# NORTHERN STATES BALD EAGLE RECOVERY PLAN

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Prepared by the

Northern States Bald Eagle Recovery Team

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## EXECUTIVE SUMMARY

The Northern States Bald Eagle Recovery Plan describes actions believed necessary to assure the survival and recovery of bald eagles in the 24 States encompassed by the Plan. The primary recovery objective is to reestablish self-sustaining populations of bald eagles throughout the Northern States Region (hereafter Region). An initial, tentative goal is to have 1,200 occupied breeding areas distributed over a minimum of 16 states (for definition see Appendix D) within the Region by the year 2000, with average annual productivity of at least 1.0 young per occupied nest.

The most important problems believed to have reduced eagle populations in the Region have been: 1) loss of suitable habitat, 2) mortality from shooting, trauma, poisoning, diseases, electrocution, and other causes, and 3) reduced reproduction caused by environmental contaminants. Incomplete and inconsistently-reported information plus inadequate communication and coordination among agencies and individuals working with eagles have contributed to problems in our understanding of the species' population dynamics, status, and requirements.

The specific recovery tasks described in this Plan fall into four general categories:

1. Determine current population and habitat status.

2. Determine minimum population and habitat needed to achieve recovery.

3. Protect, enhance, and increase bald eagle populations and habitats.

4. Establish and implement a coordination system for information and communication.

All of the tasks in the Plan are concerned with and important to the recovery of the species. However, some tasks clearly are more important than others. Those most important are described in the following four paragraphs.

<u>Annual surveys</u>. Nesting surveys are required for information on locations and absolute numbers of occupied breeding areas. Those numbers are needed to monitor changes in population status and to determine whether the primary recovery objective is being met. Winter surveys are needed to identify important wintering areas and establish priorities for site-specific magagement.

Habitat Assessment. Essential habitats need to be identified and monitored so that their boundaries can be defined clearly and information obtained for site-specific magagement.

Site-specific management plans. These are needed for essential habitats, including a) breeding areas, b) important winter night roosts, c) winter areas of consistent and concentrated daytime use, and d) other significant areas. Each of these sites is important yet unique in size, configuration, and needs for protection and management; hence, each requires an individual management plan. Such plans are already commonplace and well established for many breeding areas.

Improved communication and coordination. Better coordination, standardization, and centralization of statistical information about bald eagle populations and management is needed. (Information and maps about specific locations of individual eagle nests and winter night roosts, however, should not be centralized, for the welfare and protection of the birds. Specific location information should remain with state and federal agencies or organizations responsible for particular geographic areas.) The magnitude of the recovery effort is such that a full time coordinator is needed for the Northern States Region, or perhaps for the whole country. Coordination among the five regional bald eagle recovery teams on several issues would result in the acquisition of data in a standard format, with a minimum of redundancy, hence lower cost. Each state and federal agency with a large role in the recovery effort is strongly urged to assign or hire at least one person with appropriate expertise to consolidate information and to coordinate implementation of the Plan. The formation of state-level or inter-state working groups, composed of the agency coordinators and interested non-agency researchers, also is strongly recommended. The working groups serve as a forum for establishing priorities and management within a state or among neighboring states.

Other important, although less critical, research and management tasks that will aid recovery are described briefly in the remainder of this summary.

Reestablishment of self-sustaining breeding populations in many states is expected to occur by the natural expansion of existing populations, provided suitable habitats are maintained. However, where populations have been extirpated or severely reduced, restoration probably will require transplanting wild- or captive-produced young to suitable locations.

The ultimate success of efforts to restore breeding populations, whether by natural or artificial means, depends largely on survivorship. Providing improved habitat conditions, particularly during the winter period, probably is the most important means of maximizing survivorship. Other steps include the development and implementation of programs to reduce deaths from shooting, accidental trapping, electrocution, poisoning, or exposure to various environmental contaminants. Rehabilitation of sick or injured eagles also is important, primarily because of the public education associated with such programs.

It is imperative that surveys, research, and management planning be carried out by experienced, qualified personnel. This is particularly important for all work involving the eagles themselves, such as when birds are captured or handled or when nests and winter night roosts are visited.

