degree of knowledge, understanding and attitudes. Yes/No responses to seven statements revealed students' experience using birding equipment, visiting local natural areas, and caring for birds (Table 2.5). The percentage of students reporting "Yes" to each statement was calculated with 95% confidence intervals.

Table 2.5 Yes/No statements to determine students' experience.

Experience	Statement
Using Birding Tools	I have used binoculars before. I have used a fieldguide before to identify birds.
Caring for Birds	We have a birdfeeder at my house. My cat sometimes hunts and kills birds. I have killed a bird with a BB gun or a slingshot for fun. (adapted from Chodosh 1999)
Visiting Natural Areas	I have been to a national park to go hiking or camping before. I have gone to the fieldtrip site before.

### Assessing Ability to Identify Target Birds by Sight and Song

The ability to identify birds by song or sight is an essential skill that is fundamental to ornithological research and recreational birding (Narosky 1993, Erickson 1997, Sibley 2000). The identification section of the pre-and post-test was designed to assess whether students' ability to identify the target species by sight and song significantly improved after participation in ALAS. This section was placed last on the test as to not influence students' responses to attitudinal or open-ended items regarding birds and avian conservation.

No more than nine bird species were tested to avoid overwhelming or confusing students. A tape cassette recording of nine of the target bird songs was played one at a time for students to identify. Students circled "Yes" if they had heard the song before. If they knew the name of the bird, they wrote its name. Students circled "No" if they did not recognize the song (Table 2.6). For sight identification, students were shown nine colored illustrations of the target species one at a time. Again, students circled "Yes" if they recognized the bird, and wrote its name if they knew it, or circled "No" if they did not

recognize it (Table 2.6). Only students who responded “Yes” and also correctly named the tested bird song or illustration were considered able to identify the given bird by sight or song, respectively. The frequencies of students able to correctly identify the target birds by 1) sight only, 2) song only, and 3) both sight and song were calculated with 95% confidence intervals. The songs and illustrations were consistently tested in the same order.

Table 2.6 Yes/No test items to assess ability to identify target birds by sight and song. The correct answers to the sight and song identification items are italicized.

You will hear the songs of nine different birds that inhabit this region. If you recognize the song, circle “Yes”. If you know what bird sings that song, write its name in the blank. If you have never heard the song before, circle “No”.					
a. Yes <u>Zorzal</u> No	d. Yes <u>Chucac</u> No	g. Yes <u>Carpintero Grande</u> No			
b. Yes <u>Fio-fio</u> No	e. Yes <u>Huet Huet</u> No	h. Yes <u>Comesebo</u> No			
c. Yes <u>Tero</u> No	f. Yes <u>Rayadito</u> No	i. Yes <u>Pitio</u> No			
You will see pictures of nine different birds that inhabit this region. If you have seen the bird before, circle “Yes”. If you know what it is, write its name in the blank. If you have never seen it before, circle “No”.					
a. Yes <u>Zorzal</u> No	d. Yes <u>Carpintero Grande</u> No	g. Yes <u>Picaflor Rubi</u> No			
b. Yes <u>Rayadito</u> No	e. Yes <u>Huet Huet</u> No	h. Yes <u>Chucac</u> No			
c. Yes <u>Pitio</u> No	f. Yes <u>Fio-fio</u> No	i. Yes <u>Comesebo</u> No			

Expecting that most students would be unable to identify most of the target species, the Yes/No items were designed so that students could respond positively even if unable to name a given bird. A positive “Yes” response without the correct bird name was still considered a “No” response in the data analysis. This was intended to reduce a potential level of frustration and intimidation likely to be experienced by students who would not be able to identify most or any of the target birds.

Anticipating that birding would be a very new skill for most students, bird species that could be easily distinguished from one another by sight or song were selected. To

increase the applicability and relevance of learning about these birds, I selected species that students would be most likely to encounter either in the field or in their neighborhoods, or in both areas, based on my personal field observations and suggestions by Argentine and Chilean ornithologists (pers. comm. G. Amico, G. Iglesias, R. Rozzi).

As listed by their common names in English and Spanish (Refer to Table 3.5 for scientific names), the following eight species were tested by both sight and song: Austral Thrush, *Zorzal*; Thorn-tailed Rayadito, *Rayadito*; Chucao Tapaculo, *Chucao*; Black-throated Huet-Huet, *Huet-Huet*; White-crested Elaenia, *Fio-fio*; Patagonian Sierra Finch, *Comesebo*; Chilean Flicker, *Pitio*; and the Magellanic Woodpecker, *Carpintero Grande*. The Southern Lapwing, *Tero*, was tested by song only, and the Greenbacked Fire-crown Hummingbird, *Picaflor Rubi*, by sight only, as its song, a light trill, could be easily confused with the Thorn-tailed Rayadito for students new to birding. For a complete list of characteristics of the target species and the criteria by which they were selected, see Appendix I.

Of the nine birds tested by sight and song, four species were well-known birds that students were expected to be able to identify. These species were the Southern Lapwing, *tero*; Magellanic Woodpecker, *Carpintero Grande*; Austral Thrush, *Zorzal*; and the Green-backed Fire-Crowned Hummingbird, *Picaflor rubí*. Except for the charismatic Magellanic Woodpecker, that many students identified with the cartoon character “Woody Woodpecker” or “*El Pájaro Loco*”, these are very common birds in urban environments. Assuming that most children spend more time in urban environments than in native forest habitats, testing these four common species would help give a clearer idea of students’ ability to identify local birds.

### Administering the Pre- and Post-tests

Students were not forewarned about the pre- or post-test to minimize effects from anticipation. Tests were administered by the author or another ALAS educational coordinator. The same individual administered both the pre- and post-test to a given class. Students were informed that the tests were surveys that mostly reflected their opinion and would not be seen by the classroom teacher nor affect their grade in the class. Students were instructed to do their best, to work individually and not copy from their peers, to ask for clarification if any of the test items were unclear, and to leave open-ended items blank if they could not come up with a response. Post-tests were administered four weeks after the fieldtrip and two weeks after students had analyzed their fieldtrip data.

### Statistical Analysis of Test Results

Pre- and post-test data were statistically tested for significance at a p-value  $< .05$  using parametric, two-tailed, paired-sample t-tests on the SPSS Statistical Program. Differences were considered significant at the 95% confidence interval, or  $p < 0.05$ .

## **B. Qualitative Assessment**

Informal interviews with students, teacher questionnaires and personal observations formed the qualitative component of this study to further probe student knowledge and understanding, and to enrich the quantitative assessment (Borg & Gall 1983, Merriam 1998). Through interviews, students could expound upon their experiences, attitudes and knowledge giving deeper insight on the nature of their conceptual understanding that otherwise could not be revealed by the design of the pre- and post-test questions alone

(Borg & Gall 1983, Merriam 1998). For example, on the test, students indicated whether they felt pine plantations would be ideal places for birds to nest by responding to a Likert-scale item; however, the reasons driving their response remained unknown. During the interviews, students explained the basis for their opinions.

### Students

Fifteen to twenty minute, informal interviews were conducted with two groups of four randomly selected students (n=8) from two 8<sup>th</sup> grade classes of CEM 20, a public school in San Carlos de Bariloche where ALAS was piloted, to probe student understanding of pine plantations and native forest ecology before and after the fieldtrip. A native speaker assisted in all of the interviews to ensure questions and responses were mutually understood. Interviews were recorded on tape cassettes, transcribed by a native speaker, and translated to English by the author. Pre-trip interviews were conducted after the pretests were administered and a week before the fieldtrip. Post-trip interviews were given after students took the post-test to minimize the influence the interviews could potentially have on their test responses. Students were asked about their previous experiences on school fieldtrips to Cerro Otto (the fieldtrip site of native forest habitat in Bariloche), about their predictions regarding the fieldtrip activities and for the post trip interview, how those predictions turned out, and whether they felt pine plantations provided ideal bird habitat and their explanations. The interview questions are listed in Table 2.7.

Table 2.7 Student interview questions

Concept	Interview Question	Asked Pre or Post Fieldtrip
Experiences --On past fieldtrips	Have you been to the field trip site before?	Pre
	What did you do?	Pre
	What did you think about the ALAS fieldtrip?	Post
--On ALAS fieldtrip	What was your favorite activity?	Post
	How was this trip different from past school fieldtrips?	Post
	What were your fieldtrip predictions? Explain.	Pre and Post
Perception of pine plantation as ideal bird habitat.	What differences did you observe between the native forest and the pine plantation?	Pre and Post
	Is a pine plantation a good place for birds to nest?	Pre and Post
	If we removed all of the woodpeckers from the forest, what changes would there be?	Pre and Post
Native Forest Ecology		

### Teachers

Questionnaires were sent to participating teachers to determine if they had taught students about birds prior to their involvement with the ALAS project, and if so, by what means; whether they felt ALAS program was useful to them for teaching ecological concepts to their students; and to share any observable change in attitudes in their students after the fieldtrip experience (Table 2.8).

Table 2.8 Teacher questionnaire

Concept	Interview Question
Prior Experience Teaching about Birds	Did you teach about birds prior to ALAS? If so, what themes did you teach? If not, why?
Applicability of ALAS to curriculum	Was the fieldtrip experience useful for illustrating ecological concepts to your students throughout the school year?
Observed effects of fieldtrip on students' learning and motivation.	Have you noticed any changes in your students and their ability to understand ecology after the fieldtrip? If so, please share any anecdotes you may have.

## **Chapter 3: Results—A Step Closer to Ecological Literacy?**

### **I. Pre- and Post-test Results**

#### **A. Student Knowledge and Understanding**

After participation in the bird-centered ALAS program, students' average scores for knowledge of local native and exotic plant species, understanding of pine plantations, and native forest ecology increased significantly ( $p < .001$ ). Average scores for avian conservation, general bird identification and avian diversity also increased significantly after the program ( $p < .05$ ). There was no significant change in students' ability to name three birds on their schoolyard. Mean scores for these items are reported below with their standard error means (SE) (Table 3.1). Percentages are reported with 95% confidence intervals. See Appendix II for grading rubrics.

#### **Native and Exotic Plants**

Average scores for naming native and exotic plants significantly increased 0.4 points from  $2.7 \pm 0.07$  SE to  $3.1 \pm 0.06$  SE points ( $p < .001$ ) (Table 3.1). On the pre-test,  $6.9 \pm 2.4\%$  of students named pine incorrectly as a native plant (Table 3.2). On the post-test, no students named pine as native. The percentage of students who named pine as an exotic plant increased from  $47.4 \pm 4.8\%$  on the pre-test to  $82.5 \pm 3.6\%$  on the post-test ( $p < .001$ ).

For schools in San Carlos de Bariloche, the dominant tree species in the native forest fieldtrip site was *lenga* (*Nothofagus pumilio*). The percentage of students in Bariloche ( $n=303$ ) that correctly named *lenga* as native plant species increased from  $21.0 \pm 4.6\%$  on the pre-test to  $55.9 \pm 5.6\%$  on the post-test ( $p < .001$ ) (Table 3.2).



### Pine Plantations

Average scores for defining a pine plantation and stating its purpose increased from novice ( $0.8 \pm 0.04$  SE pts), e.g. pine plantations served broad environmental purposes such as “creating oxygen”, to intermediate ( $1.5 \pm 0.05$  SE pts), ( $p < .001$ ), e.g. pine plantations served for human consumption such as “to provide wood”.

### Native Forest Ecology

The mean student response to the three-point question “If woodpeckers disappeared from the forest, what changes would there be?” improved significantly, from novice ( $0.8 \pm 0.04$  SE) to intermediate ( $1.6 \pm 0.05$  SE), ( $p < .001$ ). In other words, the average student response progressed from describing a change that was aesthetic from a human viewpoint (e.g. there would be less noise) on the pre-test, to stating at least one clear ecological effect (e.g. there would be more bugs in the trees) on the post-test (Table 3.1).

### Avian Conservation

Scores for the test item “Name two things you can do to help birds” improved significantly ( $p < .001$ ), from novice (helping individual birds, i.e. injured or sick birds) to intermediate (helping birds at the population level, such as protecting habitat).

### General Bird Identification, Avian Diversity, and Sense of Place

On the pre-tests, students could often name up to eight birds at the order and family level, such as hawk, duck, or seagull. They infrequently named birds at the species level, with the exception of very common and conspicuous birds such as the Southern Lapwing, or *tero*, or cultural icons, such as the Andean Condor. Scores increased from  $2.6 \pm 0.06$  SE to  $3.0 \pm 0.08$  SE ( $p < .001$ ), indicating that students

named more birds at the species level on the post-test. In addition, students added more ALAS target species to their repertoire of Patagonian birds. On the pre-tests, an average of one target species from ALAS ( $1.1 \pm 0.06$  SE) was freely named, usually the hummingbird or the Southern Lapwing. In the post-tests, students named an average of four ( $3.8 \pm 0.08$  SE) of the target species, a statistically significant change ( $p < .001$ ).

Students' ability to name three birds seen in their schoolyard remained at an intermediate level on the pre- ( $1.8 \pm 0.06$  SE) and the post-test ( $1.7 \pm 0.05$  SE),  $p < .001$ . While students showed a statistically significant change in their ability to describe a bird in more detail, increasing from  $1.7 \pm 0.08$  SE to  $2.3 \pm 0.05$  SE points ( $p < .001$ ); their ability remained at the novice level (Table 3.1).

Table 3.1 Pre- and post-test results of open-ended test items.

Concept	Test Item	Average Scores $\pm$ SEM		
		Pre	Post	p<
Native and Exotic Plants	Name two native plants. 2 pts	$1.5 \pm 0.04$	$1.7 \pm 0.03$	.001
	Name exotic plants. 2pts	$1.2 \pm 0.05$	$1.4 \pm 0.04$	.001
	Total points 4pts	$2.7 \pm 0.07$	$3.1 \pm 0.06$	.001
Pine Plantations	What is a pine plantation and why do we have them? 3 pts	$0.8 \pm 0.04$	$1.5 \pm 0.05$	.001
Native Forest Ecology	If all woodpeckers disappeared from the forest, what changes would there be? 3 pts	$0.8 \pm 0.04$	$1.6 \pm 0.05$	.001
Avian Conservation	Name two things you can do to help birds. 3 pts	$1.1 \pm 0.03$	$1.7 \pm 0.04$	.001
Avian Diversity	Name 8 birds of this region. 4 pts	$2.6 \pm 0.06$	$3.0 \pm 0.08$	.001
	Average number of birds listed by students in above item that were ALAS target species.	$1.1 \pm 0.05$	$3.8 \pm 0.13$	.001
General Bird Identification	Name three birds you have seen in schoolyard. 3 pts	$1.8 \pm 0.06$	$1.7 \pm 0.05$	.891
	You will see a picture of a bird. Describe it. 6 pts	$1.7 \pm 0.08$	$2.3 \pm 0.05$	.001

**Table 3.2 Percentages of student responses on native and exotic plants with 95% confidence intervals.**

	Pre	Post	p<
Percentage of students incorrectly naming pine as native.	6.9 $\pm$ 2.4	0.0	.001
% of students correctly naming pine as exotic.	47.4 $\pm$ 4.8	82.5 $\pm$ 3.6	.001
% of students correctly naming Lenga as native (Bariloche only n=303)	21.0 $\pm$ 4.6	55.9 $\pm$ 5.6	.001

The question “When you think of Patagonia, what bird comes to mind?” reflected students’ sense of place through a representative bird species that identified the region in which they lived. The Andean Condor was the most common response in both the pre- and the post-test. However, the percentage of students naming the condor decreased from 35.8  $\pm$  4.6% on the pre-test to 29.4  $\pm$  4.4% on the post-test. Students’ post-test responses were more varied and included new species, many of which were ALAS target species. For example, no student had named either the *fio-fio* or the *rayadito* on the pre-test. On the post-test, 1.4  $\pm$  1.1% and 2.6  $\pm$  1.5% of students listed these species, respectively, as representing Patagonia. Birds of the endemic *Rhinocryptidae* family, either the *huet-huet* or the *chucao*, were also chosen more on the post-test. On the pre-test, 0.7  $\pm$  0.8% of students listed either of these birds whereas 5.4  $\pm$  2.2% of students named either of them on the post-test. The top five species of birds named by students on the pre- and post-tests are included in Table 3.3.

Table 3.3 Top five responses to the test item, “When you think of Patagonia, what bird comes to mind?”

Pre-Test		Post-Test	
Species	Percentage of Students	Species	Percentage of Students
Condor	35.8 $\pm$ 4.6	Condor	29.4 $\pm$ 4.4
Other	12.4 $\pm$ 3.1	Woodpecker	12.6 $\pm$ 3.2
Tero	7.9 $\pm$ 2.6	Other	10.3 $\pm$ 1.5
Woodpecker	5.9 $\pm$ 2.3	Chucac/Huet huet	5.4 $\pm$ 2.2
Eagle	5.4 $\pm$ 2.2	Falcon or Hawk	4.1 $\pm$ 1.9

## B. Attitudes

The averaged pre- and post-test scores of students’ attitudes towards 1) learning about birds and avian conservation, 2) pine plantations, and 3) science are described below and listed in Table 3.4.

### Avian Conservation and Learning about Birds

Pre-test results indicated that students cared about birds, wanted to learn more about them and were concerned for bird populations on both the pre- and post-tests. Students disagreed with the statement “I don’t care about birds” on the pre-test and the post-test (4.1  $\pm$  0.06 SE). Post-test results showed slightly less interest in learning about birds (2.1  $\pm$  0.05 SE) than the pre-test (1.9  $\pm$  0.05 SE) ( $p < .001$ ). On a scale of 1 to 10, students also felt that learning about birds was easier (5.9  $\pm$  0.13 SE to 6.7  $\pm$  0.13 SE,  $p < .001$ ) and more fun (7.5  $\pm$  0.12 SE to 7.9  $\pm$  0.12 SE,  $p < .001$ ) than anticipated, and important (7.9  $\pm$  0.11 SE to 8.1  $\pm$  0.18 SE,  $p < .497$ ). Before and after the fieldtrip, students agreed (2.2  $\pm$  0.08 SE) with the statement that they did not like that avian populations were declining and disagreed (4.1  $\pm$  0.07 SE) that “Killing birds for fun does not affect the environment”.

### Pine Plantations

Students' view of pine plantations as ideal bird habitat changed dramatically due to the field trip experience,  $p < .001$ . Pretest results showed that students agreed with the statement, "Pine plantations are an ideal place for birds to nest" ( $2.3 \pm 0.06$  SE). After the fieldtrip, attitudes changed to clear disagreement ( $4.2 \pm 0.06$  SE) ( $p < .001$ ). Pre-and post-test responses to a similar Likert item supported this strong change in attitude towards plantations. For the statement "Birds and animals of the native forest can also live in a pine plantation", students were uncertain, neither agreeing nor disagreeing ( $2.9 \pm 0.06$  SE). On the posttest, students clearly disagreed with this statement ( $4.3 \pm 0.05$  SE), ( $p < .001$ ).

### Learning Science and the Nature of Science

Attitudes towards science showed slight but statistically significant changes. Not surprisingly, students liked learning science in the outdoors more after the fieldtrip ( $1.7 \pm 0.05$  SE) than before ( $1.9 \pm 0.06$  SE),  $p < .02$  (Table 3.4). The average response to the statement "I won't/didn't learn anything on the fieldtrip" remained in strong disagreement on both the pre- ( $4.2 \pm 0.06$  SE) and the post-tests ( $4.3 \pm 0.06$  SE),  $p < .593$ , indicating that students expected to and felt they did benefit cognitively from the fieldtrip experience. Regarding the nature of science, students showed less agreement with the statement, "Scientists have discovered most of what there is to know about birds by now" after the fieldtrip ( $2.9 \pm 0.06$  SE) than on the pretest ( $2.7 \pm 0.06$  SE),  $p < .001$ . Though students clearly disagreed with the statement "I consider myself a scientist" ( $3.9 \pm 0.06$  SE), students disagreed slightly less after the fieldtrip ( $3.7 \pm 0.06$  SE),  $p < .026$ .

Table 3.4 Pre- and post-test results of attitudes. Average responses are based on a Likert scale to 1 to 5 according to the level of agreement with each statement, except for three items based on a scale of 1 to 10 indicated by \*. Likert scale:  
**1= Totally Agree 2 =Agree 3 =Neither Agree nor Disagree 4 =Disagree 5 =Totally Disagree**

Attitudes towards...	Average Scores $\pm$ Standard Error Mean n=412		
<b>Learning about Birds</b>	Pre	Post	p<
I would like to learn more about birds.	1.9 $\pm$ 0.05	2.1 $\pm$ 0.05	.001
I don't care about birds	4.1 $\pm$ 0.06	4.1 $\pm$ 0.06	.554
<b>* Learning about birds is.... On scale of 1- 10</b>			
*Boring (1) to Fun (10)	7.5 $\pm$ 0.12	7.7 $\pm$ 0.12	.032
*Very hard (1) to Very Easy(10)	5.9 $\pm$ 0.13	6.5 $\pm$ 0.13	.001
*Not important (1) to Very Important(10)	7.9 $\pm$ 0.11	8.0 $\pm$ 0.18	.549
<b>Avian Conservation</b>			
I don't like that bird populations are declining.	2.2 $\pm$ 0.08	2.2 $\pm$ 0.08	.670
Killing birds for fun doesn't affect the environment.	4.1 $\pm$ 0.07	4.1 $\pm$ 0.07	.001
<b>Pine Plantations</b>			
A pine plantation is an ideal place for birds to nest.	2.3 $\pm$ 0.06	4.2 $\pm$ 0.06	.001
Many of the birds and animals that live in the native forest can live in a pine plantation.	2.9 $\pm$ 0.06	4.3 $\pm$ 0.05	.001
<b>Nature of Science</b>			
Natural science is one of my favorite subjects.	2.6 $\pm$ 0.06	2.8 $\pm$ 0.07	.001
I like to study science outside.	1.9 $\pm$ 0.06	1.8 $\pm$ 0.05	.114
Scientists have discovered most of what there is to know about birds by now.	2.7 $\pm$ 0.06	3.0 $\pm$ 0.06	.001
I consider myself a scientist.	3.9 $\pm$ 0.06	3.7 $\pm$ 0.06	.026
I won't/didn't learn anything on the fieldtrip.	4.2 $\pm$ 0.06	4.3 $\pm$ 0.06	.593

### C. Students' Experience

The descriptive statistics of students' experiences with birding equipment, natural areas and killing birds and ability to identify birds are reported with 95% confidence intervals.

#### Using Binoculars and Field Guides

Most students (82.2%  $\pm$  4.3%) had used binoculars before ALAS at some point in their life, but due to the design of the question, it could not be determined if they had ever used them to observe birds before. On the post-test, 95.9%  $\pm$  2.0% of students reported using binoculars after the fieldtrip experience. Few students (19.3%  $\pm$  3.8%)

had previous experience with using a field guide to identify birds. On the post-test, 74.5  $\pm$  4.2% reported using a field guide (Table 3.5).

### Birdwatching, Birdfeeders, and Visiting National Parks

The percentage of students reporting that they enjoyed observing birds increased after the fieldtrip, from 79.5%  $\pm$  4.6% to 82.3%  $\pm$  4.1% ( $p < .05$ ), but this change was not significant. Less than one-quarter of students (18.3%  $\pm$  3.7%) reported having birdfeeders at their homes on the pre-tests which increased to 22.6%  $\pm$  4.0% on the post-tests. Overall, 74.5%  $\pm$  4.2% of students had visited nearby national parks for recreational purposes (Table 3.5).

### Killing Birds

On the pretest, 18.4%  $\pm$  3.7% of students reported killing birds for fun with a slingshot or a BB gun. About half of the students were cat owners. Of that subset, 63.1%  $\pm$  4.7% had observed their cats hunting and killing birds (Table 3.5).

Table 3.5 Percentages of students responding "Yes" to statements regarding experiences and behaviors with 95% confidence intervals.

