Managed Area Report

Managed Area Code: M.USTXHP*1410 **Acreage:** 9,826.00

Managed Area Name: Aquilla WMA

Managed Area Description:

LOCATED BETWEEN WACO AND HILLSBORO ON THE WATERSHED OF AQUILLA AND HACKBERRY CREEKS; WATERFOWL AND SMALL GAME HUNTING WILL BE AMONG THE MOST POPULAR SPECIES THE PUBLIC WILL BE ALLOWED TO HUNT

Managed Area Comments:

OPENED FOR PUBLIC USE WITH AGREEMENT BETWEEN TPWD AND USCOE/ SEE COE-AQUILLA LAKE FILE; PROVIDES PUBLIC HUNTING AND FISHING

Protection:

Protection Comments:

Land Tenure Comments:

Public Access: Restricted

Public Access Comments:

Manager: Jose Cano **Institution:** Area Manager

Street Address: Aquilla WMA
406 N. Ave. R

Phone: (254)582-2719

City: Clifton **Zip Code:** 76634

Cooperating Institution: U.S. Corps of Engineers

Cooperating Institution Comments:

Management Plan Comments:

Management Comments:

Managed Area Report

Managed Area Code: M.USTXHP*1429 **Acreage:** 1,193.00

Managed Area Name: BARDWELL LAKE (USCOE)

Managed Area Description:

THERE ARE THREE DEVELOPED PARKS LOCATED ON THE LAKE; WAXAHACHIE CREEK PARK (CLASS A) OPEN YEAR ROUND, HAS CAMPING AND NATURE TRAIL (205 ACRES, WITH 70 DEVELOPED); HIGH VIEW PARK (CLASS B) OPEN YEAR ROUND, HAS CAMPING, SWIM BEACH, AND MARINA (139 ACRES, WITH 80 DEVELOPED); MOTT PARK (CLASS B) CLOSED NOV-MAR, HAS CAMPING AND SWIM BEACH (270 ACRES, WITH 62 DEVELOPED); LOVE PARK (NON-FEE PARK) CLOSED NOV-MAR (390 ACRES, WITH 31 DEVELOPED)

Managed Area Comments:

Protection:

Protection Comments:

Land Tenure Comments:

Public Access:

Public Access Comments:

Manager:	LARRY BUCK	**Institution:**	RESERVOIR MANAGER
Street Address:	BARDWELL PROJECT OFFICE ROUTE 4, BOX 33A	**Phone:**	214 875-5711
City:	ENNIS	**Zip Code:**	75119

Cooperating Institution:

Cooperating Institution Comments:

Management Plan Comments:

Management Comments:

Managed Area Report

Managed Area Code: M.USTXHP*736 **Acreage:** 77.00

Managed Area Name: CONFEDERATE REUNION GROUNDS STATE HISTORIC PARK

Managed Area Description:

Managed Area Comments:
PARK HAS SEVERAL ATTRACTIONS OF HISTORICAL AND ARCHITECTURAL INTEREST, SUCH AS THE 1872 HERITAGE HOUSE

Protection: Unprotected

Protection Comments:

Land Tenure Comments:

Public Access:

Public Access Comments:

Manager: TOM FISHER **Institution:** SUPERINTENDENT

Street Address: C/O FORT PARKER **Phone:** 817 562-5751
ROUTE 3, BOX 95

City: MEXIA **Zip Code:** 76667

Cooperating Institution:

Cooperating Institution Comments:

Management Plan Comments:

Management Comments:

Managed Area Report

Managed Area Code: M.USTXHP*1441 **Acreage:** 1,210.00

Managed Area Name: PROCTOR LAKE (USCOE)

Managed Area Description:

CORPS PARKS ON PROCTOR LAKE

Managed Area Comments:

Protection:

Protection Comments:

Land Tenure Comments:

Public Access:

Public Access Comments:

Manager: **Institution:** RESERVOIR MANAGER

Street Address: ROUTE 1
BOX 71A

Phone: 817 879-2424

City: COMANCHE **Zip Code:** 76442

Cooperating Institution:

Cooperating Institution Comments:

Management Plan Comments:

Management Comments:

Managed Area Report

Managed Area Code: M.USTXHP*1445 **Acreage:** 3,307.00

Managed Area Name: WHITNEY LAKE (USCOE)

Managed Area Description:

CORPS PARKS ON WHITNEY LAKE; CEDAR CREEK (735 ACRES), CEDRON CREEK (226 ACRES), HAM CREEK (44 ACRES), KIMBALL BEND (299 ACRES), LOFERS BEND (1064 ACRES), MCCOWN VALLEY (379 ACRES), PLOWMAN CREEK (189 ACRES), RIVERSIDE (181 ACRES), SOLDIERS BLUFF (66 ACRES), STEELE CREEK (330 ACRES), WALLING BEND (148 ACRES)

Managed Area Comments:

OTHER PARKS ON WHITNEY LAKE INCLUDE: LAKE WHITNEY SRA OPERATED BY TPWD; OLD FORT AND CHISHOLM TRAIL PARKS OPERATED BY HILL COUNTY

Protection:

Protection Comments:

Land Tenure Comments:

Public Access:

Public Access Comments:

Manager: **Institution:** PROJECT MANAGER

Street Address: P.O. BOX 5038 **Phone:** 817 694-3189

City: LAGUNA PARK **Zip Code:** 76634

Cooperating Institution:

Cooperating Institution Comments:

Management Plan Comments:

Management Comments:

Managed Area Report

Managed Area Code: M.USTXHP*1437 **Acreage:** 2,518.00

Managed Area Name: WACO LAKE (USCOE)

Managed Area Description:

CORPS PARKS ON WACO LAKE; PICNICING, CAMPING, TRAILER FACILITIES, BOAT LAUNCHS; BOSQUE PARK IS A FISHING AREA SUITABLE FOR HANDICAPPED; KOEHNE PARK HAS PICNIC FACILITIES, BOAT LAUNCH, OVERLOOK, AND RESTROOMS

Managed Area Comments:

AIRPORT PARK (780 ACRES), BOSQUE PARK (75 ACRES), KOEHNE PARK (20 ACRES), MIDWAY PARK (53 ACRES), SPEEGLEVILLE I PARK (490 ACRES), SPEEGLEVILLE II PARK (808 ACRES), SPEEGLEVILLE III PARK (1175 ACRES)

Protection:

Protection Comments:

Land Tenure Comments:

Public Access:

Public Access Comments:

Manager:

Institution: RESERVOIR MANAGER

Street Address: WACO LAKE
BOX 173-G

Phone: 817 756-5359

City: WACO

Zip Code: 76708

Cooperating Institution:

Cooperating Institution Comments:

Management Plan Comments:

Management Comments:

Managed Area Report

Managed Area Code: M.USTXHP*153 **Acreage:** 1,274.00

Managed Area Name: DINOSAUR VALLEY STATE PARK

Managed Area Description:

THREE TYPES DINOSAUR TRACKS--SAUROPOD, THEROPOD, ORNITHOPOD- -FOUND IN STREAMBED OF PALUXY RIVER

Managed Area Comments:

Protection: Unprotected

Protection Comments:

Land Tenure Comments:

Public Access: Open

Public Access Comments:

Manager: BILLY PAUL BAKER **Institution:** SUPERINTENDENT

Street Address: BOX 396, OFF FM 205 **Phone:** 817 897-4588

City: GLEN ROSE **Zip Code:** 76043

Cooperating Institution:

Cooperating Institution Comments:

Management Plan Comments:

Management Comments:

Managed Area Report

Managed Area Code: M.USTXHP*1442 **Acreage:** 1,275.00

Managed Area Name: NAVARRO MILLS LAKE (USCOE)

Managed Area Description:

CORPS PARKS ON NAVARRO MILLS LAKE

Managed Area Comments:

Protection:

Protection Comments:

Land Tenure Comments:

Public Access:

Public Access Comments:

Manager: **Institution:** RESERVOIR MANAGER

Street Address: ROUTE 1, BOX 330 **Phone:** 817 578-1431

City: PURDON **Zip Code:** 76679

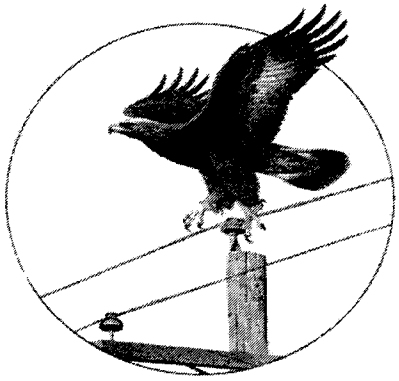
Cooperating Institution:

Cooperating Institution Comments:

Management Plan Comments:

Management Comments:

AVIAN PROTECTION PLAN (APP) GUIDELINES



A Joint Document Prepared By

The Edison Electric Institute's Avian Power Line Interaction Committee (APLIC)

and

U.S. Fish and Wildlife Service (USFWS)

April 2005

ACKNOWLEDGEMENT

APLIC and the U.S. Fish and Wildlife Service (Service) have a long history of cooperation and collaboration on avian issues. Like the Service, current APLIC member utilities want to do their part to minimize adverse impacts to protected avian species on power lines. The public expects utilities to deliver cost-effective reliable energy and the Service to protect and enhance trust resources. Working in a partnership to benefit both the birds and the electric utility industry, the voluntary Avian Protection Plan (APP) Guidelines were developed in a joint, collaborative way.

It is the hope of both APLIC and the Service that individual utilities will utilize the voluntary principles in this document to develop an APP specific to their needs, which improves reliability and avian conservation. APPs offer the industry an additional option, one that is voluntary and without the need for formal Service concurrence, to address avian electrocutions and collisions. Utilities are also encouraged to work in partnership with Federal and State resource agencies when developing and implementing their voluntary APPs.

APLIC and the Service would like to acknowledge the efforts of those individuals responsible for the development of these voluntary guidelines. These guidelines demonstrate that through ongoing collaborative efforts the Service and industry can work together to meet energy needs while acting as responsible stewards to the environment.

April 14, 2005

Paul Schmidt, Assistant Director Migratory Birds
US Fish and Wildlife Service

Jim Lindsay, APLIC Chairman

Quinlan J. Shea, III Executive Director Environment
Edison Electric Institute

Jim Burruss, Past APLIC Chairman

John W. Holt
National Rural Electric Cooperative Association

The APP Guidelines presented in this document are intended to serve as a "tool box" from which a utility can select and tailor components applicable to its specific needs. These guidelines are intended to be used in conjunction with APLIC's *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996* and *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994*, or the most current editions of these documents, which contain more detail on construction design standards and line siting recommendations.