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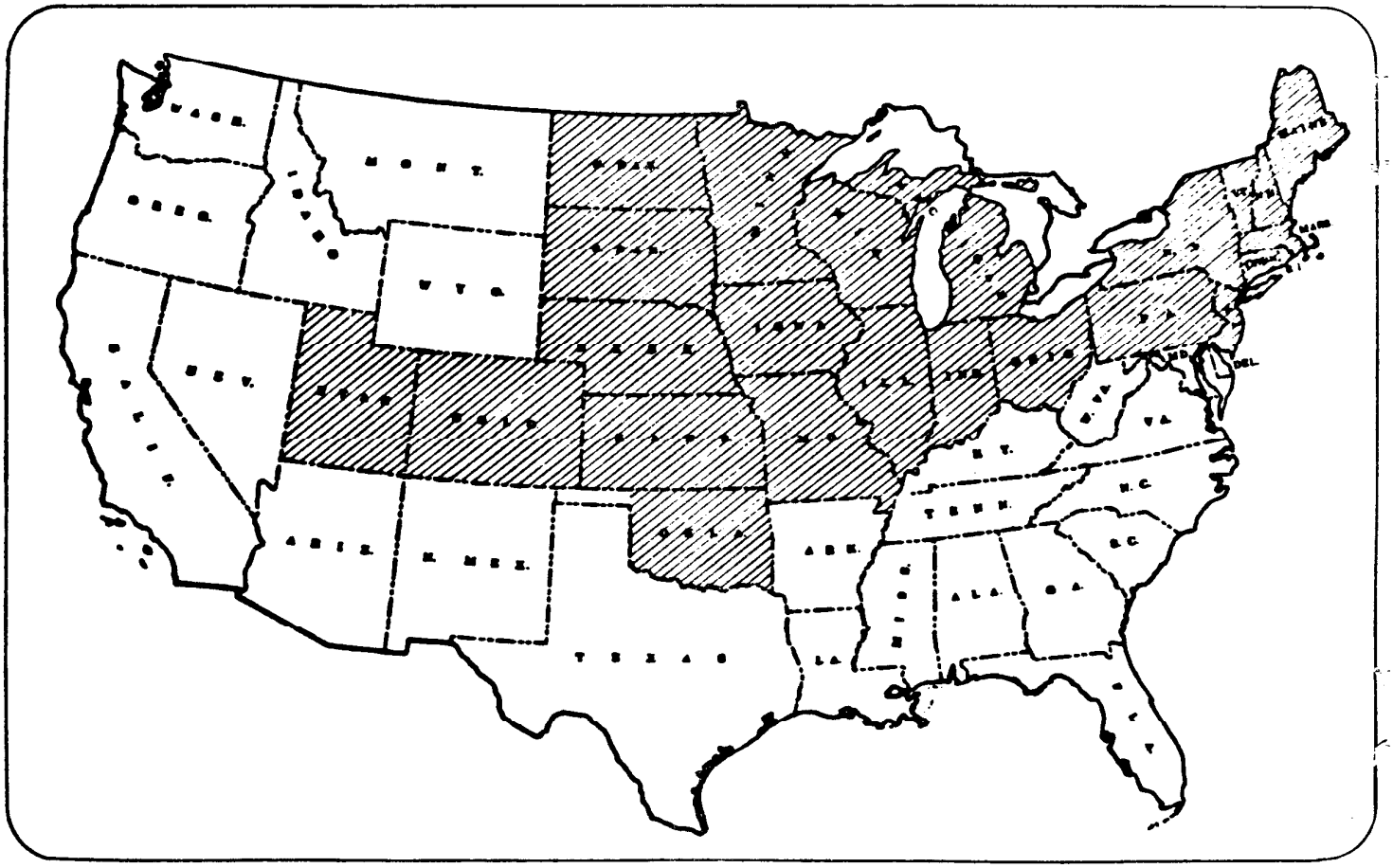


**Figure 1** NORTHERN STATES REGION

## PREFACE

In 1978 the bald eagle was listed as a threatened species in Minnesota, Wisconsin, Michigan, Oregon and Washington, and endangered in the remaining contiguous United States. This Plan was developed by the Northern States Bald Eagle Recovery Team, one of five regional teams appointed by the Director, U.S. Fish and Wildlife Service, under authority of the Endangered Species Act of 1973. This Region includes 24 states (Figure 1). (Montana and Wyoming originally were included in the Northern States Region but were transferred to the Pacific Region in March 1982 to facilitate coordination and planning for the adjacent nesting population of eagles in Idaho.) The purpose of the Plan is to recommend specific actions to bring about the recovery of bald eagles in the Region. The Plan is based on biological considerations and does not attempt to resolve social and political issues.

The Team was fortunate in working with a species that already has received considerable study. Because of this, we opted for a concise document and, after discussion and reconsideration, we omitted literature citations, except for statements for which the references are not widely known. Persons wishing more detail and references should consult Lincer et al. (1979).