Experience in...	Cumulative N=412	
	Pre	Post
<b>Ornithology</b>		
I have used binoculars before.	82.2 $\pm$ 4.3	95.9 $\pm$ 2.0
I like to birdwatch.	79.5 $\pm$ 4.6	82.3 $\pm$ 4.1
I have used a field-guide to identify birds.	19.3 $\pm$ 3.8	69.1 $\pm$ 4.5
We have a bird-feeder at my house.	18.3 $\pm$ 3.7	22.6 $\pm$ 4.0
<b>Natural Areas</b>		
I have gone to a national park before to go camping, hiking, or picknicking.	74.5 $\pm$ 4.2	74.8 $\pm$ 4.2
<b>Killing Birds</b>		
I have killed a bird with a BB gun or a slingshot before.	18.4 $\pm$ 3.7	23.5 $\pm$ 4.1
Percentage of students who own cats.	52.4 $\pm$ 4.8	59.7 $\pm$ 4.7
My cat sometimes hunts and kills birds.	61.1 $\pm$ 4.7	63.0 $\pm$ 4.7

#### D. Students' Ability to Identify Target Species by Sight and Song

Students' ability to identify most of the target birds on the pre-test was very low (Table 3.6). Less than five percent of students could identify six of the nine target birds by sight or song. In parentheses are the respective percentages of students able to correctly identify the following six birds by sight, then by song: the White-crested Elaenia, *fio-fio* (by sight  $3.1 \pm 1.7\%$ , by song  $2.3 \pm 1.4\%$ ); the Black-throated Huet-huet, *huet-huet* ( $0.5 \pm 0.6\%$ ,  $4.9 \pm 2.1\%$ ); the Patagonian Sierra Finch, *comesebo* ( $1.3 \pm 1.1\%$ ,  $0.6 \pm 0.7\%$ ); the Chucac Tapaculo, *chucac* ( $0.6 \pm 0.7\%$ ,  $5.5 \pm 2.2\%$ ); the Patagonian Flicker, *pitio* ( $5.8 \pm 2.2\%$ ,  $12.2 \pm 3.1\%$ ), and the Thorn-tailed Rayadito, *rayadito* ( $0.3 \pm 0.5\%$ ,  $0.3 \pm 0.5\%$ ). No students could identify the following three species by both sight and song on the pre-test: the Black-throated Huet-huet, *huet-huet*; the Patagonian Sierra Finch, *comesebo*; or the Thorn-tailed Rayadito, *rayadito*.

As anticipated, on the pre-test a much higher percentage of students could correctly identify the following four species by sight and by song, respectively: the Magellanic Woodpecker, *carpintero grande* ( $72.7 \pm 4.3\%$ ,  $71.9 \pm 4.3\%$ ), the Green-backed Fire-crown Hummingbird, *picaflor rubi* ( $46.8 \pm 4.8\%$ , tested by sight only), and the Southern Lapwing, *tero*, ( $60.5 \pm 4.6\%$ , tested by song only), and the Austral Thrush, *zorzal* ( $22.1 \pm 4.0\%$ ,  $5.5 \pm 2.2\%$ ).

The ALAS program had a significant impact on students' ability to identify the target species by sight, by song, and by both sight and song. Post-test results showed statistically significant and often dramatic improvements ( $p < .001$ ) in the ability to identify the all target species by sight and song except for the Southern Lapwing, *tero* by song ( $p < .319$ ), the Magellanic Woodpecker by song ( $p < .179$ ), and the Austral



Thrush by song ( $p < .233$ ). Those species with the lowest recognition on the pre-test, such as the White-crested Elaenia, *fio-fio*, the Black-throated Huet-huet, *huet-huet*, and the Thorn-tailed Rayadito, *rayadito* showed the greatest improvement ( $p < .001$ ).

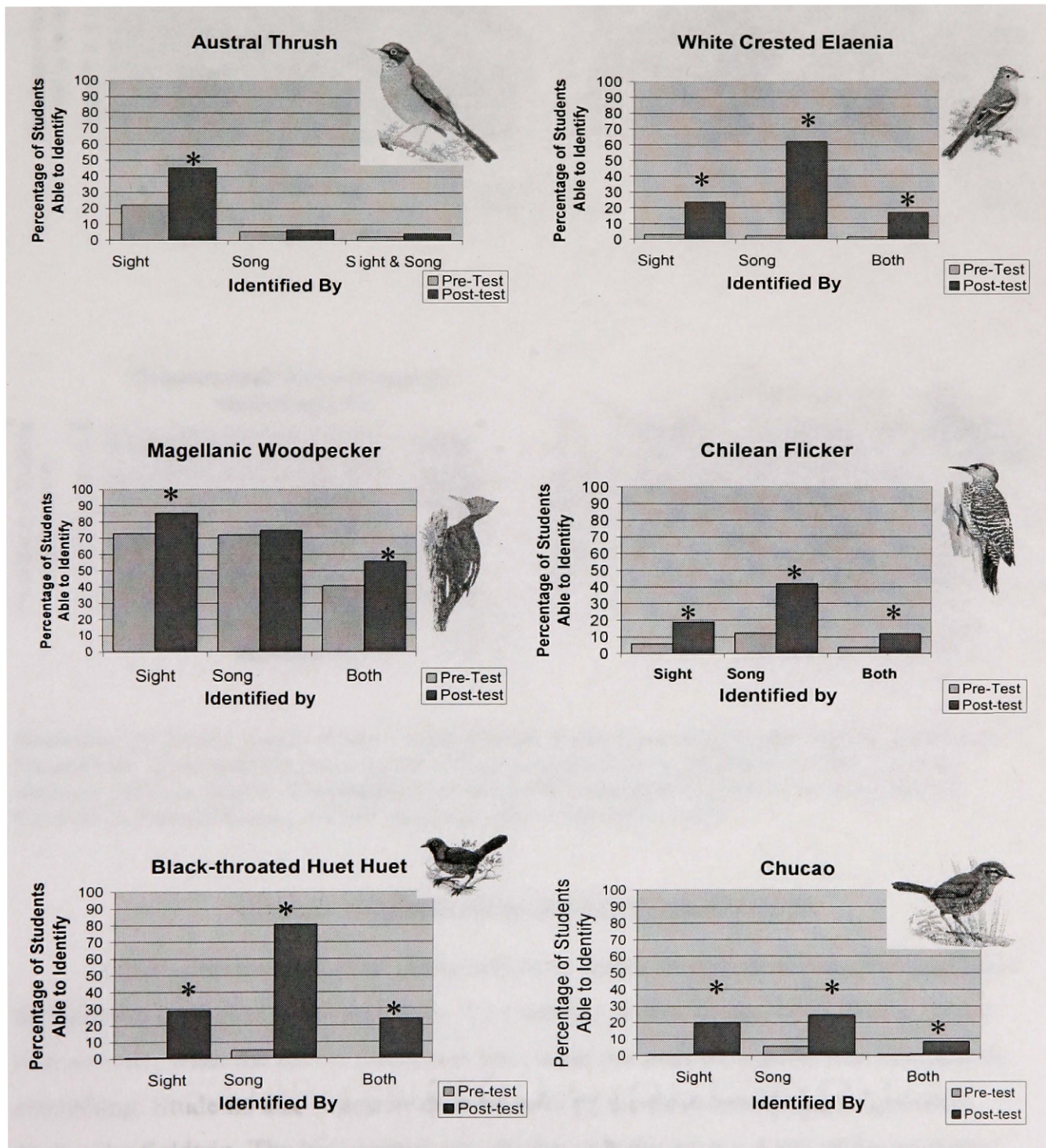
Listed in descending order are the percentages of students that could positively identify the target birds by sight on the post-test: the Magellanic Woodpecker, *carpintero grande*, ( $85.3 \pm 3.4\%$ ); the Green-backed Fire-crown hummingbird, *picaflor rubi* ( $61.7 \pm 4.6\%$ ); the Thorn-tailed Rayadito, *rayadito* ( $52.7 \pm 4.8\%$ ); the Austral Thrush, *zorzal* ( $45.5 \pm 4.7\%$ ); the Patagonian Sierra Finch, *comesebo* ( $39.2 \pm 4.7\%$ ); the Black-throated Huet-Huet ( $29.0 \pm 4.3\%$ ); the White-crested Elaenia, *fio-fio* ( $23.7 \pm 4.1\%$ ); the Chucao Tapaculo, *chucao* ( $20.1 \pm 3.8\%$ ); and the Patagonian Flicker, *pitío* ( $18.8 \pm 3.7\%$ ).

By song only,  $80.6 \pm 3.8\%$  of students could identify the Black-throated Huet-huet, followed by the Magellanic Woodpecker, *carpintero grande* ( $74.7 \pm 4.2\%$ ); the Southern Lapwing, *tero* ( $66.5 \pm 4.5\%$ ); the White-crested Elaenia, *fio-fio* ( $62.1 \pm 4.6\%$ ); the Patagonian Flicker, *pitío* ( $41.9 \pm 4.7\%$ ); the Thorn-tailed Rayadito, *rayadito* ( $26.6 \pm 4.0\%$ ); the Chucao Tapaculo, *chucao* ( $24.5 \pm 4.1\%$ ); the Austral Thrush, *zorzal* ( $6.7 \pm 2.4\%$ ); and the Patagonian Sierra Finch, *comesebo* ( $3.0 \pm 1.6\%$ ).

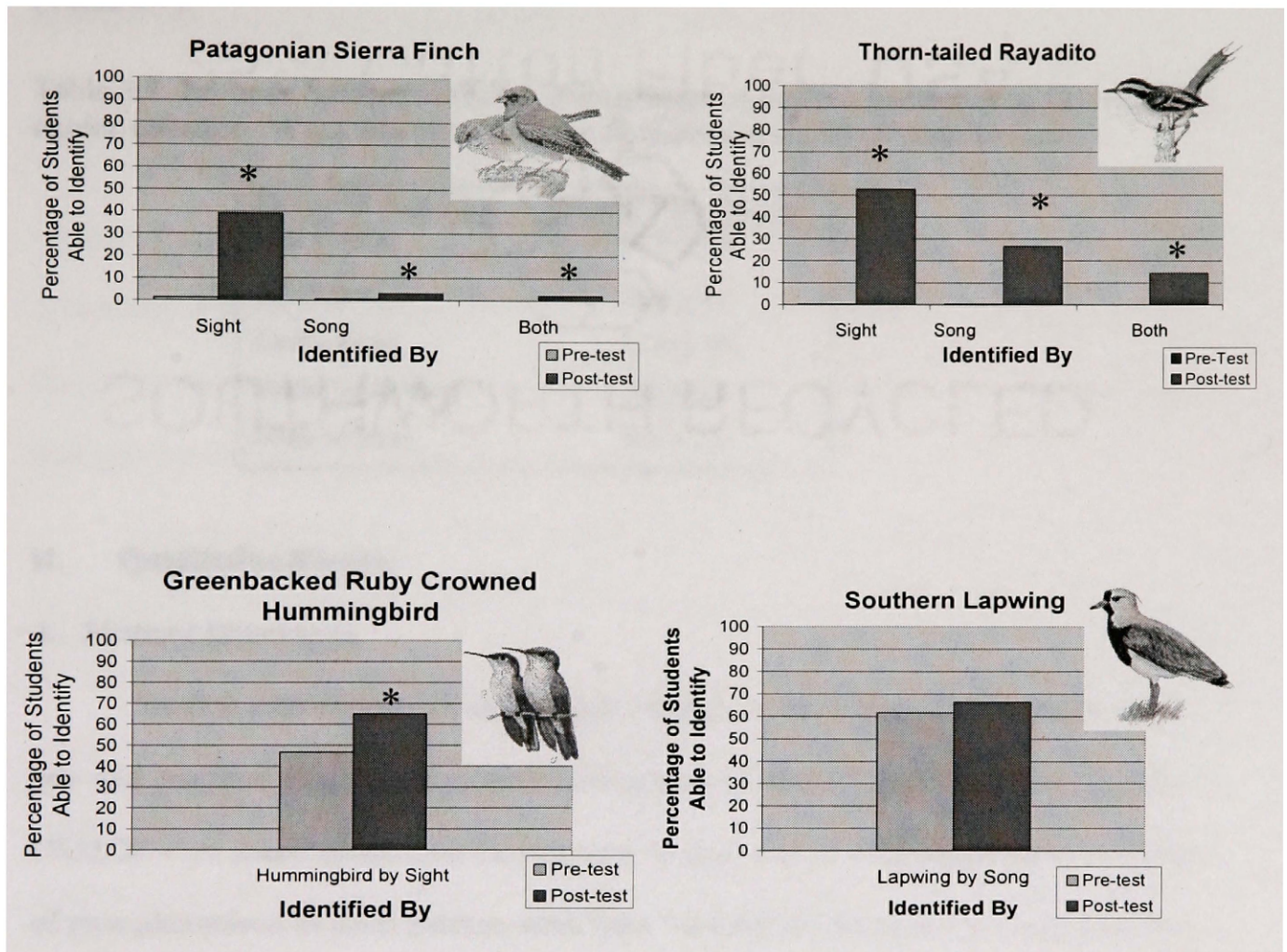
Table 3.6 Percentages of students able to correctly identify target species by 1) sight only, 2) song, and 3) both sight and song. \* Bird species with an onomatopoeic song.

Species	Identified by	Pre	Post	p<
<b>Zorzal</b>	Sight	22.1 $\pm$ 4.0	45.5 $\pm$ 4.7	.001
Austral Thrush	Song	5.5 $\pm$ 2.2	6.7 $\pm$ 2.4	.232
<i>Turdus patagonicus</i>	Sight & Song	2.4 $\pm$ 1.5	4.3 $\pm$ 1.9	.066
<b>Fio-Fio*</b>	Sight	3.1 $\pm$ 1.7	23.7 $\pm$ 4.1	.001
White Crested Elaenia	Song	2.3 $\pm$ 1.4	62.1 $\pm$ 4.6	.001
<i>Elaenia albiceps</i>	Sight & Song	1.4 $\pm$ 1.1	16.9 $\pm$ 3.6	.001
<b>Carpintero Grande</b>	Sight	72.7 $\pm$ 4.3	85.3 $\pm$ 3.4	.001
Magellanic Woodpecker	Song	71.9 $\pm$ 4.3	74.7 $\pm$ 4.2	.179
<i>Campephilus magellanicus</i>	Sight & Song	40.6 $\pm$ 4.6	55.6 $\pm$ 6.4	.001
<b>Pitio*</b>	Sight	5.8 $\pm$ 2.2	18.8 $\pm$ 3.7	.001
Patagonian Flicker	Song	12.2 $\pm$ 3.1	41.9 $\pm$ 4.7	.001
<i>Colaptes pitius</i>	Sight & Song	3.6 $\pm$ 1.8	11.9 $\pm$ 3.1	.001
<b>Huet Huet*</b>	Sight	0.5 $\pm$ 0.6	29.0 $\pm$ 4.3	.001
Black-throated Huet-Huet	Song	4.9 $\pm$ 2.1	80.6 $\pm$ 3.8	.001
<i>Pteroptochos tarnii</i>	Sight & Song	0.0	24.0 $\pm$ 4.1	.001
<b>Chuca</b>	Sight	0.6 $\pm$ 0.7	20.1 $\pm$ 3.8	.001
Chuca Tapaculo	Song	5.5 $\pm$ 2.2	24.5 $\pm$ 4.1	.001
<i>Scelorchilus rubecula</i>	Sight & Song	0.5 $\pm$ 0.7	8.3 $\pm$ 2.6	.001
<b>Comesebo</b>	Sight	1.3 $\pm$ 1.1	39.2 $\pm$ 4.7	.001
Patagonian Sierra Finch	Song	0.6 $\pm$ 0.7	3.0 $\pm$ 1.6	.004
<i>Phrygilus patagonicus</i>	Sight & Song	0.0	2.1 $\pm$ 1.4	.001
<b>Rayadito</b>	Sight	0.3 $\pm$ 0.5	52.7 $\pm$ 4.8	.001
Thorn-tailed Rayadito	Song	0.3 $\pm$ 0.5	26.6 $\pm$ 4.0	.001
<i>Aphrastrus spinicaudea</i>	Sight & Song	0.0	14.5 $\pm$ 3.4	.001
<b>Picaflor Rubí</b>				
Green-backed Fire-crown Hummingbird	Sight Only	46.8 $\pm$ 4.8	61.7 $\pm$ 4.6	.001
<i>Sephanoides sephanoides</i>				
<b>Tero*</b>				
Southern lapwing	Song Only	65.0 $\pm$ 4.6	66.5 $\pm$ 4.5	.319
<i>Vanellus chilensis</i>				

Figure 3.1 Pre- and post-test percentages of students able to correctly identify the target species by sight, by song, and by both. An illustration of each given species is to the right of each graph. An \* indicates significance difference between the means of the pre- and post-tests at  $p < 0.05$ .







Illustrations of Austral Thrush, White Crested Elaenia, Black-throated Huet huet, Chucaco, Patagonian Sierra Finch, Thorn-tailed Rayadito and the Hummingbird are by Guy Tudor in the *Birds of South America, Volumes I and II*. The Southern Lapwing, and hummingbird illustrations are by Marcelo Canevari in *Aves del Bosque-Andino Patagónico*, Guías Elemental, Pérez.

### Post-test Feedback about the Fieldtrip Experience

Eighty-five percent of students told their family members about one or more of the following aspects of the field trip: bird activity, forest understory activity, cavity nest activity, what the native forest was like, what the pine plantation was like, and/or everything. Students also reported their favorite of the three investigative activities during the fieldtrip. The bird census was the favorite for  $46.5 \pm 4.8\%$  of the students. Nearly one-quarter ( $24.1 \pm 4.1\%$ ) reported liking all three of them equally, followed by  $17.1 \pm 3.6\%$  preferring the cavity nest activity, and  $9.3 \pm 2.8\%$  preferring the forest

understory activity. About three percent ( $2.8 \pm 1.6\%$ ) did not like any of the activities (Table 3.7).

Table 3.7 Favorite fieldtrip activity. Percentages of student responses to the multiple-choice question "What was your favorite fieldtrip activity?" greatest to least.

Favorite Activity	Student Percentage
Bird Census	$46.7 \pm 4.8$
All of them	$24.1 \pm 4.1$
Cavity Nests	$17.1 \pm 3.6$
Forest Understory	$9.3 \pm 2.8$
None of them	$2.8 \pm 1.6$

## II. Qualitative Results

### A. Student Interviews

Student interviews provided deeper insight on their understanding than what pre- and posttests alone could reveal. Two groups of four 8<sup>th</sup> grade students from the CEM 20 were asked about their experiences on past school fieldtrips, their perception of pine plantations as ideal habitat, what their fieldtrip predictions were and how they turned out, what changes they thought there would be if woodpeckers disappeared from the forest, and what their overall impression of the fieldtrip was. The transcribed interviews are in Appendix II. Students' names were replaced with pseudonyms.

#### Previous Fieldtrip Experiences

Most of the students had been to Cerro Otto (the fieldtrip site) on past school trips or with family members before for diversion and sight-seeing, but none had reported doing ecological investigations on Cerro Otto before. Two of the interviewed students recalled doing environmentally-related activities on primary school fieldtrips.

One of those students, Miguel, remembered drawing the forest; another, Andrés, recalled planting pines to restore a burned area on Cerro Otto.

### Students' Predictions and Perception of Pine Plantations

Before going on the fieldtrip, students made predictions on the three investigative activities they were going to undertake in the native forest and the pine plantation. For example, were they going to find more birds in the pine plantation or in the native forest? Or would it be the same in both sites? What was the reasoning behind their prediction?

It is evident that the CEM 20 students interviewed had a previous idea of biodiversity as suggested by their description of the expected differences between the plantation and the native forest before the fieldtrip. Though they do not use the exact term “diversity”, they clearly imply it in their choice of words, such as “different”, “more species”, and “distinct forms” for example. Although they clearly recognized that the native forest had a greater diversity of tree species, all of the students felt that trees in general provided shelter and protection for birds, and therefore, birds could feasibly inhabit both sites, depending in part on the individual preference of each bird. In the post-test interviews, students were asked about how their predictions turned out. Romina was absent so María Luisa filled in. Three of the four students reported their findings to be different from what they had expected. María Luisa and Miguel expected to find more birds in the pine plantation but had observed more in the native forest.

### Understanding of Native Forest Ecology

For insight on student understanding of native forest ecology and the interdependence of organisms, students were asked about what changes would occur if

woodpeckers disappeared from the forest. This same question was on the pre- and post-tests. In the pre-trip interview, students mentioned only aesthetic or emotional changes as a consequence, such as silence, a visual absence of woodpecker sign on tree trunks, and that the forest would not be as “happy”.

#### **Pre-trip**

**Q:** If we took all of the woodpeckers out of the forest, what changes would there be?

**Miguel:** The trees wouldn't be all pecked.

**Andrés:** The song.

**Analia:** Yes, in the trees, in one form or the other, they make their nests. When you see a tree, you say “wow, here's where the bird was!” So, people are going to go to the forest and say “Look at how pretty the tree is”, but they aren't going to say “Hey, look here, we saw a tree that was all pecked up by a woodpecker.”

**Romina:** That we wouldn't hear the sound of the birds, of the woodpecker. It wouldn't be as happy, because birds are also happy.

After the fieldtrip, students demonstrated a clear understanding of ecological effects that would result from the absence of woodpeckers by directly stating the negative impact on secondary cavity nesting birds that depend in part to the availability of abandoned woodpecker cavities for nesting sites.

#### **Post-Trip**

**Q:** If we took all of the woodpeckers out of the forest, what changes would there be?

**Miguel:** The cavities. There wouldn't be more nests for the...chucaos, ummm, no, for the others, those small owls, for some of those other birds.

**Analia:** Yeah, I think that, okay, after the birds leave the nest, others come and they occupy it to have a home. I think that without that, no more. It would leave other species without a home.

**Miguel:** They would have to make another one.

**Analia:** They would have to construct another little home.

These verbal responses coincided with average pre- and post-test responses to the same question.

Most of the interviewed students found striking differences between the native forest and the pine plantation. In the pine plantation, the soil was drier, there was no woodpecker sign, very few insects in the leaf litter, and fewer birds. Romina observed no differences. The comments of most of the interviewed students demonstrated a better understanding of native forest ecology.

**Q:** What differences did you all find between the native forest and the pine plantation?

**Francisco** – In the native forest, the ground's surface was more humid than in the pine plantation because the floor of the pine plantation was all moldy pine needles and nothing more, and that (layer) was moist, but the soil wasn't.

**Clara** – I didn't see any.

**Karina** – The soil in the native forest was much moister and it was drier in the pine plantation where there were no insects that the birds could eat.

**Ezio** – The other difference was that in the native forest there were trees that were very pecked up. In contrast, in the pine plantation there weren't many.

**Francisco** – Of course because the pine trees are new there and the wood is somewhat hard. In the native forest, the wood is all, like, rotten inside with, when the fungus penetrates it. It's very old and it makes it easier for the woodpecker to peck and break it open right away than in the pine plantation.

Francisco demonstrated a clear grasp of the interaction of an arboreal fungus, old-growth *lenga*, and cavity-nesters, the principle concept of the cavity nest activity.

Karina made the connection that a lack of invertebrates in the soil meant a lack of food for birds.

### Opinion about the ALAS Fieldtrip

The eight CEM 20 students appeared to enjoy the diversity and experiential nature of the three activities, and expressed satisfaction at being able to identify birds by their name. They clearly appreciated being able to hear, see, and touch. The excerpt below demonstrates how reviewing the target bird species prior to the fieldtrip enhanced a student's experience, and that the hands-on, explorative aspect was also valued by students.

**Q:** What was your favorite activity on the fieldtrip?

**Maria Luisa:** For me, cavity nests.

**Miguel:** I liked all of them because we had to do activities and all of those things...and afterwards, the activity on the ground. All of the little bugs...there were spiders.