These "guidelines" are being distributed electronically. While the introductory pages of the document are printed, the remainder of this "tool box" is electronic. This is a dynamic document and will be periodically updated as new information and resources become available. Additional copies of the APP Guidelines and current information on related issues can be downloaded from the Avian Power Line Interaction Committee (APLIC) (http://aplic.org) and Edison Electric Institute (EEI) (http://eei.org) websites. In addition, the *Suggested Practices for Raptor Protection on Power Lines* and *Mitigating Bird Collisions with Power Lines* manuals can be obtained from APLIC or EEI.

Editor's note: Although this draft is being distributed in paper format, the final version will be distributed electronically as described above.

TABLE OF CONTENTS

I. INTRODUCTION

Since the formation of the Avian Power Line Interaction Committee (APLIC) in 1989, the electric utility industry and the U.S. Fish and Wildlife Service (USFWS) have worked together to reduce avian electrocution and collision mortality. This has resulted in the cooperative development of guidelines for Avian Protection Plans (APP) by APLIC and USFWS, representing another milestone in avian conservation. The principles presented in these voluntary guidelines are intended to allow utilities to tailor an APP that will best fit their needs while furthering the conservation of avian species and improving reliability and customer service. A utility that implements the principles contained in these APP guidelines will greatly reduce avian risk as well its own risk of enforcement under the Migratory Bird Treaty Act (MBTA). Development and implementation of an APP makes good business sense because animal- and bird-caused outages are costly. A utility that creates an APP following these guidelines and that addresses their specific avian issues can benefit through regulatory compliance, reliability improvements, cost savings and positive recognition from regulators and customers.

What is an Avian Protection Plan?

An Avian Protection Plan is a utility-specific document that delineates a program designed to reduce the operational and avian risks that result from avian interactions with electric utility facilities. Although each utility's APP will be different, the overall goal of any APP should be to reduce avian mortality. This document provides guiding principles and examples to aid utilities in their development of an APP. Although not all of these elements need to be included in every APP because of the specific circumstances of a utility or geographical area, they represent an overview of elements that should be considered for inclusion in an APP and that individual utilities may find helpful in crafting their own, individually-tailored APPs.

Principles of an Avian Protection Plan

1. *Corporate Policy*

   An APP typically includes a statement of company policy confirming the company's commitment to work cooperatively towards the protection of migratory birds. This may include a commitment by the company to balance its goal of providing reliable electrical service in a cost-effective manner with the regulatory requirements protecting avian species, as well as the need to obtain and comply with all necessary permits, monitor incidents of avian mortality, and make reasonable efforts to construct and alter infrastructure to reduce the incidence of avian mortality.

2. *Training*

   Training is an important element of an APP. All appropriate utility personnel, including managers, supervisors, line crews, engineering, dispatch, and design personnel, should be properly trained in avian issues. This training should encompass the reasons, need, and method by which employees should report an avian mortality, follow nest management protocols, dispose of carcasses, and comply with applicable regulations, including the consequences of non-compliance. Supplemental training also may be appropriate where there are material changes in regulations, permit conditions, or internal policies. APLIC-sponsored "short courses" on avian electrocution, collision, and nest issues are conducted annually throughout the U.S. In addition, a two-hour overview presentation of avian issues that can be used for internal company training is available from APLIC (see http://aplic.org).

3. *Permit Compliance*

   An APP can identify the process under which a company obtains and complies with all necessary permits related to avian issues. Particular attention should be given to specific activities that can require take permits including, but not limited

to, nest relocation, temporary possession, depredation, salvage/disposal, and scientific collection.

4. *Construction Design Standards*

Avian interactions with facilities can cause outages or system reliability issues. To improve system reliability, avian interactions should be considered in the design and installation of new facilities, as well as the operation and maintenance of existing facilities. For those reasons, inclusion of accepted construction standards for both new and retrofit techniques also should be included in an APP. Companies can either rely upon existing construction configurations recommended by APLIC (see *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996* and *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994*, or the most current editions of these documents) or may choose to instead develop their own internal construction standards that meet or exceed these guidelines. These standards should be used in areas where new construction should be avian-safe, as well as where existing infrastructure should be retrofitted to provide avian safety.

5. *Nest Management*

An APP may include procedures for nest management on utility structures. These procedures should be explained to company employees during training to ensure uniform treatment of avian nest issues among personnel.

6. *Avian Reporting System*

Although reporting of avian mortalities may be required as a condition of Federal or State permits, a utility may also choose to voluntarily monitor relevant avian interactions, including mortalities, through the development of an internal reporting system. An APP should consider providing for the development of such a reporting system, which can help a company pinpoint areas of concern by tracking both the specific locations where mortalities may be occurring, as well as

the extent of such mortalities. Data collected by company personnel can be limited to avian mortalities or injuries, or could be expanded to include historical tracking of avian nest problems, particularly problematic poles or line configurations, as well as remedial actions taken. All data should be regularly entered into a searchable database compatible for use in additional analysis (see Risk Assessment Methodology below). Bird Mortality Tracking System software developed by APLIC is available for free upon request at http://aplic.org.

7. *Risk Assessment Methodology*

A utility can have the greatest impact on reducing avian mortality by focusing its efforts in a cost-effective manner on the areas that pose the greatest risk to migratory birds. Therefore, as a general matter, an APP should include a method for evaluating the risks posed to migratory birds in a manner that identifies areas and issues of particular concern. A risk assessment study will often begin with an assessment of available data addressing areas of high avian use, avian mortality, nesting problems, established flyways, adjacent wetlands, prey populations, perch availability, effectiveness of existing procedures, remedial actions and other factors that can increase avian interactions with utility facilities. The avian reporting system discussed in the previous section is an integral component of this risk assessment, as well as the use of avian experts, birders, and biologists who can provide additional information on avian distribution. An APP also may provide for the development of models that will enable a company to utilize biological and electrical design information to prioritize poles most in need of modifications, as well as research on the varied causes of avian mortality and the benefits of utility structures to avian species.

8. *Mortality Reduction Measures*

After completing a risk assessment, a company can focus its efforts on areas of concern, ensure that the activities taken by the utility are not out of proportion to the risks encountered by migratory birds, and then determine whether an avian

mortality reduction plan needs to be implemented in certain areas. An APP could implement this approach by developing such a risk reduction plan, utilizing risk assessment results to direct where system monitoring should occur, where retrofit efforts should be focused, and where new construction warrants special attention to raptor and other bird issues. If a utility finds that implementation of such avian protection measures is appropriate, it also may choose to develop a schedule for implementation.

9. *Avian Enhancement Options*

In addition to taking steps to reduce mortality risk to avian species, an APP also may include opportunities for a utility to enhance avian populations or habitat, including developing nest platforms, managing habitats to benefit migratory birds, or working cooperatively with agencies or organizations in such efforts. Where feasible, such proactive development of new ideas and methods to protect migratory birds should be encouraged and explored.

10. *Quality Control*

An APP also may include a mechanism to review existing practices, ensuring quality control. For instance, a utility may conduct an independent assessment of its avian reporting system to ensure its effectiveness, or invest in research on the effectiveness of different techniques and technologies used to prevent collisions, electrocutions and problem nests.

11. *Public Awareness*

An APP generally should include a method to educate the public about the avian electrocution issue, the company's avian protection program, as well as its successes in avian protection.

12. *Key Resources*

An APP should identify key resources to address avian protection issues including, for example, a list of experts who may be called upon to aid in resolving avian issues. These could include consultants, State and Federal resource agencies, universities, or conservation groups. Engineers may find that internal personnel such as environmental specialists can aid in developing creative solutions to resolve avian interaction problems, and external organizations like APLIC can also serve as helpful resources by providing guidance, workshops, materials, and contacts. An understanding of raptor and other bird behavior can influence how and when avian protection should be utilized, and an APP that connects avian experts with utility decision-makers may reduce the risk of avian incidents and improve system reliability.

II. BACKGROUND

Historical Perspective

Utility poles can benefit raptors by providing perching and/or nesting structures in areas where few natural perches or nest sites exist. However, utility structures can also pose a threat to raptors and other birds through electrocutions or collisions. Although records of electrocutions and collisions date back as early as the late 19th century, avian deaths associated with power lines were not a widespread concern until the 1970's when surveys in the western United States found hundreds of eagles shot, poisoned, and electrocuted in rural areas. Throughout the 1970's, agencies and organizations such as the Rural Electrification Association (now the Rural Utilities Service), USFWS , Edison Electric Institute (EEI), and the National Audubon Society worked together to track raptor electrocutions, identify high risk configurations, and develop methods to reduce electrocutions. In 1989, biologists from the utility industry, USFWS, and the National Audubon Society formed APLIC, initially to address collision issues of sandhill and whooping cranes. The scope of APLIC's mission later expanded to include electrocution and nest issues.

APLIC now serves as a clearinghouse for information and communication on avian/power line issues. Its membership includes electric utilities, EEI, Electric Power Research Institute (EPRI), the National Rural Electric Cooperative Association (NRECA), Rural Utilities Service (RUS) and USFWS. APLIC has produced manuals for addressing electrocutions (*Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996*) as well as collisions (*Mitigating Bird Collisions with Power Lines: The State of the Art in 1994*). In addition, APLIC produces videos addressing collisions and electrocutions; offers a short course overview of collision, electrocution, and nest issues; and funds bird/power line-related research. The APP guidelines provided in this document represent a multidisciplinary culmination of several decades of research, field testing, monitoring and assessment to minimize avian mortality associated with utility structures. APLIC encourages the development of APPs as they benefit utilities and wildlife resources through reduced long-term costs, improved reliability, avian

protection, legal compliance, and positive relations between regulatory agencies and customers.

How Electrocution Occurs

Birds are electrocuted by power lines because of two seemingly unrelated, yet interactive factors:

1. Environmental factors such as topography, vegetation, available prey and other, behavioral or biological factors influence avian use of power poles.
2. Inadequate seperation between energized conductors or energized conductors and grounded hardware can provide two points of contact.

Electrocution can occur when a bird completes an electric circuit by simultaneously touching two energized parts or an energized part and a grounded part of the electrical equipment. Most electrocutions occur on medium-voltage distribution lines (4 to 34.5 kilovolts [kV]), in which the spacing between conductors may be small enough to be bridged by birds. Poles with energized hardware, such as transformers, can be especially hazardous, even to small birds, as they contain numerous, closely-spaced energized parts.

"Avian-safe" structures are those that provide adequate clearances to accommodate a large bird between energized and/or grounded parts. Consequently, 60 inches of horizontal separation, which can accommodate the wrist-to-wrist distance of an eagle (which is approximately 54 inches), is used as the standard for raptor protection (Figure 1). Likewise, vertical separation of at least 48 inches can accommodate the height of an eagle from its feet to the top of its head (which is approximately 31 inches; Figure 2). In particular areas (*i.e.* areas with concentrations of wading birds), vertical separation may need to be increased to 60 inches. Because dry feathers act as insulation, contact must be made between fleshy parts, such as the wrists, feet, or other skin, for electrocution to occur. In spite of the best efforts to minimize avian electrocutions, some degree of mortality may always occur due to influences that cannot be controlled, *e.g.* weather.