The primary readership of this Plan is anticipated to be persons in state and federal agencies needing guidelines for research and management, or wanting a ready reference for questions pertaining to eagles such as, "How do we deal with an injured or dead bird?" or "What do we do with a report of a color-marked bird?" In addition, the Plan will serve as guidance and reference for many non-government researchers, corporations, private organizations, and individuals who simply desire to contribute to knowledge of eagles. Thus, appendices have been included to help answer questions, provide guidelines and standardization, and present information of common interest that is not readily available and synthesized elsewhere. These appendices provide interim guidance pending completion of a set of similar appendices that will accompany each of the five regional bald eagle recovery plans and provide standard guidelines for the nation as a whole.

In addition to the appendices contained here, two more are printed as separate documents, available on request. They are 1) a summary of historical records for bald eagle populations for the Region, compiled by James Mattsson, Joel Kussman, and Frank Gramlich, and 2) technical and agency review comments on the Plan.

# PART I

# INTRODUCTION

## GENERAL OVERVIEW

The bald eagle (Haliaeetus leucocephalus) is a large, long-lived bird of prey restricted in distribution to North America. Adults, with their dark brown bodies, white heads and white tails are well known as the nation's symbol. However, the adult plumage is not acquired until age four at the earliest. Bald eagles go through a series of plumages prior to attaining adult coloration, and in some plumages the young bear a superficial resemblance to the golden eagle (Aquila chrysaetos).

Sexual maturity is reached at four to six years of age, but the birds may be considerably older before they breed for the first time. Known-age bald eagles in the wild have bred at four years (individuals originally released as nestlings into New York, Nye 1981) and as late as seven years (a color marked bird in Saskatchewan, Gerrard personal communication). The average life span is not known, but 30 years is a reasonable estimate of potential longevity under natural conditions. Mortality is though to be relatively high in the immature age classes but much lower for birds that manage to survive their first year or two (Sherrod et al. 1977). Many birds probably do not reach sexual maturity and few are likely to live until age 30.

Nesting bald eagles are associated almost exclusively with lakes, rivers, or sea coasts. Fish are the major item in their diet. Eagles commonly are said to mate for life but there are few data on this point. Birds are likely to replace lost mates and there may be other changes of mates.

Adults tend to use the same breeding area (see Appendix D for definitions), and often the same nest, each year. The nests are primarily in trees, and to a lesser extent on cliffs or (rarely) on the ground. Clutch sizes range from one to three eggs. Successful pairs usually raise one or two young, or occasionally three per nesting attempt. Nesting phenology depends largely on latitude; egg-laying ranges from November in Florida to May in Alaska and northern Canada. The time between egg-laying and fledging is approximately four months. The entire breeding cycle, from initial activity at a nest through the period of fledgling dependency, is about six months.

The breeding range has receded during the 19th and 20th centuries. Historic records indicate that bald eagles formerly nested in at least 45 of the contiguous 48 states. As of 1981, however, occupied nests were known in only 30 states, and approximately 90% of the 1250 or so known pairs were in just 10 states: Florida, Minnesota, Wisconsin, Washington, Michigan, Oregon, Maine, California, Maryland, and Virginia

(Green 1982). In contrast, large numbers of pairs, perhaps ten times the number in the contiguous states, continue to nest in parts of Alaska and Canada south of the Arctic tundra.

A few adult bald eagles in the temperate latitudes and far north remain in association with nesting areas throughout the year. However, most bald eagles in the interior Canadian provinces and northern United States move south in the fall, probably in response to changes in prey availability and weather conditions. As a result, thousands of bald eagles (approximately 13,000 were counted during the 1981 nationwide midwinter survey sponsored by the National Wildlife Federation) are present in the contiguous 48 states from November through March, which is referred to in the Plan as the "wintering period." Because nesting phenology varies with latitude, the wintering period overlaps with the initial weeks of the nesting season in some areas.

Wintering bald eagles occur throughout the country but are most abundant in the west and midwest. An abundant, readily available food supply in conjunction with one or more suitable night roost sites is the primary characteristic of winter habitat. The majority or wintering eagles are found near open water and they feed on fish and waterfowl, often taking those which are dead, crippled, or otherwise vulnerable. Mammalian carrion is an important alternate source of food at some locations. Also, many bald eagles spend a substantial portion of the wintering period in terrestrial habitats far from open water, relying on prey they can catch easily or scavenge, such as big game or livestock carrion and small mammals.