**Analía:** For me, the bird songs. I didn't pay any attention to them before. Now that I know them a little more, so I.... they stick out more.

**Q:** And what birds did you hear?

**Analía:** I heard the Huet Huet, ummm, the Rayadito, and I don't remember what else.

**Q:** Before leaving on the fieldtrip, we listened to the songs on the tape recorder. Did that help you?

**Analía:** Yes, yes, for that same reason. Before, I didn't pay attention to songs like that in particular. For that reason, I was listening to them. Now that they taught me this, to go and recognize them there, it was good.



Preparing students to identify the target species by sight and song prior to the fieldtrip seemed to help focus them during the fieldtrip.

## **B. Teacher Feedback**

Comments from three teachers who responded to the questionnaires also provided insight on the impact of the fieldtrip experience on their students and of its applicability to teaching ecological concepts throughout the year. María Elena, a biology teacher for 22 years who helped pilot ALAS with her students in CEM 20, reported that she had never taught about birds prior to ALAS, in part due to lack of knowledge about birds and because birds were not included in the curriculum. She found the fieldtrip experience to be "very, very important" for teaching ecological concepts to students and that she had "used examples from the trip all of the time". For this reason, she found fall field trips to be more advantageous than spring fieldtrips. María Elena reported her students to express more interest in ecology after the fieldtrip and added that "on the final exam, I added this question, 'What activities in this class helped you understand new concepts or that made the class easier and more pleasing?' Everyone responded...the fieldtrip with ALAS."

Silvana been a secondary biology teacher for 20 years and was one of the few teachers that had taught about birds before, mostly through museum visits and textbooks, primarily focusing on avian form and function. She had never taken her students to the field, and reported that after the ALAS trip, her students "got hooked". "In reality, they loved it. They wanted to go out again." She reported that after the fieldtrip, some of her students would tell her that "they can now identify birds that

appear in their yards”, and that another student of hers reported “that when she’s walking along and hears a bird singing, she’s makes a game out of trying to identify it”. “What’s more”, the teacher added, “the same thing happens to me.”

Anita, a science teacher in Primo Capararo, reported that five months after the fall fieldtrip students "still keep working on birds, they're very content and each time they ask more and bring more materials. We did a census in an urban area very close to school. We set up plots to locate nests, feathers, and to see what they eat. The *teros* live around there, and in this season they are making nests...the children were also identifying the songs and were very pleased!" Anita was also incorporating the study of birds in her curriculum for her 3<sup>rd</sup> grade students in Primo Capraro and her 8<sup>th</sup> grade students in Don Bosco, another private school where she taught. She suggested that it would be wise to start teaching the pre-schoolers and kindergartners bird songs since she had noticed how quickly her preschool-aged son had picked up bird songs at home.

### **C. Participant Observations**

Personal observations of students' spontaneous reactions upon entering the pine plantation after the native forest were also telling. "*Es todo igual. No hay nada acá*" were exclamations frequently overheard. “It's all the same. There's nothing here”, students observed. In addition, the silence due to the general absence of birds was surprising to students. While very few students found the orderliness of the plantation appealing, the majority was disappointed by the lack of diversity in contrast to the native forest. Most quickly became bored in the plantation, for there was notably less to discover. For most student groups I worked with in the field, it seemed apparent to

them that the absence of forest understory plants and invertebrates equated to an absence of food and shelter required for the birds they observed in the native forest.

### Integration of ALAS with other subjects

Language and literature teachers who had personal interest in ecology and conservation issues participated their classes in ALAS and integrated the fieldtrip experience into their subject. Marta, who taught English in a public school in Bariloche, had her students write about their fieldtrip experience in English to their new penpals in a highschool Spanish class in Gardiner, MT, a gateway town to Yellowstone National Park. Marisa, a literature teacher, incorporated ALAS activities with her unit on Expository Writing. Her students researched some element of the native forest and wrote a report on it incorporating their field observations. While grading her students' papers, she reported that for students "the differences between the native forest and the pine plantations were *clarísimo*" (very, very clear). Some of her students wrote that "when they go to the forest again, they plan on looking at things in a different way in more detail." Students from the Antu Ruca school graphed their data in their computer class.

### Fruitfulness of Scientist-Student-Teacher Partnerships fostered by the Program.

During ALAS fieldtrips, the biologists who guided the activities were frequently impressed not only by the enthusiasm of most students but also by the nature of their questions and their keen observations. For example, Martín, a biologist in San Carlos de Bariloche who guided the forest understory activity, showed some students common insect galls on a native plant. One student quickly found a different one from which an insect was actually emerging. Martín reported that even after so many seasons in the

field, he had never witnessed this event. Another student located an old Magellanic Woodpecker cavity that had not been observed before by the author or biologist Valeria Ojeda who studies this species locally. The fieldtrip guides received letters of appreciation from CEM 20 students afterwards. The teachers were also very pleased by the fieldtrip experience and some consulted the educational coordinators long after the fieldtrip to share ideas and borrow materials from ALAS.

Sharing the pre-test results with the participating biologists highlighted the importance and relevancy of their participation in pre-college education. They were shocked by students' lack of ability to identify common birds, and that most students perceived pine plantations as good bird habitat. Likewise, sharing the post-test results was motivating and demonstrated that their action positively impacted student learning.

#### **E. A Summary of Results**

The data demonstrate that the fieldtrip component had a significant impact on student learning and attitudes. Data also indicate that the ornithology-centered ALAS program helped students understand more about native forest ecology, the interdependence of organisms, and native and exotic plant species while improving their ability to identify forest birds that they previously did not know. Although slight changes (by tenths of a point) for some of the attitude test items were statistically significant, these changes could be attributed to random variation in student responses due to the large sample size and should therefore be interpreted cautiously.

## **Chapter Four: Discussion**

### **I. Introduction**

In this chapter, the results and limitations of this study are discussed followed by conclusions, recommendations, and suggestions for future research.

### **II. Discussion of Results**

#### Findings

The pre-test data from middle school children in Patagonia revealed important trends about their attitudes, knowledge and understanding of birds and native forest ecology: 1) most students perceived pine plantations to be ideal bird habitat, in spite of a general awareness that pines are an exotic species, 2) most students could not identify common endemic forest birds by sight or song, and 3) most students were concerned about bird populations and desired to learn more about them.

The general perception of plantations as ideal habitat for birds before participation in ALAS indicated a limited understanding of native forest ecology, habitat requirements for native birds, and biodiversity. Pre-fieldtrip interviews with CEM 20 students revealed an important misconception: that trees, regardless of species, provided forest birds with the shelter and nesting sites they needed. Casual observations of the exterior of pine plantations are understandably deceptive. The lush, dark green foliage of a typical pine plantation hides a dry, barren interior that is typically void of understory vegetation.

The direct comparison of native forest habitat to a pine plantation through hands-on, investigative activities helped students become aware of the interdependence of organisms and of avian habitat requirements, such as the importance of an understory

strata of plants that many birds species need for food, shelter, nesting materials and nesting sites. The strong change in attitudes towards pine plantations as ideal bird habitat on the post-test corresponded with the increased knowledge and understanding of native forest ecology, the impact of exotic monocultures on native habitats, and avian conservation.

In all of the localities where ALAS took place, native forest habitats were within walking distance of students' homes, and most students had been to nearby natural areas on fieldtrips at least once during their schooling. The low ability to identify forest birds could be attributed to little time spent outdoors, and/or the lack of adult mentorship. This would be interesting to explore in future studies.

Students' ability to identify target birds by sight and by song improved significantly after participation in ALAS. The following factors likely facilitated learning: 1) reviewing the target birds in classroom activities prior to the fieldtrip, 2) concentrating on a few bird species that would be easy to learn because of coloration or song, and 3) selecting target species that students would be guaranteed to encounter in the field and near their homes. Those species with onomatopoeic songs, or songs that sound like their common names, showed the greatest improvement in recognition by song. For example, the White-Crested Elaenia's song is a whistled and repetitive "Feee-oh, Feee-oh", sounds just like its common name in Spanish, *fio-fio*. The Black-throated Huet-huet, *huet-huet*, has an unmistakable call exactly like its common Spanish name—a quick, repetitive "whet-whet-whet-whet".

Identification of species whose coloration was more notable and conspicuous than their song, such as the *comesebo*, a bright yellow finch with a blue-grey hood, improved

more by sight than song. Some of the ALAS guides called this the “Boca Bird” to help students remember. *Boca* is a popular national soccer team in Argentina whose colors are blue and yellow. The *Rayadito*, often observed in vociferous flocks, was always seen by students on the fieldtrips in Bariloche.

Ability to identify the species that were previously identified as common urban birds that students would be most likely to recognize (Southern Lapwing, *tero*; Austral Thrush, *zorzal*; and Green-backed Fire-crown Hummingbird, *picaflor*) showed minimal improvement compared to those species that were unknown yet common (White Crested Elaenia, *fiofio*; Black-throated Huet Huet, *huet-huet*; Chucao Tapaculo, *chucac*; and Andean Flicker, *pitio*). This highlights the importance of selecting unfamiliar target species, but ones that are likely to be seen in the field, to enhance student learning.

The fieldtrip provided students with the opportunity to identify other species of birds, such as the Striped Woodpecker (*Colaptes lignarius*), a small woodpecker; the White-throated Tree Runner (*Pygarrhichas albogularis*), and birds of prey such as the Austral Pygmy Owl (*Glaucidium nanum*) which would help increase their awareness of local avian diversity.

Participation in ALAS improved students’ knowledge of exotic and native plants significantly. Because the pre-fieldtrip classroom activities focused almost exclusively on bird identification, it can be assumed that most of what students learned about these content domains occurred largely from the comparative activities of the fieldtrip experience, one of which focused on plant diversity of the forest understory.

Not surprisingly, students expressed a strong interest in studying science in the outdoors both before and after the program, and felt that they would and did learn a lot from the fieldtrip experience.

### Other Findings

Working with students in three different provinces revealed that the common names of birds differed among localities that were only 150 to 200 km apart. In San Martín de los Andes, 150 km north of San Carlos de Bariloche, for example, the *rayadito* was known as the *titinca*, its indigenous name in the Mapuche language. The name *titinca* mimics the sound that this bird makes. In Epuyen and El Bolsón, 150 km south of Bariloche, the *chucao* was commonly known as El Curioso, literally, the curious one, and a descriptor of this species' behavior. Two-hundred kilometers west across the Andes in Chile, common names are very different. The *comesebo* in Argentina is known as the *cometocino* in Chile. The *tero* in Argentina is called the *quetelhue* in Chile. This highlights the relevance of teaching universal scientific names to students in Latin America, where the common names of birds are not as standardized as in North America, particularly if sister schools within Latin America exchange information about birds.

### **C. Limitations and Recommendations**

While the pre- and post-test results show that the ALAS program did have a positive impact on student knowledge, understanding, and attitudes, there are several limitations of this study to consider. For one, control groups should have been designed to test the degree to which classroom activities versus the fieldtrip experience influenced learning. This was not tested specifically. Ideally, a control group of students who did not



participate in any of the ALAS activities would have been pre- and post-tested. However, there were ethical and social considerations for not post-testing students who did not participate in any of the activities, particularly in public schools. Other grades in the participating public schools, on more than one occasion, felt it was unfair that they could not go on the fieldtrip. Students taking the pre-test frequently expressed frustration at not being able to identify many of the target birds, or being able to answer the ecology test items.

It seemed reasonable to assume that no meaningful change in knowledge, understanding, or attitudes about avian ecology or bird identification would have occurred had students not participated in ALAS. Most of the participating teachers had never taught about birds prior to ALAS, and for the majority of students in this study, ALAS was only fieldtrip of the year due to the financial hardships facing most schools as a result of a national economic crisis.

It was not possible to consistently administer post-tests to every school group precisely four weeks after the fieldtrip experience. Factors that reduced the ability to consistently administer post-tests after a specific time period included mid-term or final exam weeks, inclement weather that caused fieldtrip delays, unexpected teacher strikes, holidays, or school events; and the scheduling constraints of having biology class only twice a week rather than daily.

Crowded classroom conditions made copying answers to the open-ended items difficult to prevent with a few students. We attempted to reduce this by reminding and reassuring students that the pre- and post-test would not affect their grade in any way, and that it was a survey that reflected their own opinion. This appeared to be effective. The

tests were not anonymous and that may have affected student responses. Similar to Pankratz'(2000) experience, negatively stated with Likert items were confusing to some students. It is recommended that only positive Likert-scale statements be used to avoid confusion.

The validity of testing bird identification by sight and song in the classroom has not been measured. Seeing and hearing birds out of the context of their natural environment may make it more difficult for students to identify them, and thus, under-represent students' actual birding ability. To enhance the qualitative data set, more student groups from the data set should have been interviewed.

In spite of the limitations of this study, the ALAS program provides a model for those undertaking similar endeavors in outdoor ecological education. Coinciding with Orion and Hofstein's (1994) research on fieldtrip design, pre-fieldtrip preparations in the classroom and working in small groups likely enhanced student learning. Allowing for student reflection in various stages of the program, such as the pre-test, pre-trip predictions, and data analysis, was another important component that likely attributed to learning important ecological concepts (Blank 1997, 2000, Feinsinger et al. 1997a, Arango et al. 2002). According to student feedback on the post-test and from the student interviews, the diversity of fieldtrip activities was a positive characteristic. Rotating through three different activities helped meet the diverse interests of students.

Interviews with students contributed valuable insight on aspects of the program that enable important modifications for improvement of the project. The interview with the Group B students of CEM 20 with whom the project was piloted revealed the importance of site selection, weather, and for guides to rotate through their activities on a

timely basis. Students that participated in the second ALAS fieldtrip in San Carlos de Bariloche in 2001 had to visit a different plantation site that was far less ideal than the one visited by the first class of eight-grade students because the property owners had permitted only one visitation. The second site was not an actual plantation, but rather a small, dense grove of Douglas fir that students accessed by a 15-minute walk through native habitat during which many birds were seen and heard. Some students, such as Rodrigo and Francisco who were interviewed, had interpreted the entire area as the plantation. Francisco also expressed his disappointment at missing the bird census activity due to a guide who had lost track of time and missed a rotation. Direct feedback from these students through the interviews during the piloting phase of the ALAS allowed these aspects to be modified and improved. Subsequent fieldtrips ran much smoother as a result.

## **E. Conclusion**

In sum, the decline of biodiversity and global warming are serious issues that must be appropriately addressed in ways that mitigate rather than exacerbate these problems. Appreciation for local biodiversity, understanding of basic ecological principles, and a working knowledge of the scientific process will help communities become aware of alternative ways to address these problems (Orr 1992, Crawford 2000, Arango et al. 2002). Learning about bird species and their interdependence with native plants through experiential activities in the outdoors can be an important stepping stone towards ecological literacy.

In this study, the direct comparison of native habitat (the forest site) to a monoculture of exotic plants (the tree plantation) through the exploration of birds and

their habitat requirements was an effective way to illustrate the concept of biodiversity to students by allowing them to discover the ecological impact of species homogenization on biodiversity and bird populations as they tested their predictions. The ALAS program provides an adaptable educational model for comparing native habitats and monocultures through the study of birds. Combined with preparatory activities in the classroom and schoolyard, this model dramatically improved students' ability to identify some of the key endemic birds of their bioregion that may be sensitive to habitat modification.

#### **F. The Future of ALAS**

Since its pilot year, over forty biologist and university students in Argentina are working in schools and in the field with primary and secondary students. ALAS has been modified for the steppe and ecotonal habitats in Junín de los Andes, north of San Martín de los Andes. Three non-governmental organizations in Patagonia are sponsors of ALAS: SNAP (*La Sociedad Naturalista Andino-Patagónica*), *La Asociación Ambiental Piuké*, and *La Asociación Aves Patagónicas*. Two native plant organizations are also linked with ALAS, *Verde Verás* and *Peninsula Raulí*. A future plan is to link their seed collection, native plant nursery and reforestation activities with the ALAS curriculum. Members from both of these organizations presented in the two ALAS teacher workshops. The National Audubon Society aims to promote the ALAS model of guided inquiry to compare monocultures and native habitats throughout Latin America, especially in those regions where pine plantations are a major conservation issue.

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## **APPENDIX I**

### **ALAS Program: Description of Sites and Target Birds**

## **Description of Argentine School System, ALAS Project Sites, and Socio-Political Setting**

### **A. The School System**

The school day for most students in Argentina is five hours long. Secondary schools include 1<sup>st</sup> to 5<sup>th</sup> year students, or the U.S. equivalent of 7<sup>th</sup> to 11<sup>th</sup> grades. In secondary schools in Argentina, students take biology every year at each grade level, twice a week in one 40-minute and one 80-minute class for a total of two hours. Some teachers felt that this limited classroom time restricted their ability to take students to the schoolyard or in the field on a regular basis.

### **B. ALAS Project Sites**

#### ***San Carlos de Bariloche, Rio Negro Province***

ALAS is based in San Carlos de Bariloche in the province of Río Negro in southern Argentina. San Carlos de Bariloche is a city of 100,000 inhabitants located on the southeastern shore of Nahuel Huapi lake in the transitional ecotone of the austral temperate forest and the Patagonian steppe, a zone characterized by one of the steepest rainfall gradients in the world. The forest is dominated by broadleaf deciduous and evergreen southern beech, Genus *Nothofagus*, and mixed with Ciprés de la Cordillera (*Austrocedrus chilensis*), the most common native conifer found at lower elevations. The city is located in Argentina's first national park Nahuel Huapi, which lies on the eastern flank of the Andean cordillera. There are two major ski areas of international attraction and a tourist-based economy.

The fieldtrip site is located at nearby Cerro Otto in a leeward, easterly facing stand of old growth lenga forest (*Nothofagus pumilio*) which can easily accessed by students on foot, bus, or bike from the center of the city. Though there are large pine plantations on Cerro Otto, we could not obtain long term permission from the landowners and instead had to choose a large 25-30 year old pine plantation of both lodgepole (*Pinus contorta*) and ponderosa pine (*P. ponderosa*), approximately 6 miles southeast of the native forest site. In all other localities, sites are ideal with native habitat directly adjacent to a pine plantation.

#### ***San Martín de los Andes, Neuquén Province***

Located in the province of Neuquén, San Martín de los Andes lies 150 km north of San Carlos de Bariloche and has a population of 30,000 and a tourist-based economy with one major ski area. There is a branch of the Comahue University with an emphasis on Forestry Engineering. There is also a prominent indigenous population of Mapuche. It is located near on the National Park Lanín. The forest type is dominated by a different species of southern beech, *Nothofagus nerviosa*, (Raulí) and *N. obliqua*, (Roble Pellín). The fieldtrip site is dominated by *Nothofagus* trees and is adjacent to a 10 year-old ponderosa pine plantation. The native habitat site is currently being subdivided for a housing development.

### ***El Bolson, Rio Negro Province; El Hoyo, Lago Puelo and Epuyen, Chubut Province***

This cluster of four towns is 150 km south of San Carlos de Bariloche, in the provinces of Río Negro and Chubut, respectively. El Bolsón has a population of 5,000 and while dependent upon regional tourism, also has a thriving agricultural community of organic farmers. The Lago Puelo national park is a popular attraction. Lago Puelo and El Hoyo are both small towns of about 500 people. Epuyen, a small rural town of 200, has a small rural public school that is also a boarding school for children who live more than two hours away from the school. The native habitat site in Lago Puelo is dominated by old-growth *piutre*, and in Epuyen, a mixed forest of *pitranthro*, and *Austrocedrus chilensis*, a native conifer.

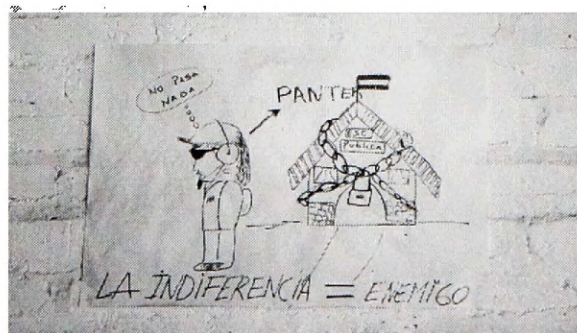
### **C. The Socio-Political Setting in Argentina**

During the two years of the ALAS project from April 2001 to November 2002, Argentina's severe economic crisis received international attention as it continued on its downward spiral. In early December 2001, the Argentine government had indefinitely frozen all bank accounts, and the rapid devaluation of the *peso* and inflation quickly followed. Unemployment reached a historical high along with the nation's foreign debt to international creditors, such as the World Bank and the International Monetary Fund. The crisis was exacerbated by conspicuous corruption within major financial and governmental institutions. On December 18, 2001, a spontaneous popular uprising in Buenos Aires forced President Fernando de La Rúa from office.

Nationwide, education was suffering. Some provinces had exhausted their reserves and could not pay school utilities bills or teacher wages provoking school closures and lengthy teacher strikes. Teachers in the Río Negro province, for example, were backpaid several months, and their salaries retroactively reduced (pers. comm. M. Cuello, M. Yanniello, L. Belloli). In 2001, public schools in Río Negro shut down for two months due to strikes, and for almost four months in the beginning of the 2002 school year.

In spite of the rapid marginalization of Argentina's working class during this time and severe cutbacks in public spending, the education of children continued and assumed an even greater sense of urgency. In 2002, students adorned their hallways with posters critiquing the current societal crisis in Argentina (Figure I.)

Figure I. "Indifference = Enemy" Poster by a secondary school student in Bariloche showing an apathetic student in front of a closed public school.



Characteristics by which target birds for the ALAS program were selected for learning activities. Likelihood of seeing and hearing are based on author's personal observations.

ALAS Target Birds	Where Most Likely to be Observed (marked by X)	FALL Likelihood of ...		SPRING Likelihood of...		Distinguishing Characteristics		Is Song onomatopoeic?	Other Considerations (Behavioral Characteristics)
						VISUAL	AUDITORY		
<b>Zorzal</b> Austral Thrush <i>Tursus patagonicus</i>	Urban	X	High	Low	High	High	Very common in yards & parks; prominent light orange breast.	No	Sings mostly in early morning and at dusk. Flocks in winter.
	Forest	X	Medium	Low	High	High			
<b>Fio-Fio</b> White Crested Elaenia <i>Elaenia albiceps</i>	Urban	X	Low	Low	High	High	Small, olive-gray; white-crest exposed when aggressive; white eyering	Yes	Migratory. On late fall or early spring field-trips less likely to see
	Forest	X	Medium	Medium	High	High			
<b>Carpintero Grande</b> Magellanic Woodpecker <i>Campephilus magellanicus</i>	Urban						Largest woodpecker in S. Amer.. Male bright red head, female black	No	Signs highly visible. Pecking on trees; large, tear-shaped cavities.
	Forest	X	Low	Low	Low	Low			
<b>Pitio</b> Patagonian Flicker <i>Colaptes pitius</i>	Urban	X	Medium	Medium	Medium	Medium	Only medium-sized woodpecker. Striped-back.	Yes	Signs highly visible; perfectly round cavities, 8-10 cm.
	Forest	X	Medium	Medium	Medium	Medium			
<b>Huet Huet</b> Black-throated Huet-Huet <i>Pteroptochos tarnii</i>	Urban						Almost all black; white eyering; large feet; upright tail.	Yes	Very responsive to playback experiments. Heard more than seen.
	Forest	X	Medium	High	Medium	High			
<b>Chuca</b> Chuca Tapaculo <i>Scelorchilus rubecula</i>	Urban						Striped breast; dark orange wings, back; white eyering; large feet; upright tail.	No	Very responsive to playback experiments. Curious.
	Forest	X	Medium	High	Medium	High			
<b>Comesebo</b> Patagonian Sierra Finch <i>Phrygilus patagonicus</i>	Urban	X	High	Low	High	High	Blue-gray hood and wings; bright yellow body; thick conical, seed-eating beak.	No	Often responds to playback experiments.
	Forest	X	High	Low	High	High			
<b>Rayadito</b> Spine-tailed Rayadito <i>Aphrastus spinicauda</i>	Urban						Long, forked tail; white eyeline; dark stripes on head, body.	No	Very responsive to playback experiments. Often in noisy flocks. Curious.
	Forest	X	High	High	High	High			
<b>Picaflor Rubi</b> Firecrown Hummingbird <i>Sephanoides sephanoides</i>	Urban	X	Medium	Low	High	Medium	Small & bright green; Bright ruby-crown exposed when aggressive.	No	Very territorial, frequents hummingbird feeders.
	Forest	X	Medium	Low	High	Medium			
<b>Tero</b> Southern lapwing <i>Vanellus chilensis</i>	Urban	X	Medium	Medium	High	High	Very conspicuous, large plover. Often nests in pairs on schoolyards, fields, and yards	Yes	Aggressive-attacks in defense of nest and young!
	Forest								



List of 6<sup>th</sup> to 8<sup>th</sup> grade classes participating in ALAS and the corresponding dates of completion of ALAS activities.