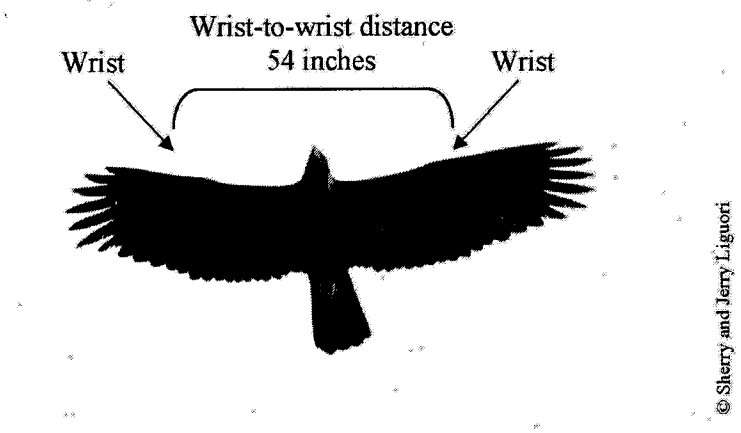


Figure 1. Wrist-to-wrist distance of an eagle.

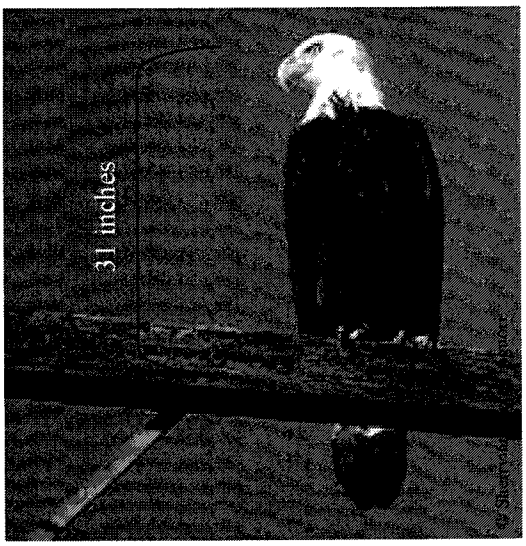


Figure 2. Head to foot distance of an eagle.

Raptors are opportunistic and may use power poles for a number of purposes, such as nest sites, high points from which to defend territories, and perches from which to hunt. "Still hunting" from a perch is energy efficient for a bird, provided that good prey habitat is within view. Some structures are preferred by birds because they provide considerable elevation above the surrounding terrain, thereby offering a wide field of

view. Identification and modification of these "preferred" structures may greatly reduce or minimize the electrocution risk on an entire line. However, in areas where lines run through homogeneous terrain, there is no apparent advantage of some poles over others. Favored perches can be identified by examining crossarms and the ground beneath them for whitewash (feces accumulations), pellets, or prey remains. Since birds such as hawks and owls cannot digest the fur, feathers, and bones of their prey, they regurgitate these parts in the form of a "pellet" or "casting."

What Species are at Risk

Electrocution has been documented as the cause of death in many raptor species in the United States, although large, open-country birds, such as eagles and buteos, are typically at greatest risk. In open habitats where few natural perches exist, such as deserts, grasslands, agricultural fields, and pastures, raptors are attracted to power poles, which provide roosting and nesting sites as well as hunting perches. The large wingspans of raptors such as golden eagles, red-tailed hawks, osprey, and great horned owls enable them to simultaneously touch energized and/or grounded parts, potentially resulting in electrocution. Although raptors are most often considered when addressing electrocution risk, other birds such as crows, ravens, magpies, small flocking birds and wading birds can also be electrocuted. Closely-spaced exposed equipment, such as jumper wires on transformers, can pose an electrocution risk to small birds such as magpies or jays. Wading birds, such as herons, egrets, ibis, or storks, may require increased vertical spacing between lines, as they may exceed 40 inches in height.

Factors Influencing Collisions

Factors that influence collision risk can be divided into three categories: those related to avian species, those related to the environment, and those related to the configuration and location of lines. Species-related factors include habitat use, body size, flight behavior, age, sex, and flocking behavior. Heavy-bodied, less agile birds or birds within large flocks may lack the ability to quickly negotiate obstacles, making them more likely to collide with overhead lines. Likewise, inexperienced birds as well as those

distracted by territorial or courtship activities may collide with lines. Environmental factors influencing collision risk include the effects of weather and time of day on line visibility, surrounding land use practices that may attract birds, and human activities that may flush birds into lines. Line-related factors influencing collision risk include the configuration and location of the line and line placement with respect to other structures or topographic features. Collisions often occur with the overhead static wire, which may be less visible than the other wires due to its smaller diameter.

Why Protect Birds?

All migratory birds in North America are protected under the Migratory Bird Treaty Act of 1918, as amended. In addition, both North American eagle species are protected under the Bald and Golden Eagle Protection Act (BGEPA), as amended. These laws provide civil and criminal penalties for the "take" of such species. "Take" under MBTA is defined as to "pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt any of these acts." Take under BGEPA is defined as to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." The bald eagle is also currently (April 2005) listed as threatened under the Endangered Species Act in the contiguous 48 states.

Power line electrocutions are a cause of mortality for raptors, eagles and other migratory birds. These deaths, many of which could be avoided by making relatively inexpensive modifications to existing power lines and poles, can cause power outages that inconvenience customers, spark grass and forest fires, and result in lost revenue and other costs to utilities.

Government agencies, conservation organizations, and the general public are concerned about avian safety. Industry and the public expect reliable electric service. These concerns and expectations have generated great public demand for both higher service reliability and better protection of avian populations and their habitats.

The electric power industry has long been aware that closely-spaced electric conductors, separated by a horizontal crossarm, can result in the electrocution of raptors and other birds. Thirty years ago, electric companies, USFWS, and interested non-

governmental organizations developed the first edition of *Suggested Practices for Raptor Protection on Power Lines*, which detailed how to reduce or eliminate the risk of avian electrocutions. Since the first *Suggested Practices*, utilities and agencies have worked cooperatively to identify electrocution and collision risks and improve the technology and methods used for reducing such risks.

The development of APPs by electric utilities will represent the continuation of an approach that emphasizes long-term proactive conservation partnerships between the utility industry, the conservation community, and USFWS. These voluntary plans will provide a framework for addressing electrocution hazards, committing utilities to evaluate their power lines and work with USFWS to conserve federally protected migratory birds.

III. APPLICABLE REGULATIONS

The Migratory Bird Treaty Act (16 U.S.C. 703-712; MBTA), which is administered by USFWS, is the cornerstone of migratory bird conservation and protection in the United States. The MBTA implements four treaties that provide for international protection of migratory birds. It is a strict liability statute wherein proof of intent is not an element of a taking violation. Wording is clear in that most actions that result in a "taking" or possession (permanent or temporary) of a protected species can be a violation.

Specifically, the MBTA states: "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means, or in any manner to pursue, hunt, take, capture, kill ... possess, offer for sale, sell ... purchase ... ship, export, import ... transport or cause to be transported ... any migratory bird, any part, nest, or eggs of any such bird ... (The Act) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior." The word "take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect."

A 1972 amendment to the MBTA resulted in inclusion of bald eagles and other birds of prey in the definition of a migratory bird. The MBTA provides criminal penalties for persons who, by any means or in any manner, pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird. The MBTA offers protection to 836 species of migratory birds, including waterfowl, shorebirds, seabirds, wading birds, raptors, and passerines. Generally speaking, the MBTA protects all birds occurring in the U.S. in the wild except for house (English) sparrows, European starlings, rock doves (pigeons), any recently listed unprotected species in the Federal Register and non-migratory upland game birds.

For a complete list of species protected under the MBTA see http://migratorybirds.fws.gov/intrnltr/mbta/mbtintro.html.

A violation of the MBTA by an individual can result in a fine of up to $15,000 and/or imprisonment for up to six months for a misdemeanor, and up to $250,000 and/or imprisonment for up to two years for a felony. Fines may be doubled for organizations. Penalties increase greatly for offenses involving commercialization and/or the sale of migratory birds and/or their parts.

Under authority of the **Bald and Golden Eagle Protection Act** (16 U.S.C. 668-668d; BGEPA), bald and golden eagles are afforded additional legal protection. Penalties for the "take" of an eagle may result in a fine of up to $100,000 and/or imprisonment for up to one year. The BGEPA has additional provisions wherein the case of a second or subsequent conviction of the BGEPA, penalties may be imposed of up to $250,000 fine and/or two years imprisonment.

The **Endangered Species Act** (16 U.S.C. 1531-1544; ESA) was passed by Congress in 1973 in recognition that many of our Nation's native plants and animals were in danger of becoming extinct. The purposes of the Act are to protect these endangered and threatened species and to provide a means to conserve their ecosystems. To this end, Federal agencies are directed to utilize their authorities to conserve listed species, and make sure that their actions do not jeopardize the continued existence of these species. Federal agencies are encouraged to do the same with respect to "candidate" species which may be listed in the near future. The law is administered by USFWS and the Commerce Department's National Marine Fisheries Service (NMFS). USFWS has primary responsibility for terrestrial and freshwater organisms, while NMFS has responsibility for marine species such as whales and salmon. These two agencies work with other agencies to plan or modify Federal projects so that they will have minimal impact on listed species and their habitats. Protection of species is also achieved through partnerships with the States, with Federal financial assistance and a system of incentives available to encourage State participation. USFWS also works with private landowners, providing financial and technical assistance for management actions on their lands to benefit both listed and non-listed species.

Section 9 of the ESA makes it unlawful for a person to "take" a listed species. Take is defined as ". . . to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." The Secretary of the Interior, through regulations, defined the term "harm" as "an act which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering." However, permits for "incidental take" can be obtained from USFWS for take of endangered species which would occur as a result of an otherwise legal activity.

Section 10 of the ESA allows for the development of "Habitat Conservation Plans" for endangered species on private lands or for the maintenance of facilities on private lands. This provision is designed to assist private landowners in incorporating conservation measures for listed species with their land and/or water development plans. Private landowners who develop and implement an approved habitat conservation plan can receive an incidental take permit that allows their development to proceed.

While the Service generally does not authorize incidental take under these Acts, USFWS realizes that some birds may be killed even if all reasonable measures to avoid the take are implemented. USFWS Office of Law Enforcement carries out its mission to protect migratory birds through investigations and enforcement, as well as by fostering relationships with individuals, companies, and industries who seek to minimize their impacts on migratory birds. Unless the take is authorized, it is not possible to absolve individuals, companies, or agencies from liability even if they implement avian mortality avoidance or similar conservation measures. However, the Office of Law Enforcement focuses on those individuals, companies, or agencies that take migratory birds with disregard for their actions and the law, especially when conservation measures have been developed but are not properly implemented.