At night wintering eagles often congregate at communal roost trees, in some cases traveling 20 km or more from feeding areas to a roost site. The same roosts are used for several years. Many are in locations that are protected from the wind by vegetation or terrain, providing a more favorable thermal environment. The use of these protected sites helps minimize the energy stress encountered by wintering birds. It also has been suggested that communal roosting facilitates food-finding. In addition to natural factors, roost sites generally provide isolation from humans. When human disturbance of a night roost occurs, birds may abandon the location (Steenhof 1976, Hansen et al. 1981, Keister 1981). In some locations the absence of a suitable night roost could limit the use of otherwise suitable habitat.

The tendency for bald eagles to congregate at certain locations during the wintering period is well known and for years it had been assumed that most of the birds were at concentration areas. However, recent analyses of data collected during the National Wildlife Federation's nationwide midwinter surveys indicate that perhaps only about 50% of the bald eagles present in the Region are in concentration areas; others are present in hundreds of locations that are used regularly by one to 20 birds. Collectively the smaller groupings and individuals probably are equal in importance to the larger concentration areas.

Although it is clear that nesting bald eagles have declined in the contiguous states, the rates, progress, and dynamics of the decline are not well understood. We have relatively good information on the numbers and success of nesting birds but little data on the number of nonbreeding adults and immatures, what age they begin breeding in the wild, the length (in years) of the reproductive period for adults, and the turnover and replacement of mates. We have limited information on the population dynamics of wintering eagles and, aside from a small sample of color-marked birds and the first-year recovery rates of banded nestlings, virtually no information on survival rates.

Hypothetical modeling of bald eagle populations, using a variety of models and reproduction-survival schedules, shows that both reproduction and survival are important. Of the two, changes in survival have more impact on the population than similar changes in reproductive rates. Depending on survival, it is possible for populations with lower reproduction to do better than others with higher reproduction (Grier 1980). Reproduction of bald eagles appears to have increased following a period of reduced productivity from the late 1940's to the early 1970's. We do not know for sure what that means without concurrent survival information. The implications are 1) that variation in reproductive rates may not be quite as important as we formerly thought (although it is still important and cannot be ignored) and 2) that we should pay more attention to survival and the habitat upon which survival depends.

We need to pursue better information and understanding of eagle population dynamics. In the meantime we have to rely on information about numbers of nesting birds and maintain our assessment of the reproductive side of the population equation.

## CAUSES OF POPULATION DECLINES

Nesting populations of bald eagles were reduced seriously in many states during the 19th century. These early declines are attributed primarily to loss of habitat, plus mortality from shooting and trapping. These problems have continued, even accelerated in some localities. During the mid-20th century a new problem, environmental contamination, entered the picture and caused further significant declines in the remaining nesting populations.

Loss of habitat is perhaps the most serious negative factor, certainly the most difficult to halt and reverse. The destruction of wild areas through land development and increased human activity is affecting adversely the suitability of both breeding and wintering areas. The cumulative aspect of habitat loss is the core of the problem. While actions or developments that detrimentally affect individual areas do not appear to "jeopardize the species" as a whole, the cumulative effect of many small, seemingly inconsequential actions on eagles may be significant.

Disturbance, although difficult to assess and evaluate, has been suggested as a cause of reproductive failure in some breeding areas and a factor that adversely affects the suitability of wintering areas. Eagles vary in their response to human activity, some individuals being tolerant while others are easily disturbed.

For more than two decades eagles found dead or moribound have been sent to research laboratories of the U.S. Fish and Wildlife Service for necropsies and chemical analyses to determine cause of death. Published summaries of data through the mid 1970s reveal that shooting and trauma were leading causes of death. Poisoning, electrocution, disease, and trapping injuries were other important causes in varying proportions from year to year. Bald eagle mortality data from 1975 to the present recently were computerized by the U.S. Fish and Wildlife Service. These data (N = 754) disclose the following distribution: trauma, 21%; shot, 17.6%; rotten (too decomposed for a diagnosis), 12.3%; emaciation, 9.7%; electrocution, 9.3%; poisoned, 8.4%; infectious diseases, 8.0%; open (no diagnosis determined), 5.7%; trapped, 5.2%; drowned, 0.7%; and other, 2.1%.

Eagle population losses from habitat destruction and other human acts such as shooting and trapping usually are identifiable and could be reversed under sound management. Far more insidious are losses resulting from direct or indirect effects of environmental pollutants or contaminants.

rain damage are in wilderness or semi-wilderness forest areas, that is, areas already supporting eagles or with potential for re-introduction. Early indications are that until the problem of acidification of lakes is addressed successfully, the future is bleak for the aquatic-based biota on which the eagle is dependent in certain parts of its range.