Season	Locale	School	Public or Private	Teacher	Grade	No. of Students	Dates of Completion of ALAS Activities			
							Pretest	Fieldtrip	Fieldtrip Data Analysis	Posttest
FALL 2001	San Carlos de Bariloche	CEM 20	Public	Maria Elena Cuello	8 <sup>to</sup> Grade A	25	Apr 10	May 11	--	May 22
		CEM 20	Public	Maria Elena Cuello	8 <sup>to</sup> Grade B	25	Apr 10	May 24	--	May 28
FALL 2002	San Carlos de Bariloche	Antu Ruca	Public	Susana Cordi	6 <sup>to</sup> Grade	21	Mar 5	Mar 15	Mar 25	Apr 8
		Antu Ruca	Public	Susana Cordi	7 <sup>to</sup> Grade	25	Mar 5	Mar 15	Mar 25	Apr 8
		Siglo XXI	Private	Ricardo Gatto	6 <sup>to</sup> Grade	24	Apr 11	Apr 17	Docente*	May 24
		Siglo XXI	Private	Griselda Osuna	7 <sup>to</sup> Grade	23	Apr 5	Apr 12	Apr 19	May 16
		Siglo XXI	Private	Damasia Losada	1 <sup>o</sup> Año	25	Mar 12	Mar 19	Apr 22	May 13
		Primo Capraro	Private	Cristina Antelo	7 <sup>to</sup> Grade A	19	Apr 18	Apr 23	Docente*	May 30
		Primo Capraro	Private	Cristina Antelo	7 <sup>to</sup> Grade B	19	Apr 18	Apr 23	Docente*	May 14
		Primo Capraro	Private	Cristina Antelo	8 <sup>to</sup> Grade A	20	Apr 24	May 7	Apr 30	May 22
		Primo Capraro	Private	Cristina Antelo	8 <sup>to</sup> Grade B	25	Apr 30	May 7	Docente*	May 28
		San Esteban	Private	Cristina Antelo	8 <sup>to</sup> Grade BB	24	Apr 24	May 8	Docente*	May 22
		Dante Alghieri	Private	Marta Ramirez	8 <sup>to</sup> Grade A,B	40	Apr 2	Apr 9	Docente*	May 29
		Dante Alghieri	Private	Marta Ramirez	8 <sup>to</sup> Grade C	20	Apr 3	Apr 10	Docente*	May 28
	San Martín de los Andes	Escuela No. 5	Public	Sandra	7 <sup>to</sup> Grade A	25	Apr 26	May 28	Docente*	Jun 28
	El Hoyo	Escuela No. 734	Public	Adriana	7 <sup>to</sup> Grade	30	Mar 26	Apr 29	May 20	Jun 13
		Escuela No. 734	Public	Adriana	8 <sup>o</sup> Grade	32	Mar 26	Apr 29	May 20	Jun 13
	El Bolsón	Munduna	Private	Daniela Rosales	6 <sup>to</sup> Grade	22	Mar 26	Apr 30	May 21	Jun 13
		Munduna	Private	Sandra Risso	7 <sup>to</sup> Grade	20	Mar 26	Apr 30	May 21	Jun 13
	Epuyen	Escuela No. 9	Public	Mariela Aburto	6 <sup>to</sup> Grade	17	Mar 25	May 7	May 20	Jun 13
		Escuela No. 9	Public	Eduardo Colodzie	7 <sup>to</sup> Grade	18	Mar 25	May 7	May 20	Jun 13

\**Docente* (teacher) indicates that the classroom teacher analyzed fieldtrip results with students, rather than an ALAS coordinator; it is assumed that it was done the week following the fieldtrip.

The ALAS team in San Carlos de Bariloche, Argentina (March 2002). Front row (right to left): Kim Olson, Mariano Rodríguez-Cabal, Alejandro Yanniello, Juan Karlanian. Back row: Shannon Ripley, Martin Costa, Martin Nuñez, Guillermo Amico, Yamila Sasal, Valeria Ojeda, Gustavo Iglesias, María Elena Cuello.



Fieldtrip with CEM 20, Austral Spring 2001 in the *lenga* forest on Cerro Otto, San Carlos de Bariloche.





Students investigating understory plant diversity in the native *lenga* forest on Cerro Otto in San Carlos de Bariloche, Argentina.



Students investigating understory plant diversity in the pine plantation in San Carlos de Bariloche, Argentina.





Investigating understory *bichos* (insects, worms) in the *hojarasca*(leaf litter) in the native *lenga* forest on Cerro Otto in San Carlos de Bariloche, Argentina. A 7<sup>th</sup> grade student from public school CEM 20.



Investigating abundance of *bichos* in the *hojarasca* in the pine plantation.





Students bird censusing in the native *lenga* forest in Cerro Otto, San Carlos de Bariloche.



Students censusing birds in the pine plantation near Cerro Otto with field trip guide, Juan Karlanian.





Comparing Arboreal Lichen and Moss Diversity in the Native Forest (Left) and the Pine Plantation (Right). This is an alternative activity for fieldtrip sites where cavity nesters are not prominent. Students found up to eight different varieties of lichens on one tree in the native site and only two varieties in the pine plantation that were very, very tiny.



The cavity nest activity in the native forest. To the left, an old growth *lenga* with a Picolezna or a Bataraz cavity (~4 cm. diameter). To the right, a half dead *lenga* trunk riddled by woodpeckers, with excavated and natural cavities. In the pine plantation, students found no sign of woodpecker activity nor natural or constructed cavities.



Students' favorite fieldtrip activity: birding! San Carlos de Bariloche, Argentina.  
(November 2001)



**APPENDIX II**  
**Assessment Tools**



## 2002 POST-TEST

Name \_\_\_\_\_ Date \_\_\_\_\_ Age \_\_\_\_\_ Sex: F M  
How long have you lived here? \_\_\_\_\_ School \_\_\_\_\_ Grade \_\_\_\_\_

### Part A. Answer the following questions.

1. Name 2 species of plants or trees that are native here, and 2 species that exotic.
2. When you think of where you live, what bird comes to mind?
3. Name two things one can do to help birds.
4. If all the woodpeckers disappeared from the woods, what changes would there be?
5. What is a pine plantation and why do we have them?
6. What fieldtrip activities did you like the most? Circle the activities that you liked and explain why in the space below.

NONE OF THEM    BIRDS    CAVITY NESTS    FOREST UNDERSTORY    ALL OF THEM

### Part B. Read the following statements. Circle "Yes" or "No" according to your personal experience.

1. I have used binoculars before.....YES NO
2. I have gone to (name of local natural area) before .....YES NO
3. I like to birdwatch .....YES NO
4. We have a birdfeeder at my house .....YES NO
5. My cat sometimes hunts and kills birds. ....YES NO I don't have a cat.
6. I have used a field guide before to identify birds ..... YES NO
7. I have been to a national park to go hiking or camping before..... YES NO
8. I have killed a bird with a BB gun or a slingshot before.....YES NO
9. What things about the fieldtrip did you tell to your family? Circle one or more of the following options:

NOTHING    BIRDS    CAVITY NESTS    FOREST UNDERSTORY

WHAT THE NATIVE FOREST WAS LIKE    WHAT THE PLANTATION WAS LIKE

EVERYTHING

### Part C. What's your opinion? After reading each sentence carefully, circle the number that corresponds to your feelings about that sentence.

#### 1. I would like to learn more about birds.

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

#### 2. A pine plantation is an ideal place for birds to nest.

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

**3. It bothers me that bird populations are declining.**

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

**4. I don't care about birds.**

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

**5. Natural science (biology) is one of my favorite subjects.**

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

**6. I like to study science outside.**

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

**7. Killing birds for fun does not affect the environment.**

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

**8. Scientists have discovered most of the things there are to know about birds by now.**

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

**9. I consider myself a scientist.**

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

**10. Many of the birds and animals that live in the native forest can live in a pine plantation.**

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

**11. I didn't learn anything on the fieldtrip.**

Totally Agree	Agree	Neither Agree nor disagree	Disagree	Totally Disagree
1	2	3	4	5

**Part D. What is it like to learn about birds? On a scale of 1 to 10, circle the number that best reflects your opinion for each one.**

Learning about birds is..... 1 2 3 4 5 6 7 8 9 10  
Boring Very Fun

Learning about birds is..... 1 2 3 4 5 6 7 8 9 10  
Very Hard Very Easy

Learning about birds is..... 1 2 3 4 5 6 7 8 9 10  
Not important Very important

**Part E. Birds of the Andean-Patagonian Region**

1. Name some species of birds that live in this region. You can name up to eight birds.

2. Name three kinds of birds you have seen on your schoolyard.

3. You will hear the song of nine species of birds that live in this region. If you recognize the song, circle "Yes". If you know what bird sings that song, write its name in the blank. If you have never heard the bird before, circle "No".

- |              |          |               |          |
|--------------|----------|---------------|----------|
| a) Yes _____ | No _____ | e) Yes _____  | No _____ |
| b) Yes _____ | No _____ | f) Yes _____  | No _____ |
| c) Yes _____ | No _____ | g) Yes _____  | No _____ |
| d) Yes _____ | No _____ | h) Yes _____  | No _____ |
|              |          | i.) Yes _____ | No _____ |

4. You will see a drawing of a bird for 20 seconds. Describe it in writing in the space below.

5. You will see drawings of nine species of birds that live in this region. If you recognize the bird, circle "Yes". If you know what bird it is, write its name in the blank. If you have never seen it before, circle "No".

- |              |          |               |          |
|--------------|----------|---------------|----------|
| a) Yes _____ | No _____ | e) Yes _____  | No _____ |
| b) Yes _____ | No _____ | f) Yes _____  | No _____ |
| c) Yes _____ | No _____ | g) Yes _____  | No _____ |
| d) Yes _____ | No _____ | h) Yes _____  | No _____ |
|              |          | i.) Yes _____ | No _____ |

## 2002 POST-ENCUESTA

Nombre \_\_\_\_\_ Fecha \_\_\_\_\_ Edad \_\_\_\_\_ Sexo: F M  
 ¿Cuántos años hace que vives aquí? \_\_\_\_\_ Escuela \_\_\_\_\_ Grado \_\_\_\_\_

### Parte A. Contesta las siguientes preguntas.

1. Nombra 2 especies de árboles o plantas que son nativos acá y 2 especies que son exóticas.
2. Cuando piensas en la region en que vives, ¿qué ave se te ocurre?
3. Nombra dos cosas que uno puede hacer para ayudar las aves:
4. Si todos los pájaros carpinteros desaparecieran del bosque, ¿qué cambios te parece que ocurrirían?
5. ¿Qué es una plantación de pinos y por qué las tenemos?
6. ¿Qué actividad de la salida te gustó más y por qué? Redondea las actividades que te gustaron y explica por qué en el espacio abajo.

NINGUNA AVES HUECOS SOTOBOSQUE TODAS

### Parte B. Lee las siguientes afirmaciones. Engloba "Sí" o "No" de acuerdo a tu experiencia personal.

1. He usado larga vistas.....SI NO
2. He ido a Cerro Otto antes.....SI NO
3. A mí me gusta observar aves. ....SI NO
4. Tenemos comedero para aves en el jardín de mi casa.. ....SI NO
5. Mi gato a veces caza y mata pájaros. ....SI NO No tengo gato.
6. He usado un guía de campo para identificar aves. ....SI NO
7. He ido a un parque nacional para ir de camping, pasear, o hacer caminatas.....SI NO
8. He matado una ave antes con un rifle a aire comprimido o una gomera por diversión.....SI NO

9. ¿Qué cosas le contaste a tu familia de la salida? Redondea una o más de las siguientes opciones:

NADA AVES NIDOS EN HUECOS SOTOBOSQUE

COMO ERA EL BOSQUE NATIVO COMO ERA LA PLANTACION DE PINOS TODO

### Parte C. ¿Cuál es tu opinión? Después de leer cada afirmación cuidadosamente, circula el número que corresponde a tus sentimientos sobre esa afirmación.

#### 1. A mí me gustaría aprender más sobre las aves.

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

#### 2. Una plantación de pinos es un lugar ideal para que las aves hagan sus nidos.

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

#### 3. No me gusta que las poblaciones de las aves estén disminuyendo.

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

**4. No me importan las aves.**

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

**5. Las materias de ciencias naturales (biología) son las que a mí me gustan más.**

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

**6. Me gusta estudiar ciencias naturales al aire libre.**

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

**7. Matar aves por diversión no afecta el ambiente.**

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

**8. Los científicos han descubierto la mayoría de las cosas que se saben de las aves hasta ahora.**

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

**9. Considero que soy un científico.**

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

**10. Muchos de los animales y aves que se encuentran en el bosque nativo, pueden vivir en una plantación de pinos.**

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

**11. En la salida, no aprendí nada.**

Totalmente de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo	En desacuerdo	Totalmente en desacuerdo
1	2	3	4	5

**Parte D. ¿Cómo es aprender sobre aves? En una escala del uno a diez, marca el número que mejor refleja tu opinión para cada uno.**

Aprender sobre aves es..... 1 2 3 4 5 6 7 8 9 10

Aprender sobre aves es ..... 1 2 3 4 5 6 7 8 9 10  
Muy difícil Muy fácil

Aprender sobre aves es ..... 1 2 3 4 5 6 7 8 9 10  
Poco importante Muy importante

**Parte E. Aves de Esta Región Andino-Patagónica.**

1. Nombra algunas especies de aves que hay en esta región. Puedes nombrar hasta ocho aves.
2. Nombra tres tipos de aves que hayas visto en el patio de la escuela.
3. Escucharás el canto de nueve especies de aves que habitan la región. Si reconoces el canto, marca "Sí". Si reconoces cual ave canta así, escribe el nombre del ave en la línea. Si nunca escuchaste ese canto antes, marca "No".

a) Sí	_____	No	e) Sí	_____	No
b) Sí	_____	No	f) Sí	_____	No
c) Sí	_____	No	g) Sí	_____	No
d) Sí	_____	No	h) Sí	_____	No
			i.) Sí	_____	No

4. Verás un dibujo de un ave por 20 segundos. Describe el ave en el espacio abajo. ¿Cómo es?.

5. Verás los dibujos de nueve aves diferentes. Si reconoces el ave, marca "Sí". Si sabes el nombre del ave escríbelo en la línea. Si nunca la has visto antes, marca "No".

a) Sí	_____	No	e) Sí	_____	No
b) Sí	_____	No	f) Sí	_____	No
c) Sí	_____	No	g) Sí	_____	No
d) Sí	_____	No	h) Sí	_____	No
			i.) Sí	_____	No

Grading rubrics for open-ended items on the pre- and post-tests.

Concept	Test Item	Points	Evaluation Criteria
Native and Exotic Plants	Name two species of plants that are native and two that are exotic. (adapted from Warner 2000)	4	<p>0—<b>Lack of knowledge</b> No response.</p> <p>1—<b>Novice</b> Correctly named only 1 native or exotic plant.</p> <p>2—<b>Intermediate</b> Correctly named two native or exotic plants, or one of each.</p> <p>3—<b>Advanced Intermediate</b> Correctly named a total of three native or exotic plants.</p> <p>4—<b>Advanced</b> Correctly named 2 native &amp; 2 exotic plants.</p>
Pine Plantations	What is a pine plantation and why do we have them?	3	<p>0—<b>Lack of knowledge</b> No response.</p> <p>1—<b>Novice</b> Responded but incorrect, e.g. "for birds".</p> <p>2—<b>Intermediate</b> Gives only one correct answer, refers only to human use or gives a practical definition, e.g. for wood; where pines are planted.</p> <p>3—<b>Advanced</b> Answers both aspects of question and specifically states pines as exotic.</p>
Avian Conservation	Name two things you can do to help birds.	3	<p>0—<b>Lack of understanding</b> No response.</p> <p>1—<b>Novice</b> 1 or 2 generalized or ambiguous responses, protecting birds at individual level, e.g., feed or cure them, don't litter, take care of them.</p> <p>2—<b>Intermediate</b> 1 or 2 more specific responses at the population level, e.g don't overhunt, protect them from cats, don't disturb nests, protect habitat.</p> <p>3—<b>Advanced</b> 2 answers that refer specifically to conservation on the community/ ecosystemic level, i.e. conserving, protecting, restoring native habitats.</p>
Native Forest Ecology  Interdependence of Organisms  Nest Web	If all of the woodpeckers disappeared from the forest, what changes would there be?	3	<p>0—<b>Lack of understanding</b> No response.</p> <p>1—<b>Novice</b> Only aesthetic effect(s) mentioned, e.g., "less noise", "sad". No ecological effect.</p> <p>2—<b>Intermediate</b> One ecological effect, e.g., "more bugs in trees"</p> <p>3—<b>Advanced</b> Two or more clearly related ecological effects, e.g. "more bugs, more trees would die" or "fewer cavities available, and other birds that can't make their own cavity would be without nests"</p>
Avian Diversity	Name some species of birds that are in this region. You may name up to eight birds.	4	<p>0—<b>Lack of knowledge</b> No response, or names 1 general bird. e.g., duck, chicken</p> <p>1—<b>Novice</b> Names 2-3 birds, general (by common order or family name e.g., duck, seagull, hawk) and/or specific (by common species name) , i.e. condor, robin.</p> <p>2—<b>Intermediate</b> 4-6 birds, 1-3 general, at least 2 specific.</p> <p>3—<b>Advanced Intermediate</b> 6-8 birds, 1- 2 general and at least four specific.</p> <p>4—<b>Advanced</b> 7-8 specific birds only.</p>
General Bird Identification	When you think of Patagonia, what bird comes to mind?	Not Scored	Species coded and frequency of responses determined C= condor, P=woodpecker, F=Picaflor, H=hawk or raptor R= Huethuet or Chucao, G=general, O=other
	Name three kinds of birds you have seen on your school yard.	3	<p>0—<b>Lack of awareness</b> No response.</p> <p>1—<b>Novice</b> 1 general or specific bird named.</p> <p>2—<b>Intermediate</b> Two specific birds, or one general and one specific bird named.</p> <p>3—<b>Advanced</b> Three specific birds named.</p>
	You will see a picture of a bird for 20 seconds. Describe what it looks like in the space below.	6	<p>0-1 — <b>Unable to describe.</b></p> <p>2-3 —<b>Novice</b> Very general description, cannot identify bird with this description.</p> <p>4-5 — <b>Intermediate</b> Able to describe with greater detail, likely to be able to identify.</p> <p>6 — <b>Advanced</b> Very specific description. One could identify bird with this description.</p>

## Description of pre and post-test items

Type of Test Item	TEST ITEM	CONTENT DOMAIN								LEARNING COMPONENT					
		Birds	Native & Exotic Plants	Pine Plantations	Native Forest Ecology	Avian Conservation	Biodiversity	Science	Sense of Place	Knowledge	Understanding	Attitude	Skill	Experience	
Open-ended	Name 2 native & 2 exotic species of plants.		X							X					
	What is a pine plantation & why do we have them?			X						X	X				
	Name two things you can do to help birds.					X				X	X				
	If all of the woodpeckers disappeared from the forest, what changes would there be?				X						X				
	Name some species of birds that are in this region. You may name up to eight birds.	X					X		X	X					
	When you think of Patagonia, what bird comes to mind?	X							X	X		X			
	Name three kinds of birds on your school yard.	X								X					
	You will see a picture of a bird for 20 seconds. Describe what it looks like in the space below.	X						X		X			X		
Likert Scale 1 to 5	I would like to learn more about birds.	X										X			
	I don't care about birds.	X										X			
	Killing birds for fun doesn't affect the environment.	X				X					X	X			
	A pine plantation is an ideal place for birds to nest.		X	X	X		X			X	X	X			
	Many birds and animals that live in the native forest can live in a pine plantation		X	X	X		X			X	X	X			
	Natural science is one of my favorite subjects.							X				X			
	I like to study science in the outdoors.							X				X			
	I consider myself a scientist.							X				X			
	Scientists have discovered most of the things there are to know about birds by now.							X				X			
	I won't/didn't learn anything on the fieldtrip.							X				X			
Scale 1 to 10	Learning about birds is..... (Blank 1999) Boring (1) to Fun (10) Very Hard (1) to Easy (10) Not Important (1) to Very Important (10)	X										X			
	Yes/No	I have used binoculars before.													X
		I have used a fieldguide before to identify birds.	X												X
		We have a birdfeeder at my house.	X				X								X
My cat sometimes hunts and kills birds.						X								X	
I have killed a bird with a BB gun/ slingshot for fun.						X								X	
I have been to a nearby national park to go hiking, picnicking, or camping before.									X					X	
I have gone to the fieldtrip site before.									X					X	
I like to observe birds.		X										X		X	
You will hear the songs of nine different birds. Circle "Yes" if you recognize it. If you know what bird it is, write its name. If you have never heard the song before, circle "No".		X								X			X		
You will see pictures of nine different birds... (Same format as above.)	X								X			X			
	TOTAL NUMBER OF ITEMS	13	3	3	3	5	3	6	4	11	6	13	3	8	



## **Pre and Post Interviews with CEM 20 Students (n=8)**

**Tape recorded interviews transcribed by Juan Karlanian**

**Translated by Kim Olson**

### **Group A PRE-fieldtrip: CEM 20—8<sup>th</sup> grade, Late Fall 2001**

**Students interviewed:** Miguel, Andrés, Analía, Romina

**Interviewed by:** Kim Olson (K.O) and Alejandro Yanniello (A.Y.)

#### **PAST FIELDTRIP EXPERIENCES**

**K.O.:** And have you been to Cerro Otto before?

**All:** Yes.

**K.O.:** Yes, many times?

**All:** Yes.

**K.O.:** When was the last time you went?

**Analía:** Last year in October.

**K.O.:** With your family?

**Analía:** No, I went with the school.

**K.O.:** And what did you do?

**Analía:** We got to know the place a bit. We had a snack there.

**K.O.:** And was that the only time you have gone?

**Analía:** No, I have been there before, but...always with the school.

**K.O.:** And you, Yesi?

**Romina:** I went in November with the school. We were in the forest after we climbed to the snack bar.

**A.Y.:** And what did you see?

**Romina:** In the woods? A bunch of trees, little birds...

**K.O.:** Mario?

**Miguel:** I went with the school, and afterwards there we saw a bunch of birds. The teachers also made us draw. I didn't understand everything we were drawing, but...the birds were pretty, and you could see some with yellow crests. And then I went with my dad, because I have an uncle up there, I don't know, he could be on my dad's side, but one day we went, and I was playing and some small mice with long legs passed by and they dove into some little holes in the ground.

**K.O.:** Interesting! And you?

**Andrés:** I went in August with the school. We went to plant pines and little trees.

**K.O.:** On Cerro Otto?

**Andrés:** Yes, in the burnt part.

**A.Y.:** You went to plant pines?

**Andrés:** Yes.

**A.Y.:** With the school?

**Andrés:** Yes.

#### **ATTITUDES TOWARDS BIRDS**

**K.O.:** Do birds matter to you? Or no?

**Analía y Yesi:** Yes.

**K.O.:** A lot or a little bit?

**All:** More or less.

**K.O.:** And, okay, why more or less?

**Romina:** Because we never used to study birds. They don't catch our attention.

**Analía:** I know more about domestic animals. Much about birds, well a little, besides I don't have many. Before my house was full of little birds and now that I have a cat, they don't come anymore.