State Regulations

Individual states may have regulations that protect avian species and a utility should consult with their respective State resource agency(s) to determine what regulations apply and if permits are required.

IV. APP PRINCIPLES

The following chapter provides guidance for implementation of each of the APP principles listed below:

- Corporate Policy
- Training
- Permit Compliance
- Construction Design Standards
- Nest Management
- Avian Reporting System
- Risk Assessment Methodology
- Mortality Reduction Measures
- Avian Enhancement Options
- Quality Control
- Public Awareness
- Key Resources

CORPORATE POLICY

The following are examples of utility Bird Management Policies. These policies have been included as examples to aid other utilities if they choose to develop a bird program policy.

Example 1. PacifiCorp's Bird Program Policy.

PacifiCorp Bird Management Policy

Bird interactions with power lines may cause bird injuries and mortalities, which, in turn, may result in outages, violations of bird protection laws, grass and forest fires, or raise concerns by employees, resource agencies and the public.

This policy is intended to ensure compliance with legal requirements, while improving distribution system reliability. PacifiCorp management and employees are responsible for managing bird interactions with power lines and are committed to reducing the detrimental effects of these interactions.

To fulfill this commitment, PacifiCorp will:

- Implement and comply with its comprehensive Avian Protection Plan (APP).
- Ensure its actions comply with applicable laws, regulations, permits, and APP procedures.
- Document bird mortalities, problem poles and lines, and problem nests.
- Provide information, resources, and training to improve its employees' knowledge and awareness of the APP.
- Construct all new or rebuilt lines in rural areas (outside city limits or beyond residential/commercial developments) and in areas of known raptor use, where appropriate, to PacifiCorp raptor-safe standards.
- Retrofit or modify power poles where a protected bird has died. Modifications will be in accordance with APP procedures.
- Participate with public and private organizations in programs and research to reduce detrimental effects of bird interactions with power lines.

PacifiCorp customer service and regulatory compliance will be enhanced and risk to migratory birds will be reduced through the proactive and innovative resolutions of bird power line interactions guided by this policy.

Signature, Executive Vice President_____ Date_____

Example 2. Southern California Edison's Policy and Procedures.

Avian Protection On or Near Power Lines

1.0 PURPOSE

One or more state and federal laws legally protect many species of birds in SCE's service territory. In order to ensure SCE's compliance with laws and regulations protecting these birds, it is necessary to have procedures in place that will allow SCE to determine where impacts are most likely to occur, what additional measures may need to be implemented to achieve compliance, if mitigation of impacts is needed, and to undertake other activities to facilitate protection of these legally protected birds on or near SCE power lines, substations and other facilities. This document is not intended to set out the specific legal requirements of all laws dealing with birds. Rather, this standard is intended to provide a process for achieving compliance with those laws.

2.0 POLICY STATEMENTS

N/A

3.0 REFERENCES

3.1 ESM 02.002.01, Environmental Policy

3.2 Endangered Species Alert Program Manual

3.3 SCE Distribution Overhead Construction Standards

4.0 OPERATIONS

4.1 Reporting

Raptor electrocutions and power line collisions shall be reported to Environmental Affairs (EA) within 24 hours of discovery of a carcass, using the current reporting mechanism or form. Non-raptor electrocutions and collisions will be reported using the Transmission and Distribution (T&D) Morning Report. Questions concerning reporting of other electrocutions of other animals should be referred to Environmental Affairs or your local T&D Environmental Specialist for guidance.

4.2 Retrofitting of Existing Structures

Any SCE power line structure involved in the electrocution of any eagle, endangered/threatened bird species, or other raptor species will be evaluated to determine if it is raptor safe. If not, the structure will be modified within 30 business days or sooner (for eagles or listed species) to make them raptor-safe. Environmental Affairs should be notified if structures of a similar design and in similar habitat are located in the same vicinity of any electrocution. This will allow Environmental Affairs to work with T&D in determining if these other structures should also be retrofitted to be raptor safe. Structures in the area where clusters of electrocutions have occurred *(i.e.,* three or more electrocutions per USGS quad, or two or more electrocutions per circuit) should be examined for retrofitting. Environmental Affairs will work with T&D to identify these clusters, determine which poles may need to be retrofitted, and the appropriate retrofit required.

***Example 2** (con't).*

As opportunities arise during routine operation and maintenance activities, T&D field personnel will retrofit exposed wires and surfaces, as appropriate, if they are capable of electrocuting raptors and other birds/wildlife. Retrofits may include, but are not limited to, installing approved bushing covers on transformers, insulator hoods, protective covering on jumper wires or taps, and making other modifications, as appropriate.

4.3 New Construction
All new or rebuilt power line structures within Raptor Concentration Areas (RCAs) will be of a raptor-safe construction. All new or rebuilt power line structures on land administered by the federal government (USFS, BLM, etc.) will be evaluated by T&D and Environmental Affairs to determine if it should be made raptor safe. Environmental Affairs has identified and mapped RCAs, and will provide guidance on safe designs and copies of RCA maps.

4.4 Monitoring
Environmental Affairs shall monitor raptor mortality and direct appropriate corrective action.

4.5 Nest Protection
All activity involving active nests on SCE facilities will be coordinated with Environmental Affairs and the local T&D Environmental Specialist. Prior to trimming trees, Line Clearing personnel will inspect the trees during the nesting season (January through August) for nests, and avoid any trees with active *(i.e.,* eggs or young birds present) nests. If the trees with nests present an emergency, then Environmental Affairs Land Services will be contacted. Avoiding trees is especially important in the vicinity of riparian areas (streams, creeks or other water bodies). Line Clearing personnel will make every attempt to schedule tree-trimming activity to avoid riparian areas during the nesting season.

4.6 Training
All appropriate T&D field personnel will receive training on avian protection issues annually. All appropriate T&D contractors will receive some level of training on natural resources issues and will have contractual obligations to abide by this training.

5.0 MAINTENANCE
N/A

6.0 ATTACHMENTS
N/A

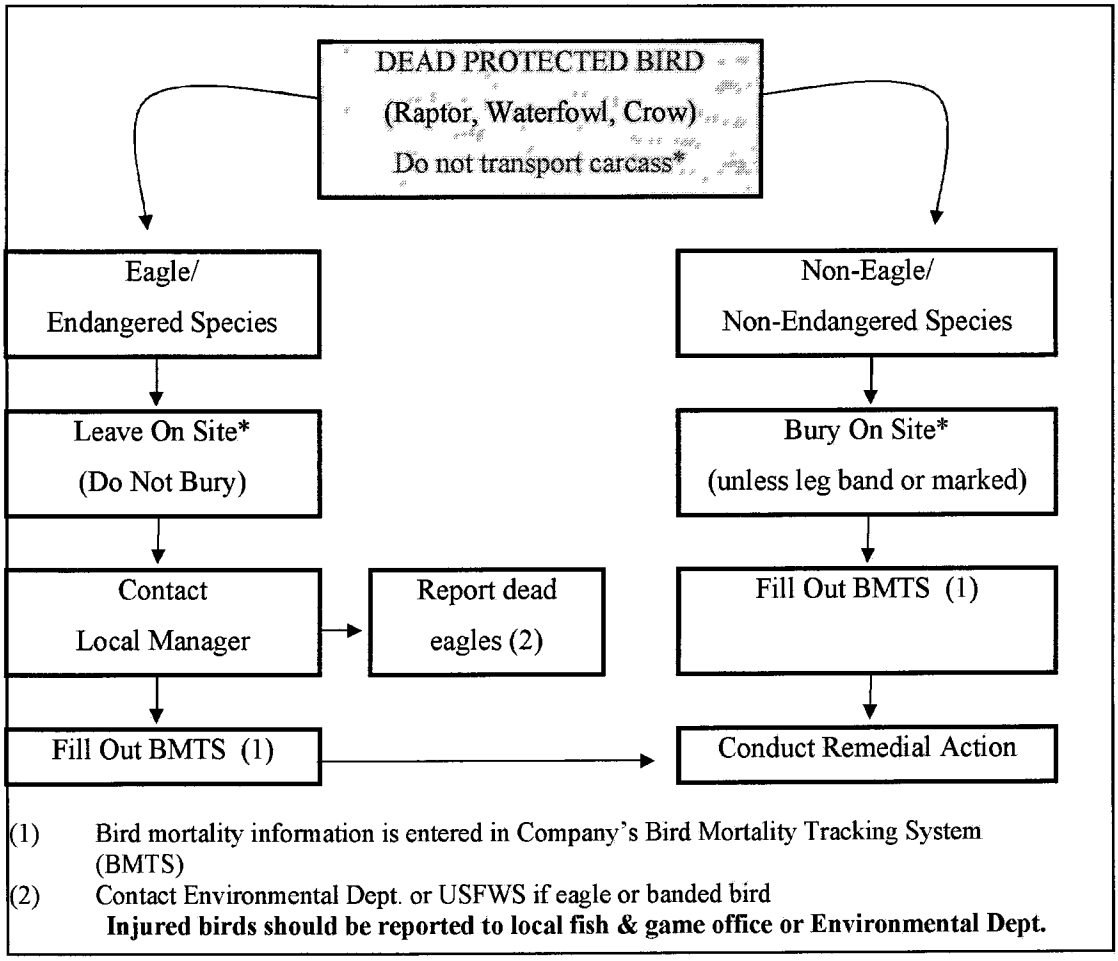
TRAINING

Training is an integral component of an APP. Workshops and short courses on avian/power line interactions are provided by APLIC (http://aplic.org) and EEI (http://eei.org). A two-hour overview of avian electrocutions and collisions intended for training use is also available through the APLIC website as part of the APP "tool box."