## DISTRIBUTION AND ABUNDANCE IN NORTHERN STATES REGION

Published information on status and distribution of bald eagles prior to the 1960's gives a subjective picture at best. In 1960 the National Audubon Society initiated the Continental Bald Eagle Project which revealed that eagles were experiencing reproductive difficulties. This provoked widespread interest in bald eagles and resulted in various federal and state agencies and private individuals undertaking extensive efforts to monitor populations throughout the United States and Canada. Thus, a new era began in our knowledge of bald eagle distribution and status. For this reason the information on distribution and abundance is organized in the following sequence: pre-history, former (prior to 1960) and current (1960 to present).

### PRE-HISTORY

The bald eagle is not uncommon in the fossil record of North America. However, only two records, both Pleistocene in origin, are known for the Region, one from Sheridan County, Nebraska and one from Genesee County, Michigan.

### FORMER DISTRIBUTION AND ABUNDANCE

A thorough documentation of historical records was an integral step necessary to evaluate changes in bald eagle populations in the Region. To facilitate this objective the major, and many of the minor, or anecdotal, historical records were collated. Because these records are numerous, they are presented as a separate appendix publication (in preparation) consisting of annoted records arranged by state. This section consists of narrative summaries of the most pertinent records for each state, minus the literature citations which are included in the appendix. Dates of references, however, are included in parentheses.

(Some of the information prior to the 1960's was not published until after 1960. Many references did not include dates for observations; hence, publication dates are used.) The number and quality of historical records vary greatly within and among states; the variability is reflected in this section.

## Colorado

Nesting. Historically a breeding bird in the mountainous regions to 10,000 feet (1912). A common resident of the mountain areas in and around Rocky Mountain National Park in the 1940's and 50's. Successful nesting records include Bent, Garfield, and Gunnison counties and one on the Garfield-Rio Blanco County line.

Wintering. Described as a winter visitor (1965), and a rare transient in the Boulder area (1937). Collection records document two bald eagles, one killed in South Park in December, 1877, the other collected in November, 1886. One specimen was killed in Morgan County in December 1904. Observations include two birds in Boulder County in December, 1909, and one in March 1912. Ten winter records exist from near Boulder in 1941-42. Four birds observed near Sapinero in Gunnison County in January 1939; and 25, mostly immatures, circling over the Green River not far from Dinosaur National Monument in March 1951. Sixty birds counted near Eleven Mile Reservoir in Park County in February 1951.

## Connecticut

Nesting. Considered a resident, breeding on the Housatonic River and other suitable locations (1877) and formerly breeding in unsettled parts of state (1913). Reported nesting in the Connecticut Valley Mountains (1927). Successfully nested in 1939 in Essex County. Believed to nest in Essex and Middlesex counties until the late 1950's. Nesting probably occurred in Fairfield, Litchfield, New Haven, and New London counties as well.

Wintering. Considered a spring and fall migrant (1877, 1913).

## Illinois

Nesting. Reported as nesting in the lower Wabash Valley (1874) and as breeding sparingly statewide, specifically in Lake County (1876). Rare in Marshall County with four known nests (1890). Formerly nested in northeastern Illinois along the Lake Michigan shore (1918). Reported nesting in Alexander, Gallatin, and Hamilton counties.

Wintering. Considered common (1876) and most abundant during winter (1881). During the 1860's large numbers fed on dead fish and offal from slaughter houses along the Mississippi River at Des Moines Rapids in Hancock County (1942). The population at Hamilton, Illinois increased significantly following construction of the Keokuk Dam (1949). Christmas Bird Count data indicate an increase in bald eagles which corresponded with the construction of dams along the Mississippi River in the 1940's (1963).

## Indiana

Nesting. Formerly a common resident throughout the state. Reported nesting in DeKalb, Franklin, Knox, Lake, LaPorte, and Starke counties, but no longer known to breed east and south of the Wabash River (1897). Two egg sets of three each were collected at English Lake in Starke County near the turn of the century.

Wintering. Frequent winter visitor along the Wabash and Tippecanoe rivers in Carroll County (1888). A male of unknown age was collected in Franklin County in January 1888.

## Iowa

Nesting. Considered occasional (1897) and very exceptional, having been common formerly. Frequently nested in favorable localities (1907). No breeding records since 1892 according to one author (1933). Reported to have nested in Allamakee, Blackhawk, Hardin, Jasper, Linn, and Sac counties. One egg was collected from a set of two in Hardin County (1907).