**K.O.:** Mario, why do you care about birds?

**Miguel:** And yes, sometimes I am saddened when they kill a little bird or a dove or something. And sometimes my cat, I have a Siamese cat, a female cat, and she comes back with a piece of wing.

**K.O.:** And do birds matter to you?

**Andrés:** More or less. Well, they're really little and hard to distinguish-- the names and all. Same in my house, I have... there are a bunch of little birds... and same thing, I have a cat.

### **KILLING BIRDS FOR FUN**

**K.O.:** Have any of your friends killed birds before?

**Miguel:** Yes.

**K.O.:** With a slingshot, or...?

**Miguel:** Yeah with stones.

**Analía:** In general, little birds don't let you grab them, so it calls one's attention, but you can't touch them or they go away. So then, I, at least when I like an animal, for example little birds, I like to grab them, to touch them, and so, you go and you want to, and it doesn't matter. There it is.

### **OUTCOME OF STUDENTS' PREDICTIONS AND IMPRESSIONS OF PINE PLANTATION**

**K.O.:** We are going to Cerro Otto for the fieldtrip to two distinct places: the native forest and a pine plantation. Are we going to see the same number of birds in the two places? Or more in one place than the other?

**Analía:** In the forest.

**Miguel:** Because there are more...trees of different...

**Analía:** There are a few trees.

**Miguel:** They're different.

**Analía:** In other words, pine, pine, pine, in contrast, in the native forest, you can distinguish different species.

**K.O.:** So if there are more distinct kinds of trees, more species is better for birds, so then there will be more birds in the native forest?

**Analía:** Yes, I think that not all birds like pines, for that matter others have preference for others.

**Andrés:** Different ones.

**Miguel:** Maybe the smallest birds live more in the native forest.

**K.O.:** But...are we going to see birds in the pine plantation?

**All:** Yes.

**K.O.:** But...not as many as in the native forest...

**A.Y.:** But... do you think we are going to see (birds) in the two places...

**All:** Yes.

### **PINE PLANTATIONS AS BIRD HABITAT**

**K.O.:** So, is a pine plantation a good place for birds to nest? For birds to make their nests and raise their young?

**Romina:** Yes.

**K.O.:** Can they nest in both places?

**Analía y Andrés:** Yes.

**A.Y.:** And you? Why not? Not if you know, but rather what do you imagine?

**Miguel:** I don't know.

**A.Y.:** Can they nest in the plantation as in the native forest? In the two places?

**Romina:** I think so, like I just said, it depends....the shape...because the pines are all the same, in contrast there are distinct forms in the native forest.

**Analía:** I think that it's the preference of each animal, no?

### **ECOLOGICAL CHANGES IF THERE WERE NO MORE WOODPECKERS**

**K.O.:** If we took all of the woodpeckers out of the forest, what changes would there be? Would there be changes?

**Miguel:** The trees wouldn't be all pecked.

**K.O.:** Any other changes?

**Andrés:** The song.

**Analía:** Yes, in the trees, in one form or the other, they make their nests. When you see a tree, you say "wow, here's where the bird was!". So, people are going to go to the forest and say "Look at how pretty the tree is", but they aren't going to say "Hey, look here, we saw a tree that was all pecked up by a woodpecker."

**A.Y.:** And what do you think?

**Romina:** That we wouldn't hear the sound of the birds, of the woodpecker. It wouldn't be so happy, because birds are also happy.

## **Group A POST-fieldtrip: CEM 20—8<sup>th</sup> grade, Late Fall 2001**

**Students interviewed:** Miguel, Andrés, Analía, María Luisa

**Interviewed by:** Kim Olson (K.O.) and Juan Karlanian (J.K.)

### **PAST FIELDTRIP EXPERIENCES**

**J.K.:** What did the fieldtrip seem like to you?

**Analía:** The cold was the only thing that...

**María Luisa:** The cold in the pine forest after the native forest. (The native forest) was warmer. We were walking more, let's say.

**J.K.:** Had you gone to Cerro Otto before some other time?

**Miguel y Leo:** Yes.

**J.K.:** And what do you think? Did you find some differences on this occasion that we went?

**Miguel:** Not many things were seen (on past fieldtrip) because we were smaller when we went with the school. The kids were walking or running and the birds were frightened away.

**J.K.:** And this time you saw more.

**Miguel:** Yes.

**K.O.:** And you?

**Analía:** Yes, I think that (this fieldtrip) was cooler because when you would go with the school (past fieldtrips), everyone went all together, and I don't know, it was another kind of fieldtrip, and everyone used to look around, yeah, but it was distinct.

**K.O.** Did you like to work in small groups then?

**Analía:** Yes.

**K.O.:** And you?

**María Luisa:** Last year we went to the refuge on Cerro Otto with the physical education teacher, and we saw some birds, but not many because it was very cold.

**K.O.:** Did you go to learn any subject matters?

**María Luisa:** No, no. It was a hike that we did for physical education. Nothing more.

### **FAVORITE FIELDTRIP ACTIVITIES**

**Analía:** Yes, for me, the bird songs, like that. I didn't pay any attention to them before. Now that I know them a little more, so I.... they stick out more.

**J.K.:** Of course, because you are paying more attention.

**K.O.:** And what birds did you hear?

**Analía:** I heard the Huet Huet, ummm, the Rayadito, and I don't remember what else.

**K.O.:** And could you notice more because you listened to the songs here (in school) first? Before leaving on the fieldtrip, we listened to the songs on the tape recorder. Did that help you?

**Analía:** Yes, yes, for that same reason. Before, I didn't pay attention to songs like that in particular. That if they come and teach me, for that reason, I was listening to them and well, how good. Now that they taught me this, to go and recognize them there, it was good.

**J.K.:** Of all the activities that we did, you saw that in both sites we did the same activities, which was the one you liked the most?

**María Luisa:** For me, cavity nests.

**J.K.:** In the pines or in the--?

**María Luisa:** No, in the native forest.

**Miguel:** I liked all of them because we had to do activities and all of those things and also, they taught us how to put up the nets and all of those things to grab some species, and afterwards, the activity on the ground. All of the little bugs. There were spiders. (*Note: In the very first fieldtrip, we set up mistnets.*)

**J.K.:** And you, Andrés?

**Andrés:** The pine plantation.

**J.K.:** What activity?

**Andrés:** Of course, because there I got to put up the nets, put the poles in, all that.

**J.K.:** And in the other site, it was already put up.

**Andrés:** Yes.

**Anaía:** Both were good. Like that, both. I think that what I liked most was the cavity nest, because in the native forest, there were more nests than in the plantation. For me, the native forest was better.

#### **OUTCOME OF STUDENTS' PREDICTIONS AND IMPRESSIONS OF PINE PLANTATION**

**J.K.:** Okay, you remember that in the classroom before going to Cerro Otto, you made a series of predictions. Do you remember? In the field workbook, that each one proposed what you were going to find? How did your predictions come out?

**María Luisa:** More or less.

**J.K.:** Where did you go wrong?

**María Luisa:** I thought that there were going to be more birds in the pine plantation because it was more dense than the native forest. And no, there were more in the native forest than in the pine forest. More nests in the native forest than in the pines because it was very hard, like, the bark of the pines. That's where I went wrong.

**K.O.:** Did that surprise you?

**María Luisa:** Yes because I thought that they would have more shelter there and more food, too, but...besides, it was colder in the pine plantation. At that time, we got there early, it seems.

**Anaía:** Yeah, I don't know. The bugs, for example. I thought there were going to be more bugs, for example, more in the pine plantation, and we didn't find any.

**K.O.:** And before, why did you think that you were going to find more in the pine plantation?

**J.K.:** More insects.

**Anaía:** Um, I don't know...

**K.O.:** And now, why do you think that you didn't see many bugs in the pine plantation?

**Anaía:** I think it was because of the change in the weather.

**Andrés:** I put that in the native forest we were going to find more birds, but we found more, or we heard more in the pine forest. Because in the native forest, that owl was there...in the lenga tree, and others were passing by, but in the pine plantation we constantly saw...

**Miguel:** Where I was mistaken was that there were going to be more birds in the pine plantation than in the native forest.

**J.K.:** And you ended up seeing more in the plantation... in the native forest....

**K.O.:** Yes, for example, how many birds did you see in the plantation?

**Miguel:** And we saw, um, picoleznas, rayaditos. There were two, two or three. You would look up and you heard the sounds and you saw some.

**K.O.:** And when you went to the native forest, how many birds...

**Miguel:** In the native forest, I saw a caburé (Austral Pygmy Owl), then a hawk. After that, and what else did I see... and he said that there were some...

**Andrés:** A chucao.

**Miguel:** A chucao, a chucao, I dunno. One of those that made those little cavities in the lenga trees. In one of the big ones, there were small cavities, I don't know what they are called.

**J.K.:** A picolezna, I suppose.

**Miguel:** He said it was a woodpecker but a tiny one.

**J.K.:** Oh! The bataraz, yeah. A little woodpecker.

**Miguel:** Yeah.

#### **DIFFERENCES OBSERVED BETWEEN PINE PLANTATION AND NATIVE FOREST**

**J.K.:** Does the pine plantation seem like a good place for birds to make their nests? Or for woodpeckers, or for birds in general?

**Miguel:** Woodpeckers, no, because the pines have very thick bark, it seems to me.

**María Luisa:** Besides, they can't get insects, because they eat the little worms inside of the bark; they can't take them out. Besides, there aren't any (bugs), either.

#### **ECOLOGICAL CHANGES IF THERE WERE NO MORE WOODPECKERS**

**J.K.:** If suddenly there were no more woodpeckers, what changes do you think there would be?

**Miguel:** The cavities.

**J.K.:** What would happen with the cavities?

**Miguel:** There wouldn't be more nests for the...chucaos, ummm, no, for the others, those small owls, for some of those other birds.

**Analfía:** Yeah, I think that, okay, after the birds leave the nest, others come and they occupy it to have a home. I think that without that, no more... it would leave other species without a home.

**Miguel:** They would have to make another one.

**Analfía:** They would have to construct another little home.

## **PRE-Fieldtrip Interview CEM 20—8<sup>th</sup> Grade: Group B, Late Fall 2001**

**Students interviewed:** Ezio, Francisco, Karina, Clara

**Interviewed by:** Kim Olson (K.O.) and Alejandro Yanniello (A.Y.)

### **PAST FIELDTRIP EXPERIENCES**

**K.O.:** Have you gone to Cerro Otto before?

**All:** Yes.

**K.O.:** On foot? Walking? By bus?

**Ezio:** I went on my bike.

**Francisco:** I've been to the guard station. They take me there on the weekends.

**Karina:** I've gone with the kids from my neighborhood and when we go, we go by bus.

**K.O.:** Do birds matter to you all?

**All:** Yes.

**K.O.:** A little? A lot? Kind of, but not really?

**All:** Quite a bit.

**K.O.:** Why?

**Clara:** I feel really bad when we find dead birds.

**Ezio:** Because some kids start throwing stones and they break their little legs.

**Clara:** Yesterday I found a little one at my house, a tiny one.

**K.O.:** What color was it?

**Clara:** Phosphorescent. Phosphorescent green.

**Francisco:** A nestling...

**K.O.:** We are going to two visit two sites on Cerro Otto: native forest and a pine plantation. What...what is a pine plantation:

**Ezio:** It must be where there are lots of pines.

**Francisco:** A plantation of trees of different sizes, of the same species, but of different sizes.

**Karina:** I don't know, I think that there are going to be only pines of different sizes and that they are going to all be big.

**K.O.:** And why are there pine plantations?

**Francisco:** For a sawmill that's nearby.

**Ezio:** In part, but... it could also be for making a home for birds, something like that, for birds.

**Francisco:** Over there there's a lumber yard. They plant pines for themselves, but they cut them all.

Going that way by the highway, and then there's a small house. I don't know if it's a house because it has barred windows and it's tall and they used to always plant a bunch of pines where it burned by the Pinar neighborhood and they've cut it all down. They have a bunch of firewood there to sell.

**A.Y.:** And did you walk around in the pine plantation?

**Francisco:** I was in the sawmill once but hardly ever in the pine plantation.

**Karina:** I've never been in the pine plantation.

**Clara:** No, when I went to Cerro Otto, I went up in the gondola. You couldn't see much, just pure trees, but you couldn't really tell them apart.

**Ezio:** But there are lots of different trees because you go looking around and you see one section of pointy trees, and others that are round.

## **ON PINE PLANTATIONS AS BIRD HABITAT**

**K.O.:** Is the pine plantation a good place for birds to nest and raise their young?

**All:** Yes.

**Ezio:** Besides, the trees, the bark is very thick, so the woodpeckers can make their holes there.

**Francisco:** But, depending on whose plantation it is, because after, they will cut them down.

**Ezio:** Maybe they'll let the trees grow, so then the birds will come, and then they will cut them down and sell the wood.

**A.Y.:** Of course, it's possible that in the pine plantation they'll sell the wood later.

**Francisco:** Yeah.

**K.O.:** And you two, what do you think? Why will a pine plantation be a good place for birds to make their nests?

**Karina:** There are lots of trees.

**Clara:** Because they like it.

**Francisco:** The trees help protect the birds.

**K.O.:** Pines offer more protection... So, thinking about the two places, are we going to see more birds in the pine plantation than the native forest? Or will it be the same?

**Karina:** The same.

**Ezio:** I suppose that there should be the same number of birds, then. Or one bird maybe doesn't like that tree so it goes to the native plantation.

*NOTE: (Ezequiel uses the term "native plantation" interchangeably with native forest.)*

**A.Y.:** And what do you think?

**Francisco:** Yes, the same, according to how long the trees last, the birds can or can't change (habitats).

**Ezio:** Because perhaps if they cut down a pine in the plantation, and there was a bird family, maybe that family goes over to the native plantation.

**Karina:** I don't know. I agree with the boys. I think the same as they do. Maybe the birds go from tree to tree, trying them out or living their adventures, let's say.

**Francisco:** It could be the same. On the one hand, I think that in the plantation of native trees, native forest, there are a lot (of birds) because they don't take out those trees. In the pine plantation, because the pines are all together, it's the same as in the native forest.

**Clara:** I think that it's the same because all the trees, that is, from the native forest and the pine plantation serve as shelter for birds.

**Ezio:** Also because in the native forest, maybe there are trees so big and so old, that they don't cut them down because they know it would take so long for them to grow back, so they leave them.

## **POST-Fieldtrip Interview CEM 20—8<sup>th</sup> Grade: Group B**

**Interviewers:** Kim Olson (K.O.), and Juan Karlanian (J.K.)

**Students:** Ariel, Ezio, Clara, Vanesa

- My name is Francisco and I'm 13.
- My name is Ezio and I'm 13.
- My name is Clara and I'm 14 years old.
- My name is Karina and I'm 13.

### **PERCEPTION OF THE FIELDTRIP**

**J.K.-** In all sincerity, what did you think of the fieldtrip? Did you like it? Did you not?

**Ezio:** It seemed nice but the day was sort of nasty for working there.

**Francisco:** I would have liked to have studied the bird activity because each group did two other parts.

**K.O. –** Which activity did you miss?

**Francisco:** The bird one in the native forest.

**J.K.—** So, what did you all think?

**Clara:** It was good.

**Karina:** Yes, it was good except for the weather.

**J.K.-** Had you gone to Cerro Otto before?

**Francisco:** Yes.

**Ezio:** Yes.

**J.K.-** And how did it seem different this time?

**Francisco:** It was raining.

**Ezio:** That before when I went, there were nests there, but now there were hardly any, because up in the trees you used to see some nests, like with grass, but now you practically don't see any.

**K.O. –** When you went, was it spring?

**Ezio:** Yes, more or less.

**Francisco:** Well we did find a nest, in the house of Otto Meiling.

**J.K.-** That cup nest at the cabin, those nests are from one kind of bird, because we saw a lot of cavity nests, or no? In the trees.

**K.O. –** And for you all? How was this trip different?

**Clara:** I went to Cerro Otto, but I went up in the gondola. You could see only the trees, nothing special.

**K.O. –** And how was it to be on Cerro Otto on the ground and in the forest this time?

**Clara:** I liked it.

**K.O. –** And you?

**Karina:** I liked it because we could share it among everyone. And it was cold but not so much.

#### **FAVORITE FIELDTRIP ACTIVITY**

**J.K.:** Which activity was your favorite of all the ones we did?

**Ezio:** I liked the bird on and the cavity nest ones the most. I liked the bug activity when we had to dig. Really, I liked all of them.

**Francisco:** I especially liked the two that I did, one to look for cavities in the trees, and the other to dig and look for bugs. (NOTE: Ariel missed the bird census because one of the fieldtrip guides lost track of time and missed a rotation.)

**Clara:** I liked observing birds.

**K.O. –**What did you see? Did you see any birds?

**Clara:** Yes.

**K.O. –**In the native forest or in the pine plantation?

**Clara:** In the native forest.

**K.O. –** What kind of birds?

**Clara:** Rayadito.

**K.O.-** How many?

**Clara:** No, I only saw one.

**Karina:** I liked the cavity nest activity.

**K.O. –** In both sites or only in the native forest?

**Karina:** In the pine plantation.

**Ezio:** Same here. In the pine plantation, we saw more than in the native forest. Because we were going down with one of the guides that had a beard, Robert I think his name was, and when we went with Ariel, there was a bird standing on top of a pine. A whole bunch were passing by. (NOTE: Here is where we realized that Ezequiel had confused the walk to the pine plantation where the grave of Otto Meiling lies as also part of the plantation.)

**J.K.-** When we were going down towards the cabin? ¿Cuando íbamos bajando a la quinta?

**K.O. –** Before arriving to the grave? (where this small pine plantation was located)

**Ezio:** When we got to the refuge (cabin) and when we were going down on the trail we saw them.

**J.K.-** No, that wasn't the pine plantation. The pine plantation was where the grave was.

**Francisco:** No, of course, above the plantation, and when you were going behind us, we told them all to stay still because there was one, and a bunch were passing by. (a flock of Austral thrushes)

**J.K.-** What other thing would you like to investigate on this kind of fieldtrip or in nature?

**Ezio:** I'd like to study what the cavity nests are like on the inside, if you could see the nests from the inside. You see how there's a hole like this and then it all goes in.

**K.O. –** It'd be really nice to be able to see what it's like inside, right?

**Clara:** I'd like to investigate more birds.

**K.O. –** To see more species or...?

**Clara:** Yes, to see more species and study them.

**Karina:** I'd like to study birds and the places where they take refuge, and what their characteristics are.

**Francisco:** I'd like to study the flora and fauna that are here in this region, too.

**K.O. –** What other thing did you see that was interesting to you that you didn't expect to see?

**Ariel –** For me, the grave and the place where Otto Meiling used to live.

**Ezio:** For me, that he had made a small pool there below where he used to take a bath. Roberto told us.

## **DIFFERENCES BETWEEN THE NATIVE FOREST AND THE PINE PLANTATION**

**J.K. –** What differences did you all find between the native forest and the pine plantation?

**Francisco:** That in the pine plantation there were fewer rodents than in the native forest. In the native forest, the ground's surface was more humid than in the pine plantation because the floor of the pine plantation was all pine needles and nothing more, and that (layer) was moist, but the soil wasn't and below it was all mold.

**K.O. –** Girls, what differences did you see between the native forest and the pine plantation? Did you see any differences

**Clara:** I didn't see any.

**Karina:** That the soil was much moister in one place than the other.

**K.O. :** More humid where?

**Karina:** In the native forest and drier in the pine plantation where there were no insects that the birds could eat.

**Ezio:** The other difference was that in the native forest there were trees that were very pecked up. In contrast, in the pine plantation there weren't many.

**Francisco:** Of course because the pine trees are new there and the wood is somewhat hard.

**Ezio:** What I saw was that when a branch falls that a small, little opening is left. That's what I saw.

**Francisco:** And also that in the native forest, the wood is all, like, rotten inside with, when the fungus penetrates it. It's very old and it makes it easier for the woodpecker to peck and break it open right away than in the pine plantation.

**Juan:** Do you remember, kids, the predictions that you all made before the fieldtrip in the classroom? How did they come out?

**Ezio:** Mine came out bad because I thought that there were going to be more birds in the pine plantation than in the native forest.

**Francisco:** Mine came out fine. Well, those two about bugs and cavity nests. There were more in the native forest than in the pine plantation.

**K.O. :** You thought you were going to see more birds in the pine plantation?

**Francisco:** Yes

**K.O. :** And you, Ezequiel, saw more birds in the pine plantation?

**Ezio:** Yes, I thought I was going to see more birds in the native forest because of the variety of trees, and I saw more in the pine plantation than in the....

**J.K. :** But, keep in mind, the pine plantation is where the grave is. Where we walked from the cabin to the plantation was not the plantation. It was a mix of a few pine trees in native forest.

**Ezio:** Ahhh!!!!

**J.K.:** I would say that what you took for the pine plantation was not the pine plantation. The grave site was the plantation. Where we saw more birds was on the outside surrounding the pine plantation, in another zone.

**Ezio:** All the same, in the dry part between the native forest and the pine plantation, when we were going down, you saw a kind of strawberry plant, something like that.

**Francisco:** Yes, wild strawberry and below there was, what is it? Raspberry.

**J.K. :** And you two, how did your predictions come out?

**Clara:** I thought I would see more birds in the pine plantation than in the... no, no in the native forest.

**Karina:** I thought there were going to be more birds in the native forest and it was opposite.

**J.K. :** You saw more in the pine plantation?



**Karina:** Yes.

**J.K. :** Okay, keep in mind this confusion...

**K.O. :** Yes, because the pine plantation was the grave site.

**J.K. :** Not the whole loop we did. The walk we did is all of Otto Meiling's property but the part that is the pine plantation was where the pines all were, and where it was all full of pine needles.

**Francisco:** Things that mattered to me a lot is what they told us that there, when they went with the other class in the native forest, they found an owl.

**J.K. :** Yes, the Austral Pygmy Owl.

**K.O. :** And about the bugs, for example...what did you think before going? That you were going to see more...?

**Clara:** Yes, I thought that I was going to see the same amount of bugs in both places, but when we were digging, we hardly found anything.

**K.O. :** Where?

**Clara:** In both places.

**K.O. :** In both places.?

**Clara:** In the native forest, we found only one worm, and in the pine plantation, we didn't find anything.

**K.O. :** And you?

**Karina:** I thought that there were going to be more bugs in the native forest than in the pine plantation.

**K.O. :** And is that what you found?

**Karina:** I found only worms in the native forest.

**K.O. :** And in the pine plantation?

**Karina:** We didn't find anything.

**Ezio:** I thought that there were going to be the same in both places but I couldn't find that out because in the native forest, we hardly were able to look, we didn't do that. We changed guides and we went with the guide for birds. So in the pine plantation, we found four, two little white ones, one phosphorescent green one or light green. We found three worms and a yellow jacket.

**Francisco:** I thought that in the native forest there were going to be more and it was like that. I thought there would be more birds in the pine plantation and there we found many things. If one goes more in the native forest, you find more.

**J.K.-** When we return in the spring, what changes do you think there will be?

**Ezio:** I think there could be more birds, because perhaps (this time) it was so cold that most of the birds were sheltered down. In contrast, in the spring, when the fruits start to come out, I think that more will be seen.

**Karina:** And that there are going to be more bushes and trees made by the birds, because if they leave their nests, or they make their nests in another place. Surely there will be more insects.

**J.K. :** I was just going to ask that, what did you think about the bugs?

**Francisco:** I also think that there will be more birds' nests and bugs, the same abundance.

**K.O. :** So that in both places, we're going to see...

**Francisco:** I don't think that we're going to see more in the native forest, if now there were going to be a little more and in the pine plantation there is also going to be, but not in the same quantity as the native forest.