The following are examples of PacifiCorp and Southern California Edison training materials, including:

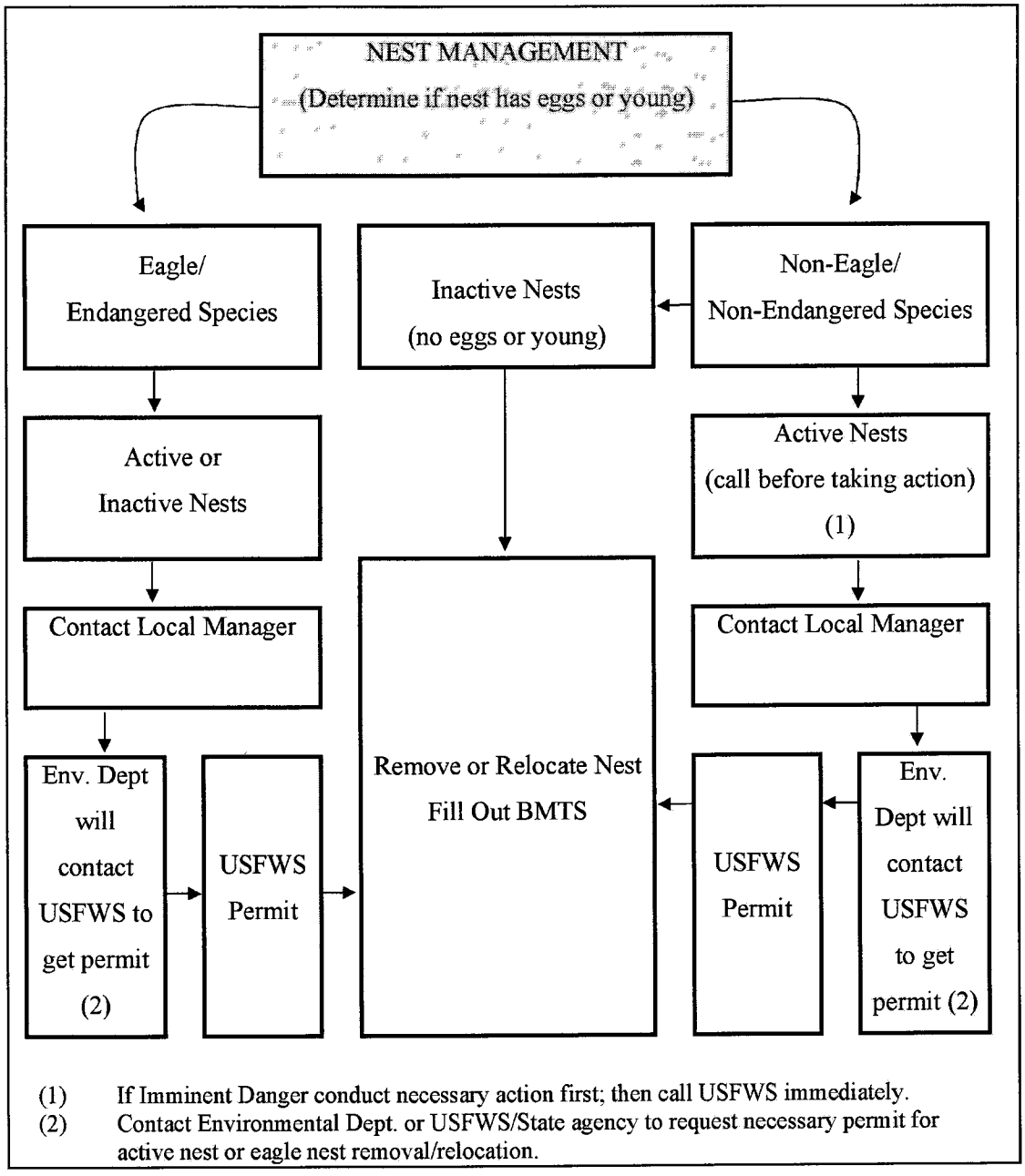
- Flow diagrams of company procedures for bird and nest management that can be distributed to field personnel as part of employee training.
- A brochure describing electrocution and nest issues and company raptor protection procedures.
- A brochure describing nest management procedures and protection.

Example 3. Bird mortality flow diagram based on PacifiCorp training materials.*



* *Individual utility permits may contain different conditions regarding transport or salvage.*

Example 4. Nest management flow diagram based on PacifiCorp training materials.*



(1) If Imminent Danger conduct necessary action first; then call USFWS immediately.
(2) Contact Environmental Dept. or USFWS/State agency to request necessary permit for active nest or eagle nest removal/relocation.

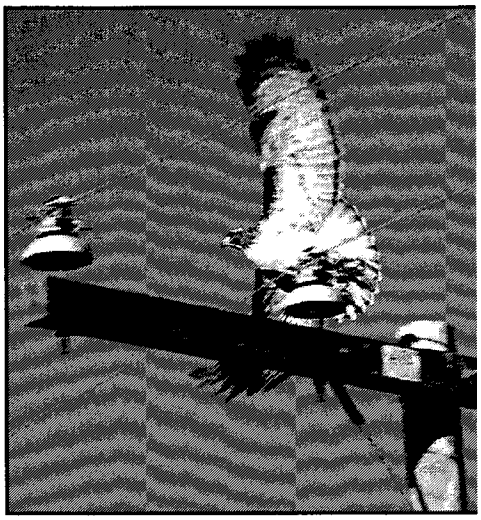
* *Individual utility permits may contain different conditions regarding nest management.*

Example 5. "Raptor Protection Program" brochure, Southern California Edison.

SOUTHERN CALIFORNIA EDISON®

An *EDISON INTERNATIONAL®* Company

RAPTOR PROTECTION PROGRAM

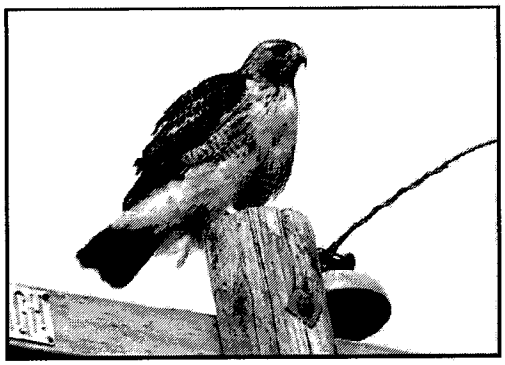


Raptor Protection Program Goals

Raptors, or birds of prey, are meat-eating birds that include the hawks, eagles, and owls. Most species of raptors are protected under one or more laws and/or regulations.

Edison's Raptor Protection Program is designed to:

1. Reduce impacts to raptors.
2. Ensure compliance with state and federal laws and rules and regulations protecting these species.
3. Gather and provide information from operating divisions within Edison to Environmental Affairs on facility-caused electrocutions. This information will assist Environmental Affairs in responding to regulatory agency inquiries and provide informed responses to concerns expressed by the public.
4. Assist Company biologists in identifying problem areas where raptor protection may be required. Selectively identify and install cost-effective raptor protection devices to ensure Company compliance with existing laws and regulations.
5. Help identify and isolate where bird-caused outages occur so that these can be minimized, providing higher levels of quality service to our customers.



***Example 5** (con't).*

Raptor Protection

Electrocutions

Raptors often perch or nest on transmission or distribution towers or poles. Occasionally, the birds will make accidental contact between phases or phase and ground, causing harm to or electrocuting the bird. These electrocutions are most common on distribution or subtransmission facilities where energized conductors are close together.

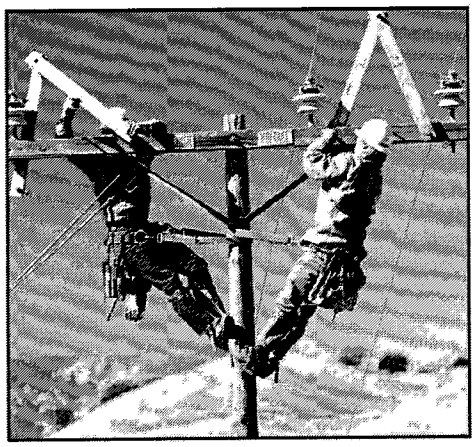
The number of electrocutions can be decreased by either designing the line to minimize contact between phases, or by retrofitting existing lines where necessary with a protective device that prevents this contact. Studies have demonstrated that raptors prefer certain poles for nesting and perching. By identifying these preferred poles, we can modify them, and thus greatly diminish the potential for raptor electrocutions in a cost-effective manner.

Nest Protection

In the absence of other suitable nest sites, raptors often use transmission towers and distribution poles for nesting. State and federal laws and regulations protect these nests from removal at certain times of the year without necessary permits. It is important that nests not be disturbed when eggs or young birds are in them.

Raptor Protection Program Procedures

1. All incidents of facility-related raptor mortality should be reported to your supervisor. You should then fill out the raptor mortality report form available in all district offices or from your supervisor. The completed form should be sent to Environmental Affairs in the General Office.
2. From February through June, nests should not be removed or disturbed. Under no circumstances should known eagle nests be disturbed at any time of the year.
3. If a nest is discovered during this February–June period that presents a hazardous situation for the continued safe operation of the line, try to trim the nest rather than remove it. If a nest must be removed, call Environmental Affairs. Environmental Affairs possesses or will obtain the necessary permits for removing nests.
4. If at any time you have questions regarding these procedures, please discuss them with your supervisor or call Environmental Affairs, Dan Pearson at PAX 29562, or Janet Baas at PAX 29541.



Example 6. "Protection of Breeding Bird Nest Sites" brochure, Southern California Edison.

What to Do If You Are Working in Sensitive Areas or Find an Active Nest

- Avoid tree or shrub trimming to the extent feasible during the nesting season, especially in sensitive areas (riparian or sage scrub habitats).
- Limit noise during the nesting season to the extent feasible by turning off equipment when not in use and/or using equipment with mufflers.
- If a nest is found, **carefully** determine if the nest is active, that is, if it contains eggs or young. Do not touch the nest or its contents.
- If young are inadvertently knocked out of a nest or are found on the ground after trimming **call Environmental Affairs (EA) immediately.** If the young are small and the nest can be found and is intact, the young may be carefully replaced in the nest (using gloves). If the young are large and active or the nest can not be found or is not intact, the young should be protected and kept warm, if possible. EA will contact a rehabilitation expert for pick up.
- CONTACT EA IF YOU MUST WORK IN A SENSITIVE AREA DURING THE NESTING SEASON OR ENCOUNTER AN ACTIVE NEST THAT MUST BE REMOVED, TRIMMED, OR MAY BE DISTURBED BY VEGETATION CLEARING ACTIVITIES OR TO PROTECT PUBLIC HEALTH AND SAFETY. Note: eagle nests may never be removed or relocated at any time of year without clearance from the US Fish and Wildlife Service and the California Department of Fish and Game. Contact EA if it is necessary to handle an eagle nest in any way.

What to Do If You Have Questions

If you have any questions, such as whether or not you are working in a sensitive area, if there is the potential for sensitive species to be nesting where you will be working, or you find an active bird nest while you are working, contact your supervisor (first) or any of the following EA personnel:

Tracey Alsobrook	PAX 27547 or (626) 302-7547
Janet Baas	PAX 29541 or (626) 302-9541
Jill Fariss	PAX 28545 or (626) 302 8545
Dan Pearson	PAX 29562 or (626) 302-9562

Outside of normal business hours, you may contact these people through the Edison operator. All may be contacted by pager

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

PROTECTION OF BREEDING BIRD NEST SITES

Why SCE is Concerned About Bird Nests

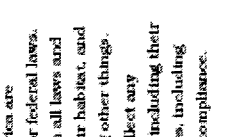

Pygmy owl (Cavity nest)

***Example 6** (con't).*

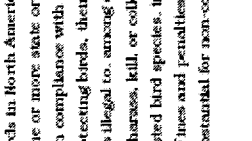
Virtually all birds in North America are protected by one or more state or federal laws. SCE must be in compliance with all laws and regulations protecting birds, their habitat, and nest sites. It is illegal to, among other things, pursue, hunt, harass, kill, or collect any migratory or listed bird species, including their eggs or nest. Fines and penalties, including jail, can be substantial for non-compliance.