Wintering. Frequent along water courses during migration (1897) but common only during the winter (1907, 1934). Formerly wintered along the Mississippi River in Clayton, Lee, and Scott counties. Numbers increased sharply around 1950 following construction of several dams by U.S. Army Corps of Engineers (1959).

## Kansas

Nesting. Described as a rare summer resident (1891, 1899). Reported to have been common in the Kansas City region, but currently rare in summer (1919). Once considered a resident bird in Kansas, but by the mid 1900's it had become a rare winter visitor (1946). No verified records of successful nesting in the 20th century (1956).

Wintering. Rare winter visitor in Kansas City region (1919). Occasionally wintered in Kansas (1935). Reported to be a common winter resident along the south branch of the Solomon River in Rooks County (1934). Winter survey records from 1951-1962 indicated the bald eagle a common winter resident in the proximity of the Arkansas River. Records were verified for Clark, Finney, Gove, Hodgeman, Kearny, Linn, Neosho, Phillips, and Stafford counties. Eagles have been reported in Barton, Ford, Hamilton, Meade, Rice and Seward counties (1966).

## Maine

Nesting. Early accounts (1605, 1668, 1806, 1820) indicate that bald eagles were extremely common and numerous in coastal Maine and probably resident throughout the year. By 1908 the number of pairs was estimated at not over 100; considered very rare. One author noted 50-100 pairs inland and along the coast and a reduction in the Kennebec Valley (1927). Considered regularly uncommon throughout the state in summer (1949). Another author documented a complete cessation of production in 1953-56 and a lack of hatching in nests he observed (1957). Reported nesting in Aroostook, Hancock, Kennebec, Lincoln, Oxford, Penobscot, Piscataquis, Sagadhoc and Washington counties.

Wintering. An "infinite number" reported in Casco Bay, Cumberland County, many being shot to feed hogs (1668). Considered common to numerous in a few coastal localities (1949). Large concentrations (25-52) reported in Oxford, Lincoln, and Hancock counties.

## Massachusetts

Nesting. Reported nesting along the Atlantic coast and Connecticut River Valley (1883, 1890, 1927, 1937). Considered rare in the west and occasional in the east in all seasons (1901) and an uncommon visitor in Essex County (1905). Nesting reported in Barnstable, Franklin, and Hampden counties.

Wintering. Reported as a rare winter visitor and migrant (1901), as occasional in winter (1937) and as an irregular coastal visitor (1955).

## Michigan

Nesting. Listed as not rare statewide and common in the Upper Peninsula (1893). Generally distributed over the state and most common near the Great Lakes and larger rivers; formerly more abundant (1912). Considered an uncommon resident (1938, 1951) and mostly restricted to the northern half of state (1959). At least 50 breeding pairs estimated in the state in the early 1940's (1951). Reported nesting in Alcona, Alger, Allegan, Antrim, Arenac, Baraga, Bay, Benzie, Cheboygan, Charlevoix, Chippewa, Crawford, Delta, Emmet, Gogebic, Grand Traverse, Huron, Iosco, Keweenaw, Lake, Leelanau, Mackinac, Macomb, Manistee, Marquette, Mason, Monroe, Montmorency, Muskegon, Newaygo, ogemaw, Oscoda, Roscommon, Saginaw, St. Clair, Schoolcraft, Shiawassee, Tuscola, Wayne, Washtenaw, and probably Menominee and St. Joseph counties. Nesting in Macomb and Wayne counties occurred about the turn of the century. Formerly nested on islands in lakes Huron, Michigan, and Superior.

Wintering. Rare winter visitor in the north; regular during fall, winter, and early spring along Lake Erie (1951, 1959). Frequent in winter in Allegan County (1944). Reported in Benzie, Chippewa, Hillsdale, and Wayne counties.

## Minnesota

Nesting. Reported as not common (1890) and as formerly common but much reduced numbers (1932). Several nests reported along the Red River between Moorhead and Pembina, North Dakota, in 1873. Reported nesting in

Becker, Cass, Clearwater, Cook, Crow Wing, Hennepin, Hubbard, Itasca, Jackson, Lake, Marshall, St. Louis, and Stearns counties.

Wintering. Rare statewide (1932); fairly common along the Mississippi River in Dakota County (1931). Reported in Wabasha, Sherburne, and Dakota counties.