**Karina:** We think the same as he does for sure, because there is a greater amount of trees.

**K.O. :** In the native forest?

**Karina:** Yes.

**Ezio:** I think there is going to be the same quantity, because maybe a bird in the native forest leaves the place, and like it knows it is night, it must stay there, perhaps in the plantation, then after it stays there, it has its young there. Do you understand? Let's say that that bird is in the native forest and it takes off flying and it's going hunting and it stays in the pine plantation, and that's why I think that it will have gone. I think there will be the same amount.

**K.O. :** Do birds use both places to hunt?

**Ezio:** Yes.

## **PINE PLANTATION AS AN IDEAL PLACE FOR BIRDS TO NEST**

**J.K. :** Is the pine plantation a good place for birds to nest?

**Clara:** Yes.

**Ezio:** Yes, it depends. It depends on the tree because perhaps if all of the trees are new, they can't make their nests there, on the other hand, if the trees are old...

**J.K. :** Did you see a nest in the pine plantation?

**Karina:** No.

**Francisco:** No. Only by the cabin. There was a nest there.

**J.K:** Okay, but in the native forest did you see nests?

**Ezio:** Yes.

**J.K. :** What kind?

**Francisco:** Cavity nests, of a woodpecker.

**J.K. :** And does the pine plantation seem like a good place to build a nest?

**Francisco:** Yes, on the one hand, yes, on the other hand, no.

**Ezio:** But at times it isn't so necessary to make a nest in the same tree because there were crossed trunks or something like that. There were fallen trees that stayed like that and there were small holes inside and I don't know if lizards went in there. There they could also make their nests.

**J.K. :** Where?

**Ezio:** In the pine plantation. There were a couple of fallen trees with some cavities there.

**Francisco:** I also think that there are going to be some in the pine plantation, because maybe it prefers some places in the pine plantation than in the native forest.

**K.O. :** And did you see a rodent?

**Francisco:** No, uummmm, little caves of rodents, yes.

**J.K. :** In the pine plantation?

**Francisco:** No, in the native forest.

**J.K. :** Oh... and why do you think that in the pine plantation there could be rodents then?

**Francisco:** Because they like to be in the pines.

**J.K. :** How did you come to that conclusion?

**Francisco:** Because in the native forest there are a lot of rodents around, and they feed on birds' eggs, the lizards.

**J.K. :** In the native forest, or you say that if they go to the pine plantation they are going to have a greater variety of food. Why are there a lot then in the native forest?

**Francisco:** No, I think that the birds have to go a little more to the pine plantation.

**Ezio:** Which means that it would be just as good for the birds to be in the native forest but more so in the pine plantation where they're going to find more insects, and all that.

**J.K. :** But, where did we see more insects?

**Francisco:** No, I say that it's better for the birds to be in the pine plantation than the native forest on the one hand, because the rodents would come up around there. And another thing, the bad thing is that there wouldn't be as an abundant a food source.

**J.K. :** OK, does the pine plantation seem like a good place for birds to nest?

**Clara:** Yes.

**Karina:** I don't know, for me yes.

**K.O. :** And you?

**Karina:** Well, more or less. Because, for one thing when they make their cavities, they can find more insects.

**J.K. :** In the pine plantation?

**Karina:** Yes.

**K.O. :** More or less, why?

**Karina:** More or less because I think that for them, it must be difficult to survive so they must look for a place where they can live. In the trees it could be the ideal place but there could be rats, lizards and all that.

**J.K. :** In which of the two places?

**Karina:** In the pine plantation.

**Ezio:** Yes because they run the risk that the lizards will climb up and eat their eggs

**J.K. :** But did you see lizards in the pine plantation?

**Ezio:** No.

**Francisco:** That is what I was saying, that on one hand it would be better to stay in the pines because the rodents wouldn't come near, nor the lizards and mice.

**J.K. :** Okay, but in the case of the woodpecker, for example, could it go and nest in the pine plantation?

**Francisco:** No, because the wood is very hard, because the tree inside is very hard and it would be difficult to enter there.

**Ezio:** Yes, but it could make it so tiny that in one way or the other it could get in.

**Francisco:** It makes it just big enough so that it can get in.

**J.K. :** Okay, what would happen if the woodpeckers disappeared?

**Francisco:** That other rodents wouldn't have anywhere to live because some rodents take over...of course, a woodpecker makes a cavity, right? And another....that cavity it leaves because maybe it gets food from the pine tree...from the woodpecker's tree... I don't know what it's called (referring to the food).

**J.K. :** The little worm (the larva).

**Francisco:** The little worm... and that cavity afterwards it leaves it and another rodent comes and there it makes its home, and those rodents wouldn't have a place to live or directly make their own home.

**J.K. :** And what do you think?

**Clara:** I don't think anything.

**Ezio:** Because maybe the lizards don't only live off of the... the woodpeckers lay eggs and the lizards could eat them, o like the biologist said that the lizards live in fallen logs too, that they make their homes there.

**J.K. :** Did you see this once, or where did you get that lizards eat woodpecker eggs?

**Francisco:** Not the woodpeckers, no, the other birds' eggs.

**J.K. :** Girls? What do you think would happen if woodpeckers disappeared?

**Clara:** There would be fewer cavities in the trees.

**J.K. :** Good and what would happen if there were fewer cavities in the trees?

**Karina:** The other animals wouldn't have a place to live.

**Francisco:** And the fungus couldn't invade the tree.

**J.K. :** That's another good point, very good.

**Clara:** And maybe there are woodpeckers that are going to make holes in the trees and they leave them so that other birds can go eat.

**K.O.:** In the spring, we are going to return and do the same activities.

**J.K. :** And we're going to note the differences that we find.

**K.O.:** For example, you all talked a lot about lizards, and what could we do to investigate the amount of lizards? To see if we'll find one because now, in this season, we didn't see any. What could we do in the spring to look for them?

**Francisco:** In the tunnels that are there, there was bamboo and below there was like a dry trunk and an opening that went below, and that's what the teacher named Valeria said, that it was from a lizard and a mouse.

**J.K.:** And to see mice, to investigate them, how could we do that?

**Francisco:** Bring a cat.

**Ezio:** I think that like since mice like birds' eggs, that you could put like a kind of false egg or something like that and maybe when the mouse goes sniffing around and it goes in, we could close the thing so it couldn't leave, like a trap, to trap them.

**K.O. :** That's what some scientists do, that kind of test, very good. It would be very interesting. Good idea. Any other comments?

**Karina:** I can't think of anything.

**K.O. :** Okay, let's say goodbye, with your names.

**Ezio.**

**Francisco.**

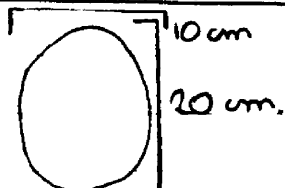
**Clara.**

**Karina.**

Examples of group work from 7<sup>th</sup> grade students in San Carlos de Bariloche given to author by a participating teacher. Below are their conclusions drawn from data analysis after the fieldtrip experience.

	Bosque nativo	Plantación de pinos
Pascal	Mayor cantidad de huevos, 5	No se encontraron ningún huevo ni
Jugo	excoados y 3 naturales. Estos	excoados ni natural. Tampoco ha
Guille	se encontraron la lengua.	había ningún tipo de ave.
Solís	Generalmente los pájaros en	
	pinos (pitío, pino negro, la	
	tanás, y el patagónico) son los	
	realizan los huevos en los ár-	
	boles para luego modificar.	
	Los huevos abollados son	
	hechos por los siguientes	
	pájaros: el pío - pio - conejo	
	el chichón el chucón el chich	
	el rayadito el ratón común	
	el zorzal y el alcones	
	el huert - huert el martin pescador	
	Huevos	
	excoados <u>5cm</u> Batanás	
	<u>10cm</u> pitío	

## Bosque nativo



Carpinteros natagónicos.

Estos huecos están en el losque nativo porque era un lugar autotono donde había más variedad, y cortada de esos árboles era más leonada permitiendo así poder modificar con mayor facilidad.

1	65%	5	2- quijos 1 soca enas 15- grommes 14- leleleis 1- ouenex 14- grommes
2	40%	6	4- aluvion 14- leleleis
COBERTURA		ESPECIES DIFERENTES	Cuántas diferentes en huecos hay?

Se encuentran más especies debido a que hay menos cobertura de sombra y es más húmedo. También por que es nativo.

## Plantación de pinos

En esta plantación de pinos no se encontró ningún hueco debido a que era exótico, no había variedad de árboles, y los cortaron de los mismos eran duros y menos de recina así impidiendo a los mejores carpinteros <sup>que</sup> hagan su labor.

1	80%	2	14- mueros 7- plantitas
2	60%	X	X
COBERTURA		ESPECIES DIFERENTES	Cuántas diferentes especies hay?

No se encuentran tantas especies como en el losque debido a que hay mucha sombra porque los pinos están juntos, porque es exótico y los árboles impiden la humedad.

## Clasificación.

### Plantación de pinos:

Nidos en los árboles no hay, porque la madera es muy dura las larvas no la comen y los pájaros al no tener comida. Además las aves por el mismo motivo no pueden hacerlos nidos.

Sotobosque: en la plantación de pinos el sotobosque no existe, porque el sotobosque es un lugar donde crece mucha vegetación y ahí no crece nada.

Aves: las aves, en la plantación de pinos ahí muy pocas porque por lo general viven en los huecos naturales.

### Bosque nativo:

Huecos en los árboles: hay muchos huecos en los árboles, porque la madera es más blanda, las larvas pueden comer la madera y los pájaros al tener comida construyen sus viviendas ahí.

Sotobosque: el sotobosque del bosque nativo, es muy fértil porque la tierra es húmeda y crece mucha vegetación.

Aves: en el bosque nativo, viven muchas clases de aves, porque el suelo de ahí es muy fértil y ahí mucha comida.

## Comparación

~ 7B

Plantación de pinos: En la plantación de pinos no había nada de  
pejoror porque todavía no se pudieron adaptar. Allí no había  
huecos en los pinos porque la madera es muy dura comparada a  
de la lenga. Además por que los troncos son demasiado ergos  
para que los pejor (carpinteros, pilos, etc.) puedan hacer sin miedo.

Allí aprendimos a contar los años de los pinos. No vimos  
ninguna clase de hichos. Por eso no se si habian más en el  
bosque nativo pero creo que habian más hichos en el bosque nativo.  
No hay miedo porque no hay pejoror. No hay estorbo.

Bosque nativo: En el bosque nativo hay muchos pejoror porque  
tienen todo lo que necesitan, alimento, madera blanda, caños (porque  
hay algunos como el Chusco que lo necesitan) etc. En los árboles hay  
un montón de huecos, de pejoror (miedo, o para hacer comida),  
hablar para poder salir, y de la naturaleza en el pino hay un  
montón de hichos.

La hoja nueva es más húmeda que la de la plantación  
de pinos.

**APPENDIX III**  
**ALAS Curricula Materials**



**PRE-TRIP CLASSROOM ACTIVITY No. 1**  
**Learning to identify target species.**

**BIRD BRAINS!** By Kim Olson  
(An Ornithological Game of Memory and Observation!)  
Appropriate Age Level: 2<sup>nd</sup> through 9<sup>th</sup> grades

This is an adaptation of a common memory game frequently used in foreign language classes. Students learn to identify local bird species through an interactive memory where they match bird pictures with their common names, and simultaneously learn how to use a simple bird field guide. Laminated, foldable field guides that highlight the most common species are ideal for beginners. For more advanced students, a standard field guide may be used.

Review: Bird topography. Six Species of Birds. Field Marks. Field Guides.

**Materials:** Memory Board, 6 matching card sets of bird pictures and their corresponding name, Field Guides

**Objectives:**

- Build students' observation skills and ability to describe field marks.
- Identify 6 common species of local birds by matching picture with name.
- Practice using field guides to identify birds.
- Become familiar with common field marks and bird adaptations such as bill shape.
- Have fun!

**Procedure:**

Optional background information (to tie in Language Arts) A common, but perhaps antiquated insult in English is to say someone has a "Bird Brain". What does that mean? Are birds stupid because their brains are tiny? Many species of birds actually have astoundingly acute memory, especially those that cache thousands of seeds in the fall to survive harsh winter seasons, like Chickadees. Let's see how good your memory is and learn how to identify local birds at the same time.

1. Divide students into groups of four to five students. Each group gets a field guide (if available).
2. Set up the Memory Board and briefly explain rule. Each group tries to make a match. To indicate what card they want to see, they must call out the picture on the sleeve that is in front of the card on the memory board (See photo below). The pictures on the sleeves may include beaks for different functions (seed-eating beak, insect-eating beak, meat-eating beak, for example), of different fieldmarks used to identify birds in the field (eyebrow, wing bars, eyering, crest) and different feet (perching foot, a clawed raptor foot, a webbed foot). If a student calls out "Beak" for example, and there are three different beaks, they must specifically describe which beak they are referring to. Teacher then turns cards over.

3. If a match is made, the group keeps the cards on their desk, and the next group takes a turn. If a match is not made, the cards are turned back over and the next group takes a turn.
4. When all of the matches have been made, each group of students takes a few minutes to prepare a brief presentation about their bird to give to the class. They use information from the field guide and their own comments about the physical characteristics of the bird.



### **Suggestions:**

Before starting the game, use the pictures on the sleeve to review key characteristics of birds, for example, different families of birds have different bill forms that correspond with their diets. (Form fits function.) There is a lot we can infer about birds by noting their physical characteristics. Tell students to look for examples in their fieldguides for birds with an insect-eating beak, for example, or for birds with a notched tail, as you review each picture on the memory board. The pictures shown above are more appropriate for primary school children. Other pictures on the sleeves may include illustrations of other common fieldmarks such as wing bars, eye rings, crest, crown, and so forth.

Explain the rules of the game and start. If a name card is chosen before a picture card, question students to recall the characteristics of the bird. For example, a group chooses a



name card. Ask students to recall what this bird looks like. They can look it up in the bird guide if they don't know. Then they choose the second match. If a picture of a bird is picked, the teacher can ask questions about it to help reinforce observation and identification skills. What distinctive field marks does it have? What type of food does it probably eat? Why do you think that? What is its song like? (Students can imitate song if they have been hearing it in class.) If no one can identify the bird, students can use the field guides to do so and to confirm that the name card matches the picture card.

### **Variations**

For more advanced groups, include a set of cards of silhouettes of the same species. Students can match the picture with a silhouette, or do a three-way match of the name, silhouette, and picture. Name cards can include scientific names only to practice the scientific names. When students' skills become more refined, you can include species of the same genera that are more difficult to distinguish, or use scientific names rather than common names.

## **PRE-TRIP SCHOOLYARD ACTIVITY No. 2**

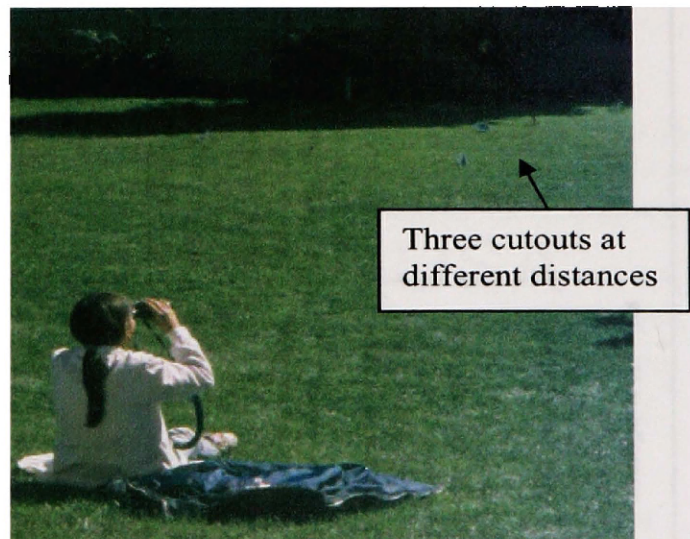
### **Binocular Practice in the Schoolyard**

Learning to identify birds in the wild with binoculars can be a frustrating experience. Spotting a moving bird through binoculars and focusing quickly is not easy for beginners. In this activity, life-sized, illustrated cutouts of local bird species are placed at different distances on the schoolyard. Student groups sharing binoculars and fieldguides try to identify each cutout. This idea was adapted from Matt Erickson who worked at the Teton Science School in Jackson, WY. This activity is great for preparing for an actual schoolyard point count.

#### **Example Cutout of the Chucao**



#### **Student Practicing with Binoculars**



Descriptive summary of comparative fieldtrip activities that are conducted in the native forest and then in the pine plantation. Students' observations for each of the activities below are recorded in their ALAS fieldtrip workbooks.

Activity	SENSES	BIRDS	UNDERSTORY	CAVITY NESTS	MOSSES & LICHENS (optional/time permitting)
<b>Time</b>	15 min.	30 min.	30 min.	30 min.	30 min.
<b>Materials</b>	Eyes, ears, and nose!	Binoculars, Field Guides, Small Tape Cassette player (for playback experiments-optional and highly recommended)	Garden Shovels 0.5 or 1 m hoops, Magnifying Glass	Ruler, Field Guide	Magnifying Glass
<b>Objectives</b>	Perceive an environment through three senses: sight, hearing, and smell.	Conduct a bird census Distinguish between individuals and species Practice using binoculars to observe birds in the field.	Distinguish between different species of plants and invertebrates.	Learn about the different species of woodpeckers and secondary cavity nesters in the austral temperate forest.	Distinguish mosses from lichens Distinguish different types of lichens and mosses
<b>Concepts</b>	There's more to the woods than meets the eye!	Species richness and abundance of birds Habitat use Avian behavior and communication	Species richness and abundance of understory plants and invertebrates Microhabitats Nutrient cycling and decomposition Important source of food, shelter and nesting materials for birds	Importance of old-growth trees for woodpeckers and secondary cavity nesting birds and animals—the "nest web". Interrelationship between fungus, living <i>Nothofagus</i> , cavity-nesters, and tree-boring insects.	Species diversity of mosses and lichens Mutualism (lichens=algae + fungi) Microhabitats  Lichens provide nesting material for many species of songbirds, such as the hummingbird.
<b>Sequence</b>	Introductions between students and field trip guide.  Students record date, time, weather.  On appropriate page, students record what they see, what they hear, and what they smell.  After this, they rotate through the three following investigative activities	Students record date, time, weather and note any changes.  Using binoculars and field guides, students walk in silence with guide and record the birds they see and hear, and the number of individuals of each species.	Students record date, time, weather and note any changes and draw a picture of a native plant leaf in the native habitat site and label it.  They investigate the components of the leaf litter and then count the number of different plant species and individual of each within a 0.5 meter plot. They do two to three samples.  For their last sample, they record the invertebrates found in the leaf litter and soil and note the soil moisture.	Students record date, time, weather and note any changes.  They look for both natural and constructed cavities in trees and record the number of cavities and size. From shape and size of the constructed cavities, they infer the species. Signs of woodpeckers foraging are also noted as well as the age and species of the tree where cavities are found.	Students record date, time, weather and note any changes.  Students are taught about the differences between lichens and mosses.  At breast height they record the number of different lichens and moss species on three trees. They record the circumference at breast height and the species of each tree.

## **Description of ALAS Fieldtrip Workbook and Fieldtrip Activities**

The fieldtrip workbook and activities were designed by Kim Olson. Illustrations are by Daniel Varela. The *Bichos* (invertebrates) activity was adapted from Peter Feinsinger (Arango et. al. 2002) at the suggestion of Alejandro Grajal of the Latin America and Caribbean Program of the National Audubon Society. It is a classic schoolyard ecology activity. The layout of the workbook was intended to facilitate student data collection, and the direct comparison and analysis of data from the native forest and pine plantation.

### **1. Pre-trip Preparation.**

- A. Before the fieldtrip, students are handed the workbooks and are informed about the activities they will be doing in the field and what type of data they will be collecting.
- B. They are then asked to record their predictions regarding each activity on the “Páginas de Predicciones” and explain their predictions. According to the classroom teacher’s preference, students can do this individually or in their pre-assigned research groups. Student predictions can generate interesting discussions in class, as students’ predictions vary for different reasons.
- C. Students are instructed to write their names on the cover. Educational coordinators collect all of the workbooks and hand them back to students at the fieldtrip site. This ensures that all students will have their workbooks.

### **2. Sequence of Fieldtrip Activities**

- A. When students arrive at the first fieldtrip site, the native forest, they get in their respective research groups and are assigned to a biologist or fieldtrip guide.
- B. Before rotating through the three, thirty-minute comparative activities, student groups enter the forest with their guide to an area isolated from the other groups. Students note the time, weather, and general wind speed and direction. Then they spend 15 minutes recording what they hear, see, and smell.
- C. They begin the first of the three activities, either the bird census, the cavity nest, or the forest understory activity depending on which guide they are with. At the beginning of each activity, students record the time and weather at the top of the page, and the name of their guide.
- D. When finished with the first of the three investigative activities, groups reconvene at a predesignated rendezvous site and switch to their next activity led by a different fieldtrip guide. This gives students the

opportunity to work closely with three different professionals or undergraduates that specialize each of the given activities.

- E. When all of the activities have been completed, students have a 20 minute snack break in the native forest before investigating the pine plantation.
- F. In the pine plantation, students repeat the same activities in the same sequence with the same guides.
- G. When finished, field workbooks are collected by the teacher or one of the ALAS guides, which will be returned to the students in the classroom for data analysis. This gives the teacher the opportunity to assess students' work in the field and ensures that all students will have their workbooks for the data analysis.

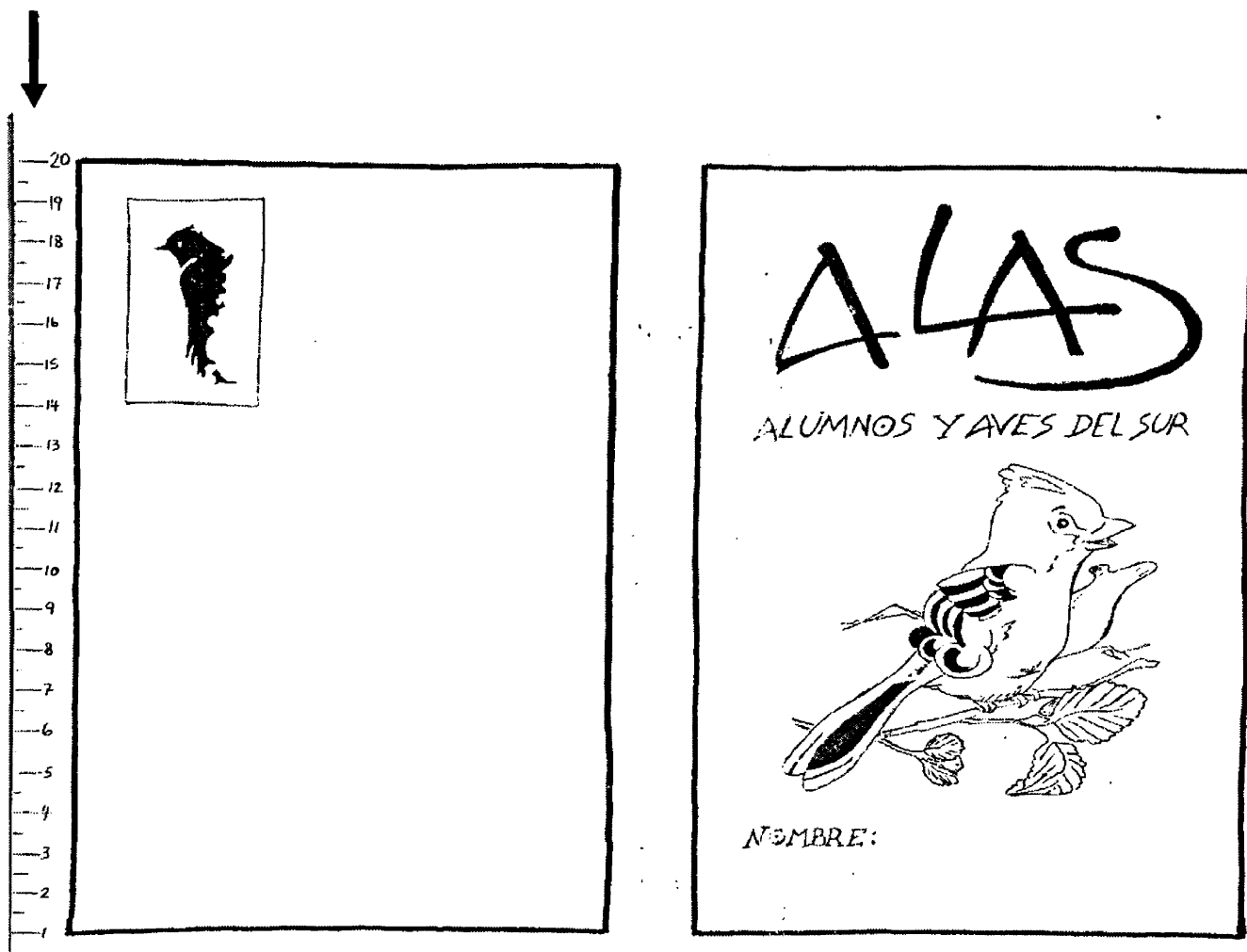
### **3. Post Trip Data Analysis**

- A. In the classroom, completed workbooks are returned to the students. Student groups compile, graph and analyze classroom data. If the teacher feels uncomfortable about his/her ability to do this, an ALAS coordinator visits the classroom to lead the analysis. Students summarize their results on the Prediction Page in the *Resultados* (Results) box. In the Conclusions box, students reflect upon possible explanations for their findings.
- B. Based on their observations, students conclude which site would be more suitable for birds.