When and Where Birds Nest

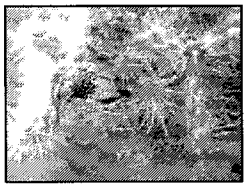
Most birds nest during the period from mid-February through August. The specific timing depends on several factors such as species of bird, its nest location (altitude and latitude), abundance of food, and weather. Birds nest in a wide variety of habitats such as riparian areas (along streams, creeks, ponds), forests, beaches, deserts and foothills. That is, anywhere adequate shelter and food for young can be found. Nesting sites within these habitats include trees, shrubs, holes and cavities in trees or dirt embankments, on cliff ledges, on the ground, and utility poles and towers.



Scrub jay
(Bushy nest)

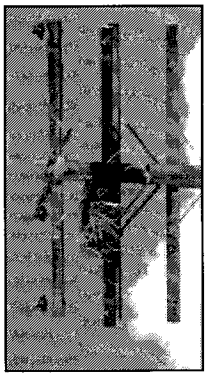


Killdeer
(Ground nest)



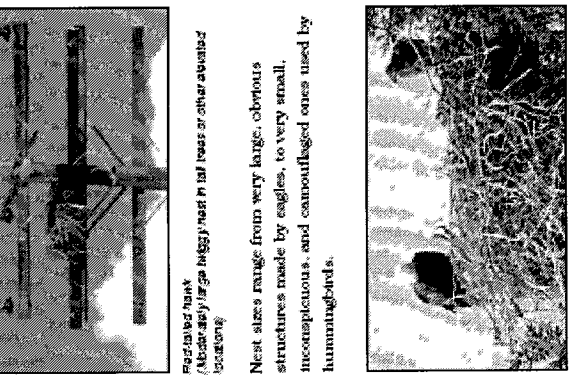
Cactus wren
(Baggy mass in cactus or yucca)

Willow Flycatcher
(Small cup in willow shrubs)



Red-tailed hawk
(Moderately large baggy nest in tall trees or other elevated location)

Nest sizes range from very large, obvious structures made by eagles, to very small, inconspicuous, and camouflaged ones used by hummingbirds.



Bald eagle
(Branches in large tree or atop utility pole)

Anna's hummingbird
(Tiny cup in a shrub)

How to Locate and Avoid Disturbing Nesting Birds

- Be aware of when birds nest (generally mid-February through August)
- Be aware when working in especially sensitive habitats, such as riparian and sage scrub (at least partly natural areas with somewhat woody shrubs, below about 3,000 feet).
- Note any bird activity within shrubs or trees. If a bird appears agitated or reluctant to leave an area, it may indicate a nearby nest.
- Many nests are found between the ground and 10 meters high in shrubs and trees.
- Look for small dark, generally cup-shaped masses among the branches of shrubs or both small and larger masses in trees.
- Prior to trimming or cutting down trees, look for holes or cavities that may contain nests.

PERMIT COMPLIANCE

A company should work with resource agencies to determine if permits are required for their operational activities that may impact protected avian species. Particular attention should be given to specific activities that can require Special Purpose or related permits, including, but not limited to, nest relocation, temporary possession, depredation, salvage/disposal, and scientific collection.

While it is recommended that each utility developing an APP familiarize itself with the different permit types and their provisions located in 50 CFR part 21 (http://access.gpo.gov/nara/cfr/waisidx_03/50cfr21_03.html), it is highly recommended that the utility make initial contact with the Migratory Bird Permit Examiner located in the USFWS Region where the utility is specifically planning to implement its APP. The Migratory Bird Permit Offices in each of the USFWS's seven Regions are listed on pages 69 and 70 of the Key Resources section.

To acquire a permit application, contact the Migratory Bird Permit Office in the Region where your business is headquartered or in the Region (if it is different) where you propose to implement your APP. Information about Regional boundaries can be accessed at htpp://permits.fws.gov/mbpermits/birdbasics.html then click on Regional Bird Permit Offices, for locations and addresses (listed on pages 69 and 70 in the Key Resources section).

State permits may also be required to manage protected bird nests or for temporary possession of avian species. Specific information on required permits should be obtained from your State resource agency (see Key Resources, pages 76-78, for State agency contacts). Both State and Federal agencies should be consulted as you develop your APP.

Migratory Bird Treaty Act and Migratory Bird Permits

USFWS Regional offices administer permits for qualified applicants for the following types of activities: falconry, raptor propagation, scientific collecting, rehabilitation, conservation education, migratory game bird propagation, salvage, take of

depredating birds, taxidermy, and waterfowl sale and disposal. These offices also administer permit activities involving bald and golden eagles, as authorized by the BGEPA.

The MBTA makes it illegal for anyone, including individuals, companies, or agencies, to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except (1) under the terms of a valid permit issued pursuant to Federal regulations or (2)under the terms of a regulation not requiring a permit. The migratory bird species protected by the Act are listed in 50 CFR 10.13 (this list is available online at http://migratorybirds.fws.gov/intrnltr/mbta/mbtintro.html).

Migratory bird permit policy is developed by the Division of Migratory Bird Management and the permits themselves are issued by the Regional Migratory Bird Permit Offices. The regulations governing migratory bird permits can be found in 50 CFR part 13, General Permit Procedures (http://access.gpo.gov/nara/cfr/waisidx_03/50cfr13_03.html) and 50 CFR part 21, Migratory Bird Permits (http://access.gpo.gov/nara/cfr/waisidx_03/50cfr21_03.html).

Bald and Golden Eagle Protection Act and Eagle Permits

The two species of eagles that are native to the United States have additional protection under the BGEPA. Under the Act, USFWS issues permits to take, possess, and transport bald and golden eagles for scientific, educational, and Indian religious purposes, depredation, and falconry (golden eagles). No permit authorizes the sale, purchase, barter, trade, importation, or exportation of eagles, or their parts or feathers. The regulations governing eagle permits can be found in 50 CFR part 13, General Permit Procedures (http://access.gpo.gov/nara/cfr/waisidx_03/50cfr13_03.html) and 50 CFR part 22, Eagle Permits (http://access.gpo.gov/nara/cfr/waisidx_03/50cfr22_03.html).

Federally Listed Species (Endangered Species Act)

To obtain a list of all federally-listed (threatened and endangered) birds, or all federally-listed fauna and flora, consult 50 CFR part 17.11. This list is available online at http://endangered.fws.gov/wildlife.html.

Where power companies propose to construct power generation, transmission, or related equipment on Federal lands, the federal land management agency must first consult under Section 7 of the ESA with USFWS. Before initiating an action, the Federal action agency (the agency authorizing a specific action) or its non-Federal permit applicant (the power company), must ask USFWS for a biological opinion (if a listed species could be impacted) and to provide a list of threatened, endangered, proposed, and candidate species and designated critical habitats that may be present in the project area. USFWS has developed a handbook describing the consultation process in detail, which is available at http://endangered.fws.gov/consultations.

When non-Federal activities (activities not on Federal lands and/or lacking a Federal nexus such as Federal funding) could result in a take of threatened or endangered species, an incidental take permit is required under Section 10 of the ESA. Some states may also have regulations that require issuance of permits or development of conservation plans. The standards for approval of an incidental take permit are found in section 10 of the ESA. Approval of an incidental take permit issued in conjunction with a Habitat Conservation Plan (HCP) requires the Secretary of Interior to find, after an opportunity for public comment, that among other things, the taking of ESA species will be incidental and that the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking. An HCP must accompany an application for an incidental take permit. The HCP associated with the permit is to ensure that there are adequate conservation measures to avoid jeopardy to the species. Information about consultations and HCPs can be obtained from the nearest USFWS Ecological Services Field Office, generally located in each state. A list of those offices and their phone numbers can be accessed at http://info.fws.gov/pocketguide.

CONSTRUCTION DESIGN STANDARDS*

In certain habitats that have power equipment and the potential for avian interactions, the design and installation of new facilities, as well as the operation and maintenance of existing facilities should be bird friendly. Inclusions of accepted construction standards for both new and retrofit techniques are highly recommended for inclusion in an APP. Companies can either rely upon construction design standards found in APLIC's *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996* and *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994*, or the most current editions of these documents, or may choose to develop their own internal construction standards that meet or exceed these guidelines. These standards should be used in areas where new construction should be avian-safe, as well as where existing infrastructure needs to be retrofitted. An APP bird policy may require that all new or rebuilt lines in identified avian use or problem areas be built to current safe standards. Implementing avian-safe construction standards in such areas will reduce future legal and public relations problems and enhance service reliability.

New Construction

Distribution, transmission and substation construction standards must meet National Electric Safety Code (NESC) requirements and should provide general information on specialized construction designs for avian use areas. Avian-safe construction, designed to prevent electrocutions, must provide conductor separation of 60 inches between energized conductors and grounded hardware, or must cover energized parts and hardware if such spacing is not possible. Some common examples of avian-safe construction and retrofit techniques to reduce electrocution risks are presented in this section. Additional information can be found in *Suggested Practices for Raptor Protection on Power Lines.*

In areas where birds frequently collide with conductors/ground wires, or where

* Only examples of common structure configurations are presented in these Guidelines. See current edition of *Suggested Practices* for additional configurations and recommendations.

agencies are concerned about the safety of protected birds (*e.g.*, near wildlife refuges), appropriate siting and placement of lines will reduce the likelihood of collisions. When possible, avoid siting lines in areas where birds concentrate (*e.g.*, wetlands, stream crossings, historic staging areas, roosts, and nesting colonies) and take advantage of vegetation or topography that naturally shields birds from colliding with the wires (*e.g.*, placement next to cliffs or trees). If this is not possible, installing visibility enhancement devices can reduce the risk of collision on new or existing lines (see pages 43-44). These devices include marker balls, bird diverters, or other line visibility devices placed in varying configurations, depending on the line design and location. The effectiveness of these devices has been validated by Federal and State agencies and independent researchers in conjunction with APLIC. Additional information may be found in *Mitigating Bird Collisions with Power Lines.* In some situations, the additional costs and reliability risk of under grounding a section of line may be justified.

Modification of Existing Facilities

Modification of existing facilities is necessary when dead and/or injured protected birds are found, where high-risk lines are identified, or concerns of legal compliance are at issue. A "problem pole" is one where there has been a documented avian collision, electrocution, problem nest material or where there is a high risk of an avian mortality. The need for this remedial action may result when "problem poles" are identified through bird mortality records or field surveys, or when the company is notified by agency representatives or concerned customers. System reliability concerns due to bird interactions may also result in requests from field operations staff. Retrofitting to prevent electrocutions could include: 1) covering jumper wires, conductors and equipment; 2) discouraging perching in unsafe areas; 3) reframing; or 4) replacing a structure.