Missouri

Nesting. Formerly bred along all large rivers; considered nearly extinct by one author (1907). Rare permanent resident throughout state (1932) with probably fewer than 50 pairs (1939). Nesting reported in Andrew, Buchanan, New Madrid, Platte, Oregon, St. Charles, and possibly Holt counties.

Wintering. Uncommon winter resident (1907).

Nebraska

Nesting. Formerly a common breeder in the Missouri River Valley and also nesting in Gage County in the late 1870's and early 1880's. Nesting sites reported in both Gage and Cherry counties (1896). One author noted that bald eagles "probably formerly bred in the more heavily wooded portions of northeastern Nebraska, and it is likely that a few still do so, but there are no definite breeding records" (1901). No verified record exists of successful nesting in the 1900's.

Wintering. Listed as an uncommon migrant and winter visitor (1945). Work in 1959-60 documented 14 locations being used by wintering eagles.

New Hampshire

Nesting. Considered as "tolerably common" during the summer around lakes and ponds, particularly Winnepasaukee Lake and the bay along the river that drains it (Bellknap and Carroll counties) (1898). Noted as

uncommon in summer and as occurring in the southeast (Rockingham County) (1903). Listed as an uncommon summer resident in Coos County (1911). Records indicate that eagles last nested at Lake Umbagog in Coos County in 1949.

Wintering. Reported as occasional (1899). The Audubon Society of New Hampshire reported sightings in all but one winter between 1949 and 1980.

New Jersey

Nesting. A total of 10 active nests reported in Cape May, Cumberland, and Salem counties in 1936 (1937). Sixteen immatures were present at Ft. Mott, Salem County on 1 August 1936. In the early 1950's, seven nesting pairs were known in Cumberland County alone. An eagle could be seen on most trips along the Delaware Bay shore (1952). As of 1959, 10 active nests were known statewide (1964).

Wintering. Seen regularly in fall and winter (1937). An average of 67 fall migrants were recorded at Cape May Point from 1931-1937 (1973). The maximum number of bald eagles recorded during the Christmas Bird Count period, 1930-59, was 12 in 1952.

New York

Nesting. Commonly observed until nesting and wintering populations began to decline in the early 1900's. Seventy-two historic nest sites have been identified in Cattaraugus, Chautauqua, Essex, Erie, Franklin, Hamilton, Jefferson, Livingston, Madison, Niagara, Oneida, Onondaga, Orleans, Oswego, St. Lawrence, Seneca, Suffolk, Warren, Washington and Wayne counties. Nests were known to exist in these areas into the 1950's; however, by 1960 nesting activity had ceased at most nest sites in the state.

Wintering. Often seen along major rivers and near large lakes where open water persisted, particularly Long Island, the lower Hudson River, and along the eastern shores of Lake Ontario (1937, 1953). During one winter in the mid 1800's, 60-70 bald eagles were shot on Long Island (1844). Considered to have been a rare winter visitor (1974). Migrant

eagles were formerly found to occur throughout the state including Long Island, the shores of the Great Lakes, central New York and Adirondack Mountains.

## North Dakota

Nesting. Breeding populations were common in the 1800's and early 1900's proximal to the larger rivers and lakes that were bordered by mature stands of trees. Nested regularly along the Red River between Fargo and Pembina (1878, 1959) and in the vicinity of Devils Lake (1895). Many nests were also reported along the Missouri River from Mandan to the Montana state line (1897, 1927, 1928, 1961). Isolated nesting sites reported at Lake Jessie in Griggs County in 1853, in the Turtle Mountains in 1890, and near Kenmare in Ward County in 1893.

Wintering. Little information on wintering activities (1928). Rare fall and winter occupancy noted along the Missouri River in eastern McKenzie County (1928).

## Ohio

Nesting. Listed as common in some localities (1879) and as a rare resident (1903); a few pairs nesting along the shore of Lake Erie and large reservoirs, being most numerous in the vicinity of Sandusky. Breeding reported in Ashtabula, Auglaize, Cuyahoga, Erie, Highland, Lake, Logan, Lorain, Lucas, Mercer, Ottawa, Sandusky, Wayne, and possibly Paulding counties. Also reported to have nested at Rockport in 1850, 1852, and 1858 and at Grand Reserve, Indian and Buckeye lakes. Eggs were collected in Ottawa County in 1916, 1917, and 1918, and in Sandusky County in 1922.

Wintering. Sometimes appeared in "considerable numbers" at Licking Reservoir (1903).

## Oklahoma

Nesting. Listed as an irregular resident, but common around impoundments. May have nested along the Arkansas River (Osage County) in 1908. Nesting attempt was made near Ft. Gibson Reservoir (Wagoner County) in 1950; however, no young were reared. Pairs of adults spent the summer of 1950 along upper Spavinaw Lake, but did not nest.