## The ALAS Fieldtrip Workbook

The ALAS Fieldtrip Workbook for students, known as the cuadernillo is shown on the following pages. It is made of four double-sided letter pages, folded in half and stapled, to make a booklet of twelve pages on which to record data for the three comparative activities: Bird Census, Forest Understory, and Cavity Nests, as well as additional observations. The workbook was illustrated by Daniel Varela, an artist in San Carlos de Bariloche.

20 cm metric Ruler for making measurements in the field.



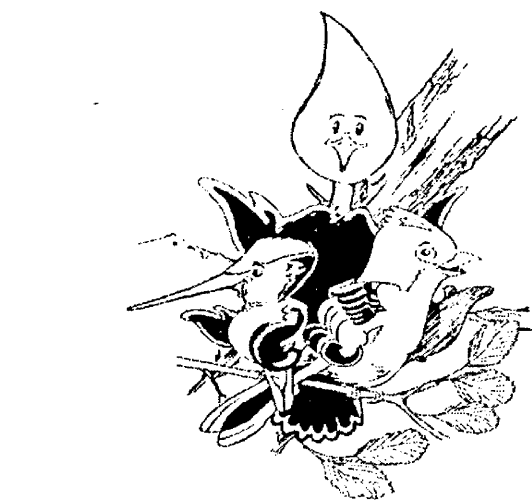
### Back Cover Page

ALAS logo on top left-hand corner. (silhouette of the Fio-fio with wing in the shape of Patagonia.

### Front Cover Page

with the ALAS mascot, the Fio-fio (White-crested Elaenia)

## "Kids....Welcome to the Forest!"



**CHICOS...  
¡BIENVENIDOS  
AL BOSQUE!**

Inside Cover Page with caricatures of four common representative species of the austral temperate forest. In the lower left-hand corner, the Chucao Tapaculo. Perched on a Lenga branch, are the Magellanic Woodpecker, the White-crested Elaenia (the ALAS mascot) and the Green-backed Fire-crowned Hummingbird.

## "Let's Go to the Field!"

15-minute Introductory Seeing,  
Hearing, and Smelling Activity

### ¡VAMOS AL CAMPO!

FECHA \_\_\_\_\_ HORA \_\_\_\_\_ TEMP. \_\_\_\_\_

CLIMA \_\_\_\_\_ VIENTO 0° N E

BIENVENIDOS AL BOSQUE NATIVO  
LUGAR: \_\_\_\_\_



BIENVENIDOS A LA PLANTACIÓN DE PINOS



③

When students first arrive to the field, before starting the three investigative activities, they record the date, time, weather and wind direction. In the *Bienvenidos al Bosque Nativo* (Welcome to the Native Forest) section, they record what they see. They are instructed to close their eyes and listen, then record the sounds they hear. Lastly, they inhale deeply and record what they smell. The same activity is repeated later in the pine plantation site and recorded on the lower half of this page, *Bienvenidos a la Plantación de Pinos* (Welcome to the Pine Plantation)



## The Pages of Predictions! \*We are all Scientists!\*

On these two pages, students record their predictions prior to going on the fieldtrip, about Birds (*Sobre Aves*), Invertebrates (*Sobre Bichos*), and Cavity Nests (*Sobre Huecos*). In the box "Predicción", they check whether they will see 1) more in the native forest, 2) more in the pine plantation, or 3) the same amount in both places. Students explain the rationale for their predictions. When they have finished the comparative activities in the field, they report their findings in the "Resultados" (results) box. In the box marked "Conclusión", students reflect upon possible explanations for their results.

### PÁGINAS DE LAS PREDICCIONES

#### \*SOMOS TODOS CIENTÍFICOS\*

Vamos a investigar varias componentes de dos habitats distintos: EL BOSQUE Y LA PLANTACIÓN DE PINOS.

#### \*¿QUÉ VAMOS A ENCONTRAR?\*

Ya tenemos una idea de qué diferencias y similitudes habrá en cada lugar por experiencia propia, así que...

¡HAGAMOS PREDICCIONES! ¿se cumplirán? ¡INVESTIGUEMOS!

### SOBRE AVES

PREDICCIÓN → ¿QUÉ PIENSAS QUE VAS A ENCONTRAR?

☐ más aves en el bosque nativo ☐ más aves en la plantación ☐ igual en los dos lugares  
¿POR QUÉ?

RESULTADOS → ¿QUÉ ENCONTRASTE?

CONCLUSIÓN → ¿A QUÉ SE DEBE LO QUE ENCONTRASTE?

①

### SOBRE BICHOS

PREDICCIÓN → ¿QUÉ PIENSAS QUE VAS A ENCONTRAR?

☐ más bichos en el bosque nativo ☐ más bichos en la plantación ☐ igual en los dos lugares  
¿POR QUÉ?

RESULTADOS → ¿QUÉ ENCONTRASTE?

CONCLUSIÓN → ¿A QUÉ SE DEBE LO QUE ENCONTRASTE?

### SOBRE HUECOS

PREDICCIÓN → ¿QUÉ PIENSAS QUE VAS A ENCONTRAR?

☐ más huecos en el bosque nativo ☐ más huecos en la plantación ☐ igual en los dos lugares  
¿POR QUÉ?

RESULTADOS → ¿QUÉ ENCONTRASTE?

CONCLUSIÓN → ¿A QUÉ SE DEBE LO QUE ENCONTRASTE?

②

#### Translation: \*We are all Scientists!\*

We are going to investigate various components of two distinct habitats: The Native Forest and the Pine Plantation. What are we going to find? We already have an idea of what differences there will be in each place from our own experience, so.....LET'S MAKE PREDICTIONS! How will they turn out?  
LET'S INVESTIGATE!

In each box, marked *Predicción* (Prediction), *Resultados* (Results), and *Conclusión* (Conclusion), a question follows that helps define each term.

**Prediction** → What do you expect to find?

**Results** → What did you find?

**Conclusion** → How could you explain your findings?

## Drawing the Leaf of a Native and Exotic Plant

## Bird Census Activity

### PLANTAS NATIVAS

Dibuja las hojas de algunas plantas nativas

### PLANTAS EXOTICAS

Dibuja las hojas de algunas plantas exóticas



### AVES DEL BOSQUE NATIVO

HORA:  
TIEMPO:

NOMBRE DEL ORNITÓLOGO:

¡Hagamos un censo de aves!...  
Apunta lo que ves y escuchas.

\* ESPECIE DE AVE Y CANTIDAD      \* OBSERVACIONES

1		
2		
3		
4		
5		
6		



### AVES DE LA PLANTACION DE PINOS

HORA:  
TIEMPO:

¡Hagamos un censo de aves!...  
Apunta lo que ves y escuchas.

\* ESPECIE DE AVE Y CANTIDAD      \* OBSERVACIONES

1		
2		
3		
4		
5		
6		

⑥


⑦

On this page, students draw on leaf of a dominant native plant in detail while in the native forest (top-half under the title *Plantas Nativas*). In the pine plantation, they draw pine needles and cones in detail in the *Plantas Exóticas* section (lower half). In Bariloche, the students draw the leaf of a *lenga* tree.

All of the species that students hear or see during this 30 minute activity are recorded in the left-hand column. In the top half, birds observed in the native forest (*Bosque Nativo*) are noted. In the bottom half, birds seen in the pine plantation (*Plantación de Pinos*) are recorded. Students tally the number of individuals of each species that they observe and add any additional comments about behavior in the right-hand "Observations" column, for example, if the species was seen or heard, or flying.

**Cavity Nest Activity.** Students record the presence and abundance of natural and constructed cavity nests, the presence of woodpecker sign found on three trees in the native forest (left page) and the pine plantation (right page). At the start of the activity, students note the time, weather and the name of their guide.

### Cavity Nests in the Native Forest



## NIDOS EN BOSQUE EL NATIVO

HORA: \_\_\_\_\_  
TIEMPO: \_\_\_\_\_

NOMBRE DEL GUÍA: \_\_\_\_\_

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**ÁRBOLES PRINCIPALES EN ESTA ÁREA**


¿Qué aves hacen su propio hueco en los troncos para nidificar?

¿Qué otras aves nidifican en huecos, pero no pueden hacerlo?

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**¡INVESTIGUEMOS LA ABUNDANCIA DE HUECOS!**

ÁRBOL	ESPECIE	EDAD/SALUD	Nº DE NIDOS EXCAVADOS		Nº DE HUECOS NATURALES		¿PICOTEADO?	
			SI	NO	SI	NO	SI	NO
1							<input type="radio"/>	<input type="radio"/>
2							<input type="radio"/>	<input type="radio"/>
3							<input type="radio"/>	<input type="radio"/>



(8.)

### Cavity Nests in the Pine Plantation



## NIDOS EN LA PLANTACION DE PINOS

HORA: \_\_\_\_\_  
TIEMPO: \_\_\_\_\_

NOMBRE DEL GUÍA: \_\_\_\_\_

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**ÁRBOLES PRINCIPALES EN ESTA ÁREA**

¿Qué necesitan los pajaros carpinteros para poder vivir en un lugar?

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**¡INVESTIGUEMOS LA ABUNDANCIA DE HUECOS!**

ÁRBOL	ESPECIE	EDAD/SALUD	Nº DE NIDOS EXCAVADOS		Nº DE HUECOS NATURALES		¿PICOTEADO?	
			SI	NO	SI	NO	SI	NO
1							<input type="radio"/>	<input type="radio"/>
2							<input type="radio"/>	<input type="radio"/>
3							<input type="radio"/>	<input type="radio"/>




(9)

In the top of the page, *Arboles Principales en esta Area*, (Dominant trees of this area), students note the dominant tree species at the site.

**Review:** In the Native Forest, students review the bird species can make their own cavity nests. *¿Qué aves hacen su propio hueco para nidificar?* (What birds make their own cavities in order to nest?). They learn that there are four primary cavity nesters, three woodpeckers (large: Magellanic Woodpecker, medium: Andean Flicker, and small: Bataraz) and one songbird (the White Throated Tree Runner), and record their common names. With the second question, *¿Qué aves nidifican en huecos pero no pueden hacerlo?* (What birds nest in cavities but can't make their own?), they learn about the secondary cavity nesting species that rely on abandoned woodpecker nests and/or natural cavities; for example, the Thorn-tailed Rayadito, the Patagonian Sierra Finch, the Austral Parakeet, the Austral Pygmy Owl, the American Kestrel, the Housewren, and swallows.

In the chart, students visit three trees (*árbol*) one at a time. At each tree, they note the species (*especie*), the approximate age (*edad*) and health (*salud*) (i.e. old/half-dead; young/healthy), the number of constructed cavities (*nidos excavados*) and the number of natural cavities (*huecos naturales*) that they find on each individual tree, and whether or not the tree has been pecked up (column of circles marked *Si/No*). In the space below the chart, students draw the shape of the cavity nests they find and the corresponding species of primary cavity nester. The same sequence of activities is repeated in the pine plantation.


**Forest Understory Activity.** On the left, data on the understory of the native forest is collected. On the right, data on the pine plantation understory is collected. Having these two pages side-by-side facilitates data analysis in the classroom. Before beginning the investigation, students note the time, weather and the name of their guide.

 **SOTOBOSQUE DEL BOSQUE NATIVO** HORA: \_\_\_\_\_ TIEMPO: \_\_\_\_\_  
NOMBRE DEL GUÍA: \_\_\_\_\_

**(A) PLANTAS**

MUESTRA	MEDE LA COBERTURA ARBÓREA A LA MUESTRA	CUÁNTAS ESPECIES DIFERENTES HAY?	¿CUÁNTAS HAY DE CADA ESPECIE?
1			
2			

OBSERVACIONES: \_\_\_\_\_

**(B) BICHOS**  Muchos bichos viven en la hojarasca y en el suelo. ¡Investiguemos este micro-habitat! ...

Mede la profundidad de la hojarasca: \_\_\_\_\_ cm  
¿De qué es la hojarasca? \_\_\_\_\_

BICHOS EN	CLASE DE BICHO Y CANTIDAD	OTROS DATOS				
		1	2	3	4	5
LA HOJA RASCA		1	2	3	4	5
EL SUELO HASTA 5 cm		1	2	3	4	5


(10)

**SOTOBOSQUE DE LA PLANTACION DE PINOS** HORA: \_\_\_\_\_ TIEMPO: \_\_\_\_\_  
NOMBRE DEL GUÍA: \_\_\_\_\_

**(A) PLANTAS**

MUESTRA	MEDE LA COBERTURA ARBÓREA A LA MUESTRA	CUÁNTAS ESPECIES DIFERENTES HAY?	¿CUÁNTAS HAY DE CADA ESPECIE?
1			
2			

OBSERVACIONES: \_\_\_\_\_

**(B) BICHOS**  Muchos bichos viven en la hojarasca y en el suelo. ¡Investiguemos este micro-habitat! ...

Mede la profundidad de la hojarasca: \_\_\_\_\_ cm  
¿De qué es la hojarasca? \_\_\_\_\_

BICHOS EN	CLASE DE BICHO Y CANTIDAD	OTROS DATOS				
		1	2	3	4	5
LA HOJA RASCA		1	2	3	4	5
EL SUELO HASTA 5 cm		1	2	3	4	5

(11)

**Part A. Plants, *Plantas*** (Species Richness and Abundance). Using a spoon as a densiometer, students estimate the percent of canopy cover over their mini-plot, a 0.5 m hoop and record it. They note the number of different species of plants in their plot and the number of individuals of each species. Students conduct two samples.

**Part B. Invertebrates, *Bichos*** (Species Richness and Abundance). Students measure the depth of the leaf litter, *la hojarasca*, in centimeters and describe its contents. (i.e. dead leaves, twigs, seeds). They sort through the leaf litter to the soil surface in their plot looking for invertebrates and record the type (i.e. spiders, worms, ants, beetles) and number of individuals of each type. Using a small garden shovel or a stick, they dig into the soil, *en el suelo*, 5 cm. looking for invertebrates and record their findings. On the scale of 1 (very dry/*muy seco*) to 5 (very wet, like mud/*como barro*), students record the moisture of the leaf litter and the soil.

## Lichen and Mosses Activity (optional)

The purpose of this activity is to distinguish between a moss and a lichen, state the difference between the two (lichen—a mutualism of an algae and a fungi; moss—a primitive, nonvascular plant) and to compare the species richness and abundance of arboreal lichens in the native forest and the pine plantation.

## Let's Reflect (Summary Questions)

### LIQUENES Y MUSGOS

HORA:  
TIEMPO:

NOMBRE DEL GUÍA:

Contesta las siguientes preguntas.

① ¿QUÉ ES UN LIQUEN Y DONDE SE ENCUENTRAN?

② ¿QUÉ ES UN MUSGO Y DONDE SE ENCUENTRAN?



### BOSQUE NATIVO

AL NIVEL DEL PECHO

ESPECIE DE ARBOL	CIRCUNFERENCIA DEL ARBOL	¿HAY MUSGOS?	¿HAY LIQUENES?	¿CUÁNTOS TIPOS DE LIQUENES VES?	¿DE EL LARGO DEL LIQUEN MÁS GRANDE QUE VES.	¿DE QUE COLORES SON LOS LIQUENES QUE VES?



### PLANTACION DE PINO

AL NIVEL DEL PECHO

ESPECIE DE ARBOL	CIRCUNFERENCIA DEL ARBOL	¿HAY MUSGOS?	¿HAY LIQUENES?	¿CUÁNTOS TIPOS DE LIQUENES VES?	¿DE EL LARGO DEL LIQUEN MÁS GRANDE QUE VES.	¿DE QUE COLORES SON LOS LIQUENES QUE VES?

⑫

## REFLEXIONAR

CONTESTA LAS SIGUIENTES PREGUNTAS

① ¿Qué diferencias y similitudes observaste entre el bosque nativo y la plantación de pinos?

② ¿Cómo salieron tus predicciones? ¿Cuáles de tus resultados te sorprendieron más?

③ ¿Cuál es la diferencia entre un líquen y un musgo? ¿Cómo los distingues?

④ ¿Es un buen lugar la plantación de pinos para que hagan sus nidos las aves? Explica tu respuesta.

⑤ Si desaparecieran todos los pájaros carpinteros ¿Qué cambios habría?

⑬

Students record the time, weather, and their guide's name. The guide leads them through the introductory questions. 1) What is a lichen and where are they found? and 2) What is a moss and where are they found?

Students investigate two trees at breast height. They record the circumference, the presence of moss (Yes or No), the presence of lichens (Yes or No), the number of different kinds of lichens they see, the length of the largest lichen they see, and the colors of the lichens that they see.

Answer the following questions.

- 1) What differences and similarities did you observe between the native forest and the pine plantation?
- 2) How did your predictions come out? Which of your results did you find most surprising?
- 3) What is the difference between a lichen and a moss? How do you tell them apart?
- 4) Is a pine plantation an ideal place for birds to nest? Explain your response.
- 5) If all of the woodpeckers disappeared from the forest, what changes would there be?

Typical Fieldtrip Organizational Schedule

CEM 20 Fieldtrip, November 2001

Leave from CEM 20 at 0830

BOSQUE NATIVO

ACTIVITY <i>Guide</i> Hora		BIRDS Mariano	BIRDS Juan	CAVITIES Yamila	CAVITIES Andres	UNDERSTORY Maria Elena	UNDERSTORY Martín
A	900 940	Rayaditos	Huet-Huets	Chucaos	Fiofios	Picoleznas	Pitios
B	945 1020	Picoleznas	Pitios	Rayaditos	Huet-Huets	Chucaos	Fiofios
C	1025 1100	Chucaos	Fiofios	Picoleznas	Pitios	Rayaditos	Huet-Huets
1105 1130		SNACK TIME IN THE NATIVE FOREST..... CHANGE SITES  PINE PLANTATION					
		Mariano	Juan	Yamila	Andres	Maria Elena	Martín
D	1130 1150	Rayaditos	Huet-Huets	Chucaos	Fiofios	Picoleznas	Pitios
E	1155 1215	Picoleznas	Pitios	Rayaditos	Huet-Huets	Chucaos	Fiofios
F	1220 1240	Chucaos	Fiofios	Picoleznas	Pitios	Rayaditos	Huet-Huets
1245 1300		RETURN TO CEM 20					

1º año, CEM 20 Profa. María-Elena Cuello

**Rayaditos**

Ariel Levio  
Cynthia Rodriguez  
Rosita Cherquemon  
Silvana Lucero  
Romina Rivero

**Picoleznas**

Augustin Cerde  
Mario Villalbe  
Vaneza Pozas  
Jairo Bascuñan  
Cristina Uribe

**Fiofios**

Sergio Peña  
Walter Marin  
Antihual Ariel  
Belén Sosa  
Martín Yáñez

**Huet-Huets**

Paolo Ortega  
Ezequiel Leira  
Riquelme Nicolas  
Emilce Aguila

**Chucaos**

Raúl González  
Noelia Pérez  
Natalia Poblete  
Vanessa Cárdenas

**Pitios**

Andrea Hernández  
Carolina Calfubo  
Sánchez Estefanía  
Vanessa González

## **ALAS Workshops**

Workshops help provide teachers with practical training, new ideas, and the confidence to teach subject matter that was previously unfamiliar or disliked (Feinsinger et.al., 1997). ALAS workshops provided 16 hours of training for teachers during two 8-hour sessions. Two workshops were given during the time of this study, one in San Carlos de Bariloche and one in San Martín de los Andes where teachers received credits from the local university for attending. Teachers were led through the activities in the same hands-on methods that, by example, they were be encouraged to use with their own students. They became familiar with the common birds likely to be found on their schoolyards and were exposed to common field research techniques such as point counts.

The workshop objectives for teachers were to:

- 1.) develop basic observational skills
- 2.) record observations and formulate questions
- 3.) learn to use binoculars
- 4.) identify target birds by sight and sound
- 5.) construct classroom species accounts
- 6.) use skills to identify birds at home or a local park
- 7.) design simple experiments to answer questions
- 10.) be involved in a citizen-science research project
- 11.) gain exposure to ornithological field techniques
- 12.) use games, creative writing and art activities to synthesize knowledge of birds

**Coordinado por:**

Kimberly L. Olson  
Universidad de Montana, EEUU

Lic. Horacio Matarasso  
Asociación Aves Patagónicas, Argentina

**Hecho posible por las ideas luminosas y  
energía colectiva de muchas personas  
dedicadas al proyecto...**

Maria-Elena Cuello

Gustavo Iglesias

Anita Kreiter

Lic. Valeria Ojeda

Luis Belloli

Alejandro Yanniello

Martín Núñez

Lic. Guillermo Amico

Juan Karlanian

Martín Costa

Roberto Orduna

Lic. Yamila Sasal

Mariano Rodríguez Cabal

Shannon Ripley

y el dibujante oficial para el proyecto, Daniel Varela.

**Auspiciado por**

National Audubon Society,  
Latin America and Caribbean Program

Partners in Flight of the  
National Fish and Wildlife Foundation

Sociedad Naturalista Andino-Patagónica

Asociación Ambientalista Piuké

Asociación Aves Patagónicas



Asociación  
Aves Patagónicas

**presentan**

**PROYECTO ALAS  
Alumnos y Aves del Sur**

**2º TALLER PARA DOCENTES**

*Un viajero sin conocimiento es un pájaro sin alas*  
Sa'di Guli

**13 y 14 de Abril de 2002**

**San Martín de los Andes,  
Neuquén - Argentina**

The handout for the second ALAS workshop for teachers in San Martín: title page with acknowledgements and schedule of events on the following page



## HORARIO

### Sábado 13 de Abril

- 9:00 hs ¡BIENVENIDOS! Presentaciones...
- 10:00 hs ¿Quién no sabe nada de las aves?
- 10:15 hs Matecitos
- 10:25 hs Conozcamos nuestras Aves  
Juegos y Actividades para el Aula
- 11:00 hs Hacer un Guía de Campo  
Adaptaciones, el dibujo, la imaginación.
- 11:30 hs Trabajar con la Mini-Guía de Aves:  
una herramienta didáctica y divertida para los chicos
- 12:30 hs Educación Ambiental en Chile (Helen Urra)
- 13:00 hs ALMUERZO
- 14:00 hs Actividades en el Patio de la Escuela
- 15:00 hs Descanso, Preparar Mates
- 15:15 hs Proyecto Fio-fio  
Investigación internacional con alumnos
- 16:00 hs Biogeografía regional (Sebastián Di Martino y  
Horacio M.)
- 17:00 hs Preparar para la SALIDA AL CAMPO!