The objectives of remedial action are to:

1. Prevent or reduce avian mortality and outages related to bird electrocutions, collisions, or nests;

2. Provide 60-inch minimum horizontal separation between energized conductors and/or energized conductors and grounded hardware;
3. Insulate hardware or conductors against simultaneous contact if adequate spacing is not possible;
4. Discourage birds from perching in unsafe locations;
5. Provide safe alternative locations for perching or nesting; or
6. Increase the visibility of conductors or shield wires to prevent avian collisions.

Site-Specific Plans

The factors that create a hazard for birds near power lines are complex and often site-specific. Therefore, the most efficient solution for correcting a problem line is a site-specific plan that satisfies unique local conditions (*i.e.*, topography, avian populations, prey populations, land use practices, line configuration, adjacent wetlands, historical bird use areas, etc.). The plan is comprised of recommendations for the most appropriate remedial action to the poles or lines causing the problem, and should include a timetable for job completion. When a problem area or line is identified, a site meeting may be conducted with engineering and operations personnel to provide guidance on line modifications, and with company biologists or consultants to provide input on biological aspects of the affected species. The timeframe for action will be based on agency requests, public relations, budget, logistical and manpower constraints, as well as biological considerations that affect species vulnerability. The application of remedial measures to a few "problem poles" or spans can reduce problems over a wide area.

Electrocutions: Avian-Risk Designs

This section provides information about designs which have historically caused avian electrocution problems. These designs should be avoided in known raptor or other protected bird use areas and rural sites.

Most lines that electrocute raptors or other large birds are primary distribution lines. Problems occur most often when:

1. The distance between conductors is less than the wingspan or height of a landing or perching bird (see Figure 3).
2. Hardware or equipment cases are grounded and are in close proximity to energized conductors, energized parts or jumper wires (see Figure 4).

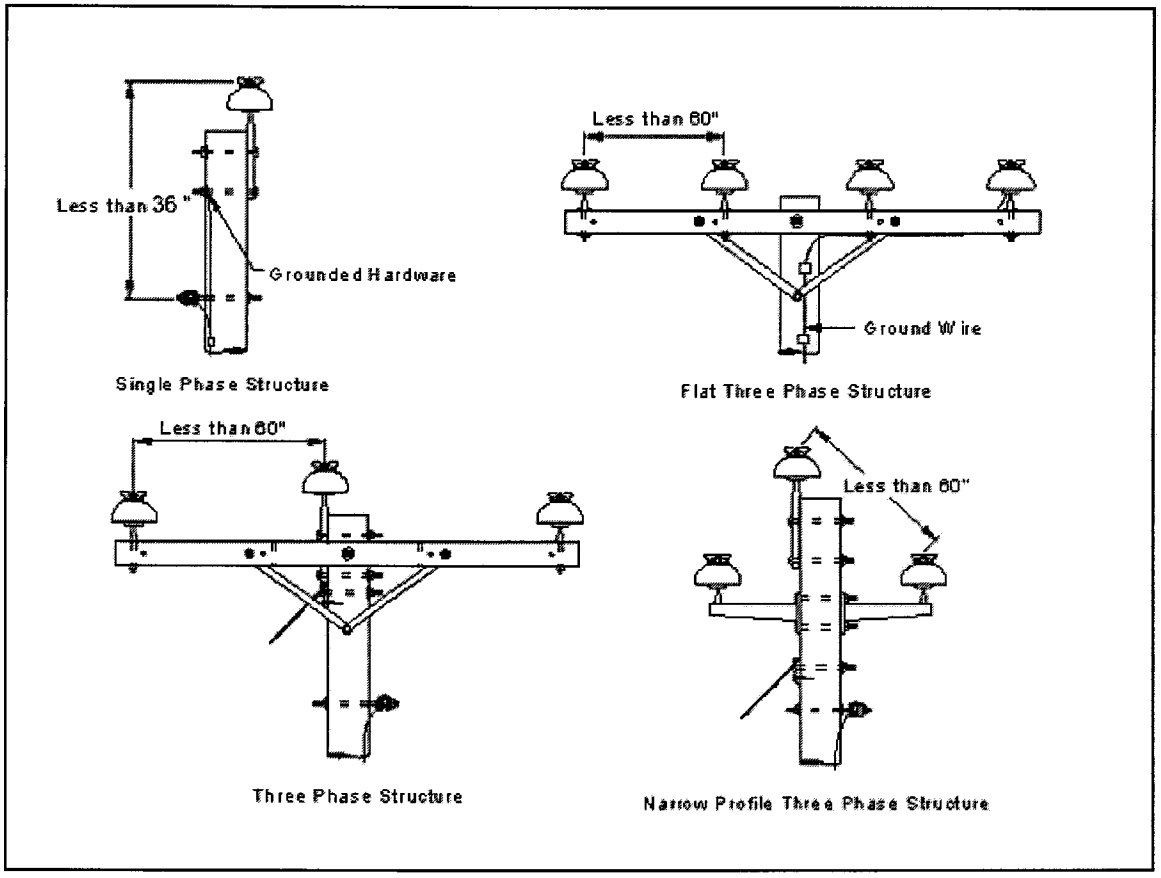


Figure 3. Typical avian-risk structures.

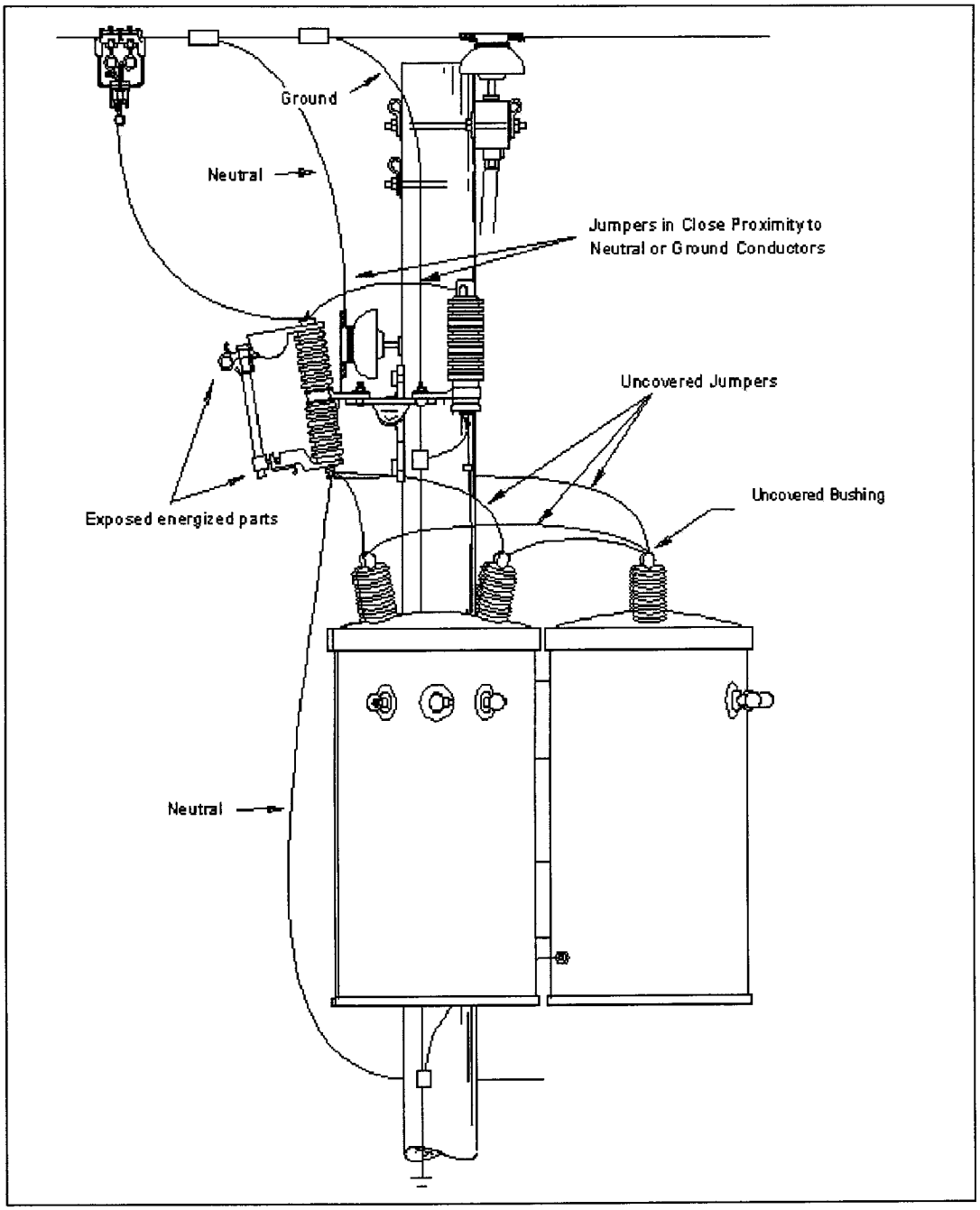


Figure 4. Typical avian-risk equipment structure.

This section provides information on designs and criteria for constructing new lines or rebuilding existing lines to avian-safe standards.

Proper Design of New Facilities

The following dimensions for primary structures are intended for use in areas with populations of raptors or other large birds or in rural sites (areas outside city limits or beyond incorporated areas with commercial or residential development). Nonetheless, avian-safe construction should be considered to improve system reliability and avian protection whenever it does not conflict with other considerations. When a new line or extension is designed, avian-safe standards for construction of the distribution system should be followed (see Figures 5 and 6 for typical safe designs).

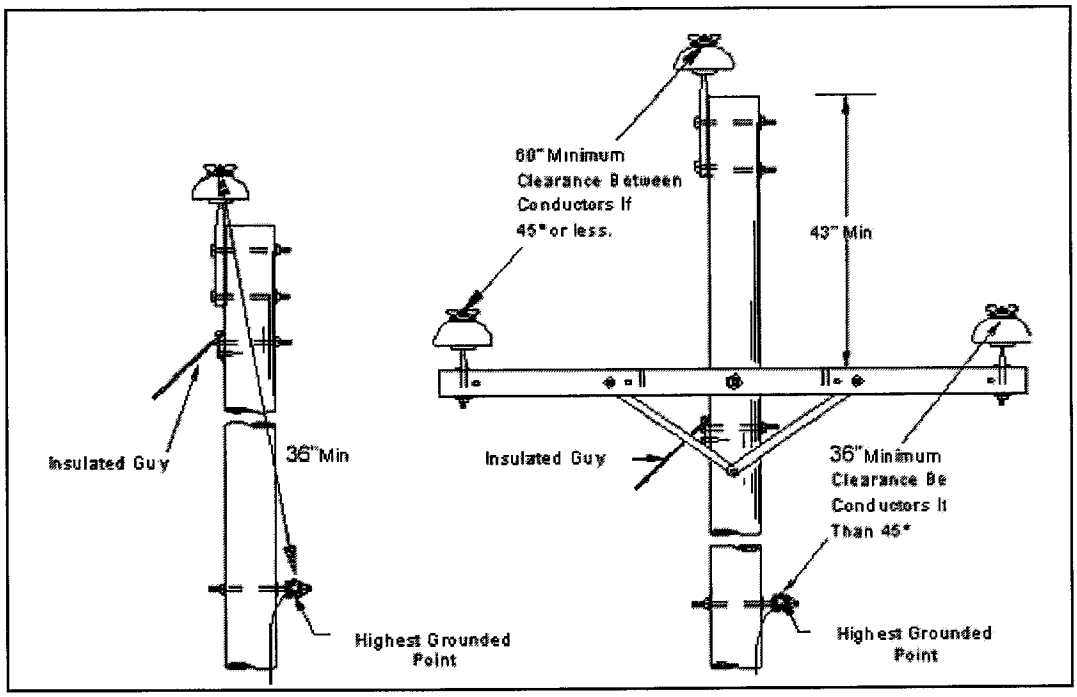


Figure 5. Typical avian safe structures: single phase (left), three-phase with lowered 8-foot crossarm (right).

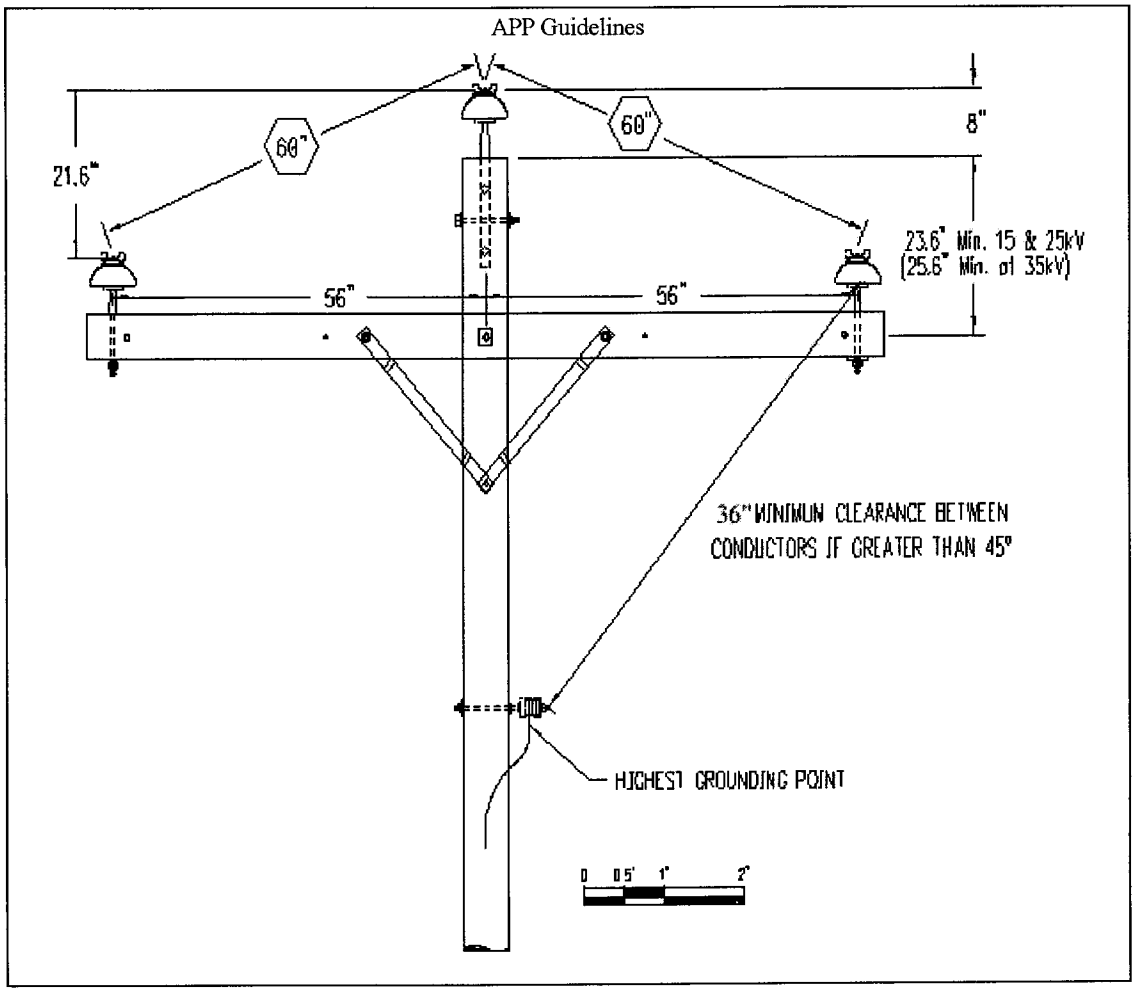


Figure 6. Typical three–phase avian-safe structure with 10–foot crossarm.

On single phase structures, a minimum vertical separation of 36 inches from phase to ground is needed to safely accommodate eagles and most wading birds (Figure 5). On three phase structures, a vertical clearance of at least 43 inches between un-insulated conductors, ground wires and grounded hardware on poles with 8-foot crossarms will provide the 60-inch required clearance (Figure 5). Separation can be accomplished by lowering crossarms and neutral attachments, or if vertical space is not available, an 8–foot crossarm can be replaced with a 10–foot arm (see Figure 6). If there is not enough pole height to drop the crossarm, a 10-foot crossarm can be the economical choice. Structural strength of the longer arm must be considered if the arm is replaced. Also, narrow rights-of-way may dictate the horizontal width of a crossarm, possibly requiring more pole height to achieve avian-safe spacing. Regardless of the configuration, hardware should not be grounded above the neutral position.

An alternate method for ensuring separation of energized conductors is to use vertical construction (see Figure 7). This is not the preferred method of separation, since considerable pole height is required to attain adequate clearance, making this an expensive solution. However, it may be useful in some situations, such as turning corners, where normal separation methods are not possible.

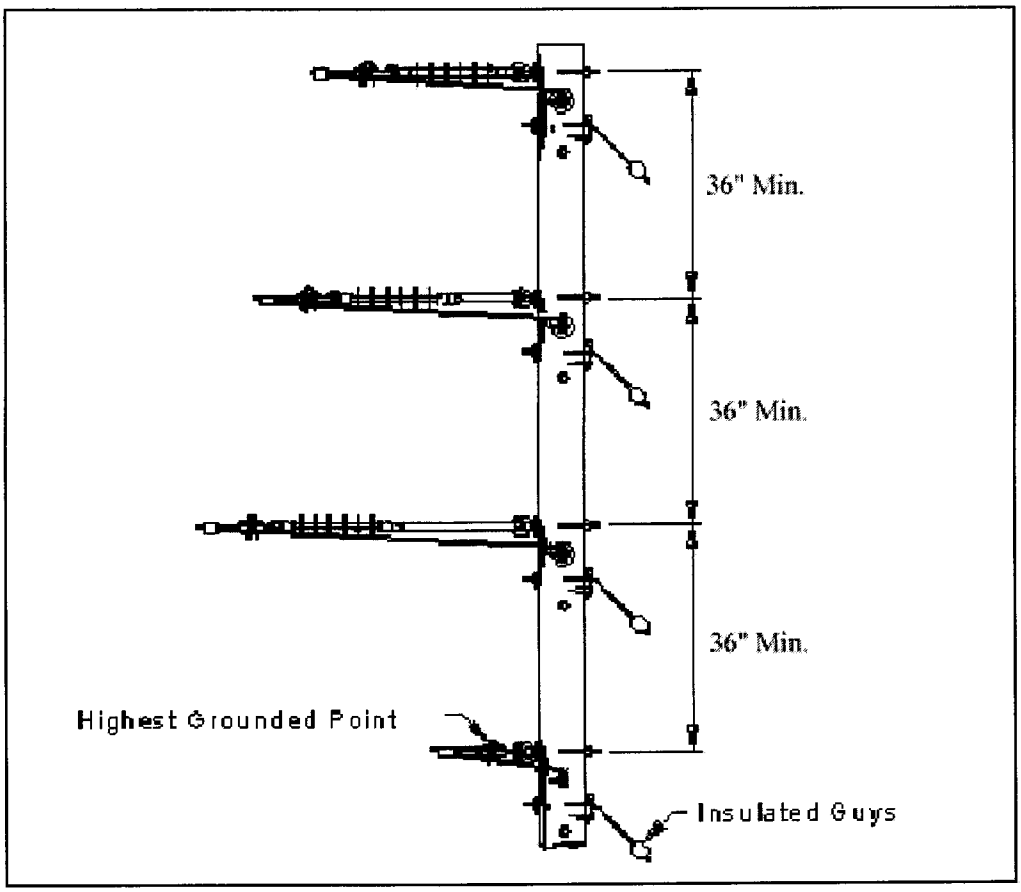


Figure 7. Typical avian-safe three-phase vertical corner configuration.

Modification of Existing Structures

On existing structures where raptors or other large birds have been electrocuted or injured, the preferred remedial measure is to provide 60–inch separation between energized conductors. Reframing using a 10–foot crossarm which allows 60–inch separation between conductors may be a suitable alternative to pole replacement.

However, pole replacement utilizing a safe design may be required on poles where bird mortalities have been documented and other safe modifications are not feasible due to pole height or condition.

Other remedial options include covering conductors and equipment or installing bird perch guards (triangles) or triangles with perches. These options do not offer total protection for birds, but may greatly reduce the chance of avian electrocutions. These options should be used when separation of the conductors is not possible, or where equipment is on the pole.

Perches and Guards

If conductor separation cannot be achieved and covering or reframing is impractical, perch guards (triangles) with optional perches may be used for large perching bird protection (Figure 8). Since raptors will often perch on the highest vantage point, the installation of perch guards between closely-spaced conductors and the placement of perches above existing arms and conductors may keep a bird from contacting energized parts or wires. Perches may not be effective when used without perch guards. Perches and guards, when properly installed, are not an absolute solution, but they do reduce the risk to birds. Ideally, when a perch guard is installed, an alternative, safe perch site should be provided. The open part of the crossarm, as shown in Figure 8, could serve as such a site. Perch guards are generally 18 to 22 inches wide and should not be used when conductor spacing is greater than 32 inches. When spacing is between 32 and 60 inches, use an insulator cover (see Figure 9) instead of a triangle or perch. Protective equipment should not be installed when conductors are more than 60 inches apart.