### Domingo 14 de Abril

- 8:45 hs Encuentro (salida 9 hs)
- 9:30 a 12:30 hs SALIDA AL CAMPO  
Realización en el campo del Programa Alas
- 12:30 hs Almuerzo en el bosque (a la canasta)
- 13:30 hs Volvemos a la Universidad
- 14:30 hs Llevando el Campo al Aula
- 15:00 hs ¿Qué hacer con los datos después de una  
salida? (Lic. Maria-Elena Cuello)
- 16:30 hs Video "Invasión Verde".
- 17:00 hs Península Rauli, una experiencia  
(Alejandra Y Gogo Castro Cisneros)
- 17:30 hs Cierre, Encuesta
- ¿Y si llueve el domingo? (¡¡NO VA A LLOVER!!)**  
Sólo si llueve a cántaros suspenderemos la salida, pero  
**nos reuniremos igual a las 9:00hs → plan "b"**
- 9:00 hs Las actividades en diapositivas
- 9:30 hs ¿Qué hacer con los resultados de la salida?  
(Maria-Elena Cuello).
- 10:30 hs Descanso
- 10:45 hs Pájaros Carpinteros y Ecología del Bosque  
Andino-  
Patagónico (Lic. Valeria Ojeda).
- 11:30 hs Video "Invasión Verde".
- 11:45 hs Fundación Península Raulí, una experiencia
- 12:30 hs Cierre, Encuesta, Entrega de materiales.

## ¿Qué es ALAS?

ALAS (Alumnos y Aves del Sur) es un programa internacional educativo cuyo objetivo es enseñar conceptos ecológicos (tales como biodiversidad, interacciones entre plantas y aves, etc.) y el proceso de conocer las ciencias por medio de la indagación a primera mano.



En ALAS, la investigación de aves y sus necesidades de hábitar se realiza en el patio escolar, en el bosque nativo y en una plantación de pinos. Estos espacios son utilizados como herramienta para aumentar el conocimiento del medio ambiente y reflexionar sobre el efecto de las acciones humanas en su entorno natural.

El diseño del programa ALAS promueve la colaboración entre biólogos, profesores y maestros, capacitación profesional para docentes, y el autoaprendizaje fuera de las cuatro paredes del aula.

## ¿A quién está dirigido ALAS?

ALAS está dirigido a alumnos de primaria y secundaria de la región Andino-Patagónica de Argentina y Chile con sede en San Carlos de Bariloche. En el año 2001, más de 200 alumnos participaron en salidas al campo con ALAS.



Inside Page of Brochure

## Contáctenos!!!!

Para más información o para planificar una salida con su clase, contáctenos:

Kimberly Olson, Coordinadora Principal  
[alumnosyavesdelsur@yahoo.com.ar](mailto:alumnosyavesdelsur@yahoo.com.ar)  
 Tel: (02944) 52-9672

Por San Carlos de Bariloche:  
 Mariano Rodríguez Cabal:  
[barriosgarcia@bariloche.com.ar](mailto:barriosgarcia@bariloche.com.ar)  
 Tel: (02944) 52-2076  
 Yamila Sasal: [shamilaconv@hotmail.com](mailto:shamilaconv@hotmail.com)  
 Tel: (02944) 52-0714

Por El Bolsón, Epuyén y El Hoyo:  
 Luis Belloli: [luisbelloli@yahoo.com.ar](mailto:luisbelloli@yahoo.com.ar)  
 Tel: 15 63 66 83

Por San Martín de los Andes y Junín de los Andes:  
 Horacio Matarasso: [matarasso@smandes.com.ar](mailto:matarasso@smandes.com.ar)  
 Tel: (02972) 42-2022

ALAS es subsidiado por las siguientes organizaciones:

- The National Audubon Society Programa Para América Latina y el Caribe
- Partners in Flight of the National Fish and Wildlife Foundation
- Birders' Exchange

## Instituciones Afiliados con ALAS

Sociedad Naturalista Andino-Patagónica (SNAP)  
 Asociación Ambientalista Puké  
 Asociación Aves Patagónicas  
 El Parque Etnobotánico Omora  
 Alaska Bird Observatory  
 Partners of the Americas University of Montana

Back Cover

# ALAS

ALUMNOS Y AVES DEL SUR



Un viajero sin conocimiento es como  
 un pájaro sin alas.  
 -Sa'di Gulistan

Front Cover

The ALAS informational brochure provided to teachers. It is one double-sided legal sheet folded in three. It was designed by volunteers Shannon Ripley and Janine Arnold. The ALAS logo on the front cover was designed by Daniel Varela.

## Actividades de ALAS



Salidas al campo para dar a los alumnos la oportunidad de iniciarse en la metodología de indagación a primera mano en pleno contacto con la naturaleza.



Talleres de capacitación para docentes sobre el programa ALAS y la enseñanza de ecología en el patio escolar con la colaboración de biólogos locales.



Ornitólogos y docentes trabajan juntos para guiar a los alumnos en sus observaciones, toma de datos, análisis y discusión de los mismos.



Organización del intercambio de cartas e información cultural con otras escuelas participantes de la Patagonia y con clases de los Estados Unidos y Canadá.



Préstamos a colegios de recursos didácticos para utilizar en el aula y en el campo:

- prismáticos.
- guías de aves.
- juegos de aprendizaje de aves.
- video (La Invasión Verde, Aves del Sur)
- cassettes de cantos



Formación de una red de escuelas que coleccionan datos sobre el Fiofio, para ayudar en la investigación científica de su ruta migratoria, la cual es poca conocida.



## ¿Cómo funciona una salida de ALAS?



Uno de los coordinadores de ALAS visita el aula para conocer a los alumnos, realizar una encuesta pre-salida, enseñar los nombres de las aves más comunes, sus cantos y adaptaciones. Además, practicar con ellos el uso de binoculares, de la guía de aves y también para ayudarlos a formular predicciones acerca de las tres actividades que van a realizar en el campo.



En el campo, los alumnos son divididos en pequeños grupos y cada uno posee un cuadernillo en el que anotará los datos obtenidos.



La salida al campo dura una mañana o una tarde, aproximadamente cinco horas. Los chicos son acompañados por guías adultos de ALAS en todo momento, y cuentan con un transporte para el traslado.



Empezando en el bosque nativo, cada grupo de alumnos rota por tres actividades para investigar la diversidad de aves, bichos y huecos en los árboles. Estas actividades son repetidas en la plantación de pinos para permitir una comparación directa entre los dos tipos de hábitats.



En el aula los alumnos reflexionan sobre sus observaciones, analizan los datos obtenidos, se discuten los resultados y así se generan nuevas preguntas.



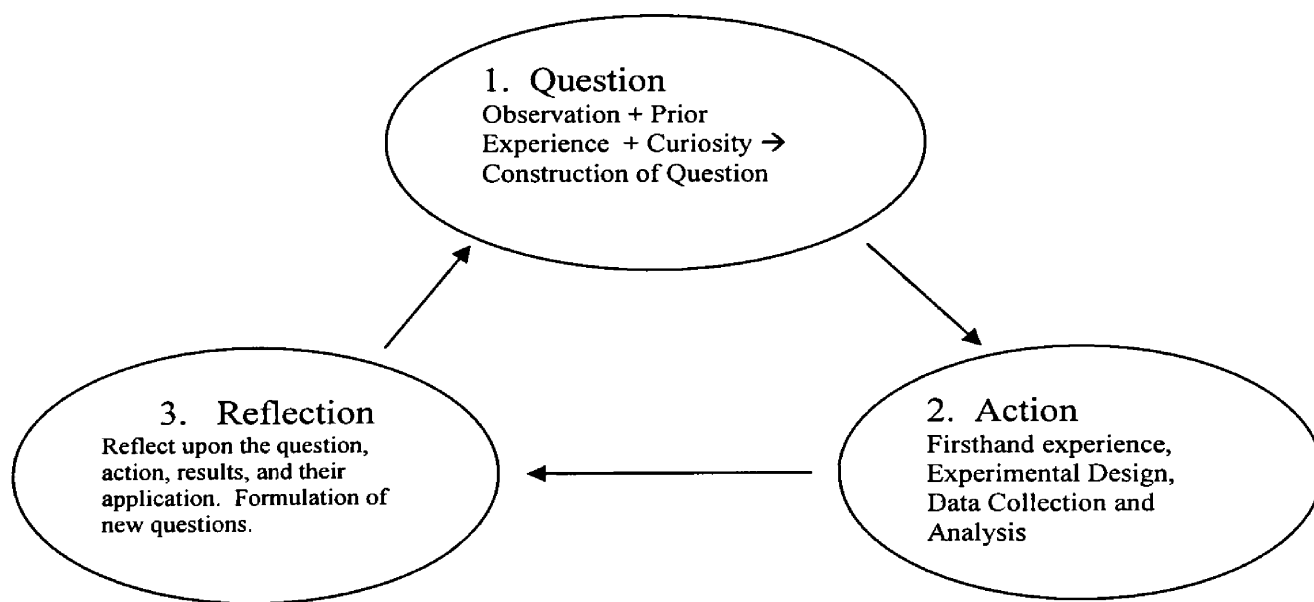
**APPENDIX IV**  
**Background Information**

## What is Inquiry?

Inquiry is an endless cycle of question formulation, action-taking, and reflection that is driven by curiosity, previous observation, and the desire to seek a set of probable explanations to a posed question (Feinsinger et al. 1997a, 1997b, Arango et al. 2002) (See Figure A.). The emphasis lies not in producing “right” or “wrong” answers, but rather on drawing conclusions based on measurable observations. The construction of the question is key to successful inquiry and the first step. The nature of the question should be (Feinsinger et al. 1997a, 1997b, Arango et al. 2002):

1. Answerable.
2. Comparative.
3. Interesting and relevant to the student.
4. Simple: avoiding scientific jargon and use of sophisticated technology.

Figure A. The Cycle of Inquiry (from Arango et al. 2002)



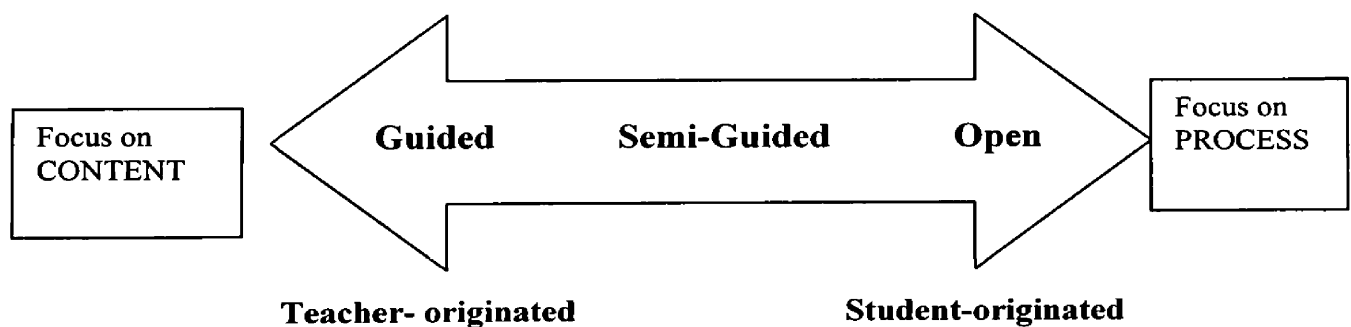
While the desire to know “why” is the engine of inquiry; for the purposes of carrying out the cycle of inquiry, “why” questions are not comparative and are too complex to be answerable in one cycle. The Action phase of the cycle involves first-hand experience in the form of experimental design (what is being compared, measured, when, where, and how), data collecting and analysis. “Why” enters in the critical stage of reflection. An accumulation of evidence gathered through continuous cycles of inquiry enables students to get closer and closer to

ultimately understanding “Why” as students reflect upon what their observations mean, to what they may be attributed to, and what aspects of their investigation may have biased their results (Feinsinger 1997, Arango et. al. 2002). Reflection is key for the continual construction of children’s mental concepts, and the development of critical thinking skills (Blank 1997, 2001).

### Three Levels of Inquiry

Three different levels of inquiry, guided, semi-guided, and open, are based on the degree of teacher intervention (Fig. B). In guided inquiry, the teacher guides students through all stages of the cycle by posing the question, providing the methodology that students employ, and guiding them through the reflection. Inquiry is not geared towards "expected" outcomes, or "right answers", as often is the case with traditional laboratory exercises, but rather, students make predictions based on the provided question, test those predictions with a given methodology, and draw conclusions based on the critical analysis of their observations. In semi-guided inquiry, the teacher provides the subject and tools for investigation, while the students develop the question and methodology and are supervised as they complete all stages of the cycle. For open-inquiry, teacher intervention is minimum and student autonomy is the highest. Students choose the subject, formulate the question and experimental design, conduct the investigation and reflection, while the teacher merely supervises.

Figure B. Three types of Inquiry (based on Arango, et. al. 2002)



## Counteracting Popular Misconceptions about Pine Plantations in Patagonia

### Mixed Messages

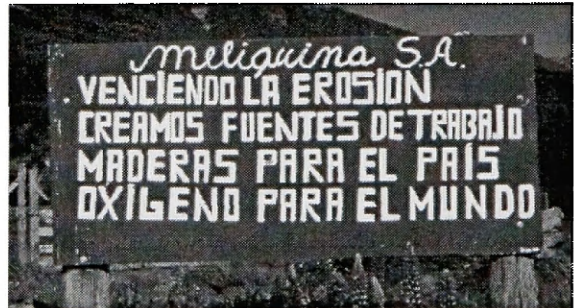
In several provinces in Argentina, planting pine seedlings of invasive *P. ponderosa* is a common environmental education activity in public schools. To honor the International Day of the Environment for year 2002, for example, a daily newspaper lauded the brigades of schoolchildren in Neuquén who planted 2,000 pines donated by a local forestry company. The event was sponsored by the Provincial Directive of the Environment and the Association of Friends of the National Park Perito Moreno under the motto of "*Demos a la tierra una oportunidad*", or "Let's give Earth a Chance". A copy of the article and photograph of students in action follows. A national radio station aired in Bariloche also reported this event (pers. comm. M. Rodriguez-Cabal). Schoolchildren in Bariloche planted pines on Cerro Otto to help restore an area that burned in 1998. Extensive pine plantations lie within some national Argentine parks, covering entire hillsides. In the ecotone region of Lanin National Park, signs next to pine plantations that dominate the immediate landscape implore tourists to "Take Care of the Forest. Extinguish All Fires" as shown in Figure A. Other placards placed by private landowners list the role plantations have in creating oxygen for the world, preventing erosion, providing wood and employment. (Figure B.)

Figures A and B. Signs in front of private pine plantations inside Lanin National Park

Figure A.



Figure B.



The Botanical Society of Chile issued a public declaration in October 2001 ([http://www.udec.cl/~botanica/Declaracion Pública sobre Campaña “Bosque para Chile”](http://www.udec.cl/~botanica/Declaracion_Pública_sobre_Campaña_“Bosque_para_Chile”)) denouncing ad campaigns by forestry companies promote pine plantations as “forests”, a term that implies that plantations fulfill the same ecological roles as native forests.



The copy of a June 5, 2002 article from a daily newspaper from the city of Neuquen below reports that local schoolchildren honored the International Day of the Environment by planting pines on their schoolyards. Translation of photo caption: "The best act to celebrate the Day of the Environment, on a schoolday for reflecting upon the state of the planet."

4  
LA MAÑANA DEL SUR  
Miércoles 5 de junio del 2002

## Los alumnos plantarán pinos en sus escuelas

**Escolares neuquinos festejarán el Día Mundial del Medio Ambiente parquizando los patios de sus escuelas con ejemplares de pinos que donó la Corporación Forestal Neuquina (Corfone).**

**NEUQUEN.-** «Demos a la tierra una oportunidad». Bajo ese lema más dos mil pinos serán plantados hoy en diferentes establecimientos educativos de Neuquén para conmemorar el Día Mundial del Medio Ambiente.

Los árboles -que fueron donados por la Corporación Forestal Neuquina (CORFONE)- serán distribuidos por representantes de la Asociación Amigos de Parques Nacionales «Perito Moreno» y profesionales de la Dirección Provincial de Medio Ambiente.

El objetivo central de la iniciativa es promover «la toma de conciencia de la importancia que tiene para nosotros el cuidado del medio ambiente. Y creemos que la escuela y los colegios son un buen lugar para hacerlo», dijo ayer Daniel Wenk, docente y miembro de la Asociación Amigos de Parques Nacionales.

Los ejemplares de pino serán implantados por los propios alumnos con el asesoramiento de los profesionales. Por eso, ayer la mayoría de los colegios que adhirió a la conmemoración se dedicaron con esmero a preparar los sitios donde serán colocados los árboles.

Las actividades comenzarán a las 9 en la Escuela Santa Genoveva donde se implantarán 100 pinos; luego otros 200 serán ubicados por voluntarios y alumnos del cole-

gio AMEN; posteriormente se harán lo mismo en el barrio San Lorenzo.

Las camionetas irán posteriormente hacia el CPEM 29 y la EPET 13; la comunidad mapuche Ragiñ Co, con alumnos y comisión vecinal de Mariano Moreno, donde se forestará una plaza y luego en el colegio Padre Fito.

### Bardas

Posteriormente se forestará en el Parque Industrial -con el CPEM 44 y con el Instituto Universitario de Ciencias de la Salud IUCS-, en proximidades del tanque de agua de la zona de bardas.

El cierre de la jornada será en la parroquia San Cayetano donde estará presidiendo el acto el sacerdote Juan San Sebastián.

Wenk dijo que en cada uno de los sitios donde serán entregados los ejemplares de pino, se han preparado equipos que luego se encargarán de cuidarlos y regarlos durante todo el año.

El docente recordó que uno de los miembros fundadores de la Asociación Amigos de Parques Nacionales fue el célebre Gregorio Álvarez.

En definitiva, la de hoy será una jornada destinada a ofrecer un mensaje de urgencia sobre el estado del planeta. La celebración del Día Mundial del Ambiente fue establecida por la Asamblea General de la Organización de las Naciones Unidas el 5 de junio de 1972, para marcar el inicio de la Conferencia de Estocolmo (Suecia), que se constituyó en un hito para todo el planeta. Ese mismo día se adoptó una resolución que dio origen a la creación del Programa de las Naciones Unidas para el Medio Ambiente (PNUMA).



*El mejor acto para festejar el Día del Medio Ambiente, en una jornada para reflexionar sobre el estado del planeta.*



An e-mail received by the author about a meeting in the United Kingdom to discuss carbon sink projects in Argentine Patagonia.

**Hotmail®** n\_tro\_p@hotmail.com

Inbox | Pr

---

**From :** "susana garay" <mpyma@ciudad.com.ar>

**To :** "RENACE" <renace@elistas.net>,"Cali Villalonga" <energia@dialb.greenpeace.org>

**Subject :** [renace] Nuevamente el ciefa

**Date :** Thu, 21 Nov 2002 14:19:56 -0300

**Attachments :** FondodeEnblanco.gif (202b)

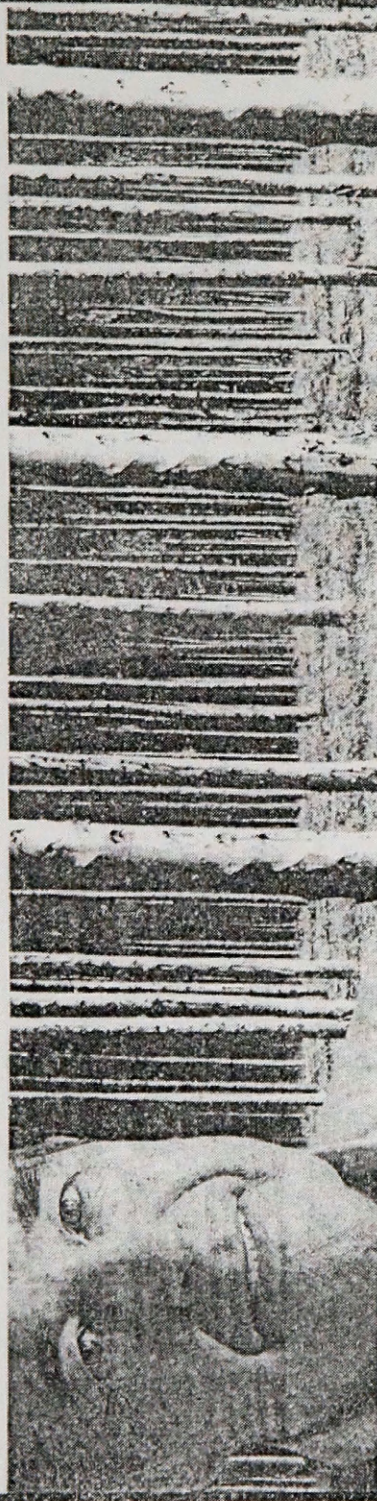
Nuevamente el CIEFAP y el ingeniero Deffose, no contentos con lo de Proma Klima, siguen con los bonos de carbono.....  
Como defenderemos nuestros bosques?

Susana

Asunto: ROUND TABLE ON PATAGONIAN FORESTRY

>  
>"Patagonia, Argentina, has a very important potential for afforestation,  
>over 2.000.000 hectares besides the Andes range. Therefore, there are great  
>possibilities for development of projects within the Clean Development  
>Mechanism (CDM) of the Kyoto Protocol to the UN Framework Convention on  
>Climate Change. There are also possibilities for reforestation of valuable  
>native species as well as activities related to the timber industry.  
>  
>The British Argentine Chamber of Commerce (BACC) together with the  
>Argentine Embassy in the UK are organising a round table about investment  
>opportunities in the forest sector in Patagonia. Dr. Guillermo Defossé,  
>chairman of Patagonian Andes Forest Research and Advisory Center (CIEFAP  
>-Centro de Investigación y Extensión Forestal Andino Patagónico-,  
>www.ciefap.org.ar) and Ricardo Irianni, Undersecretary for Forestry of the  
>Province of Chubut, will be the main speakers.  
>  
>This event will take place on 5th December 2002 from 11:00 to 13:30 at the  
>Argentine Embassy, 65 Brook Street, London W1K 4AH.  
>

## "Esta es mi propiedad y además mi mejor inversión..."



Por veracidad informativa sólo exhibimos tomas fotográficas de bosques pertenecientes a la empresa Paso Alto.

### Inversión segura

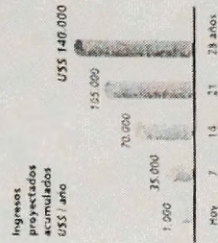
Paso Alto es un sistema "llave en mano" que entrega tierra y bosques ya plantados y libera al inversor de toda preocupación por el cuidado y mantenimiento de los mismos.

La escritura de propiedad de la tierra y los bosques es hecha a nombre de cada comprador por su propio escribano, por lo que el inversor cuenta con absoluta seguridad jurídica.

Paso Alto es una forma segura y accesible de obtener una sucesión de ingresos escalonados en el tiempo y con niveles de rentabilidad hasta ahora sólo posibles para grandes empresas.

### Propuesta de inversión

Con el equivalente a US\$ 1.000 por mes, sin intereses, usted es propietario para siempre de tierra y bosques ya plantados. Las garantías son absolutas.



Invierta seguro, invierta en forestación.



PASO ALTO

Buenos Aires  
Tel. (54 11) 4312 3440  
Tucumán 141, P7  
pasalto@ba.net  
www.pasalto.net

El rendimiento anterior no indica el rendimiento futuro. Los inversores deben leer detenidamente el prospecto informativo de Paso Alto antes de invertir.