Wintering. Frequent winter resident around impoundments, reservoirs, and other large bodies of water (1967). Sizable winter roosting areas existed at Salt Plains National Wildlife Refuge in Alfalfa County (1954), Wichita Mountains Wildlife Refuge in Comanche County (1959), and Grand Lake in Ottawa County (1961). Numbers at all traditional wintering areas generally varied greatly from year to year.

## Pennsylvania

Nesting. Rare breeder along the Susquehanna (1890); fairly common at Erie (1928). Reported nesting in Bradford, Crawford, Erie, Lancaster, Pike, and possibly Philadelphia counties. Two egg sets of two each were collected from Lancaster County, one in 1885 and one in 1920.

Wintering. Present all year (1890, 1942). Rare and irregular migrant and occasional in winter (1928).

## Rhode Island

Nesting. Considered an irregular visitor (1903). There are no historical records of bald eagles nesting in the state.

Wintering. No information available.

## South Dakota

Nesting: Considered a rare summer breeder in southeastern South Dakota (1885). Listed as a rare resident in the badlands region (1909). Represented in H. Behrens collection of birds of the Rapid City area (1909).

Wintering. Scant documentation available. Bald eagles historically used the Missouri River flowage and associated reservoir systems and tailrace areas below most dams throughout the migration/wintering period.

## Utah

Nesting. Described as "formerly a permanent resident" (1975). Regularly visited Utah Lake (Utah County) for fish (1875). Nesting rare in southeastern Utah (1945). Documented nesting in following counties: Salt Lake (1918), Summit (1922), Tooele (1922), Utah (1928), and Wasatch (1914).

Wintering. Frequently observed in the early fall 1871 around Ogden in Weber County. Documented near Provo (Utah County) and in Garfield, Kane, and Sevier counties in the winter of 1888. More recent observations (1944) indicated that bald eagles may overwinter in Utah. A concentration of 120 birds reported near the Bear River Migratory Bird Refuge in Box Elder County (1957).

## Vermont

Nesting. Formal documentation of nesting is lacking; however, recent correspondence suggests that historical nesting probably occured.

Wintering. New Hampshire records from the Connecticut River Valley (6 winters) must be partly credited to Vermont as the river forms a boundary between the two states.

## Wisconsin

Nesting. Reported as numerous throughout the state (1854) and nesting in the northern part of the state and along the Mississippi River (1903). Nesting reported in Adams, Bayfield, Door, Forest, Iron, Jackson, Jefferson, Marinette, Oconto, Oneida, Sawyer, Vilas, and Washburm counties.

Wintering. Spring and fall migrant in southern part of state (1903). Single immature eagles were collected in 1900 and 1931 in Dodge County. Occasional throughout the state but regular in Dane County (1940).

## PRESENT DISTRIBUTION AND ABUNDANCE

Nesting bald eagles have been extirpated in Connecticut, Indiana, Kansas, Massachusetts, New Hampshire, Nebraska, and Utah. Evidence of possible natural re-establishment by bald eagles exists for Connecticut but to date there is no confirmation. There is no evidence that bald eagles ever nested in Rhode Island or Vermont.

The county distribution of occupied breeding areas between 1960 and 1980 is presented in Figure 2. Distribution varied somewhat during this period. Nesting population densities within certain counties declined appreciably but recently have increased in others. In Michigan, for example, during the late 1950's bald eagles nested in 44 counties. A steep decline in reproduction was then already well underway; at least 5-7 counties had been vacated since about 1945. During about 1960-1973 the bald eagle disappeared as a breeding bird from 18 (41%) of the 44 counties (including Isle Royale and the Beaver and Manitou Islands). Beginning in 1974 Bald Eagles re-established themselves in six of these counties, and a nesting attempt occurred in 1981 in a seventh county. This leaves 11 (25%) of the 44 counties where eagles nested two decades ago currently with no nesting pairs.

Productivity data for 1981 are presented in Table 1. Of 568 known occupied breeding areas, 544 (96%) occurred in Minnesota, Wisconsin, Michigan, and Maine. An examination of historical records reveals that the proportion of breeding areas outside these 4 states has decreased markedly. In 1981 only 66 (10%) of 640 young were produced in states other than the four mentioned.

Figure 2. Occupied bald eagle breeding areas by county, 1960-80. There have been considerable shifts among counties during this period, however (see text for description of changes in Michigan).

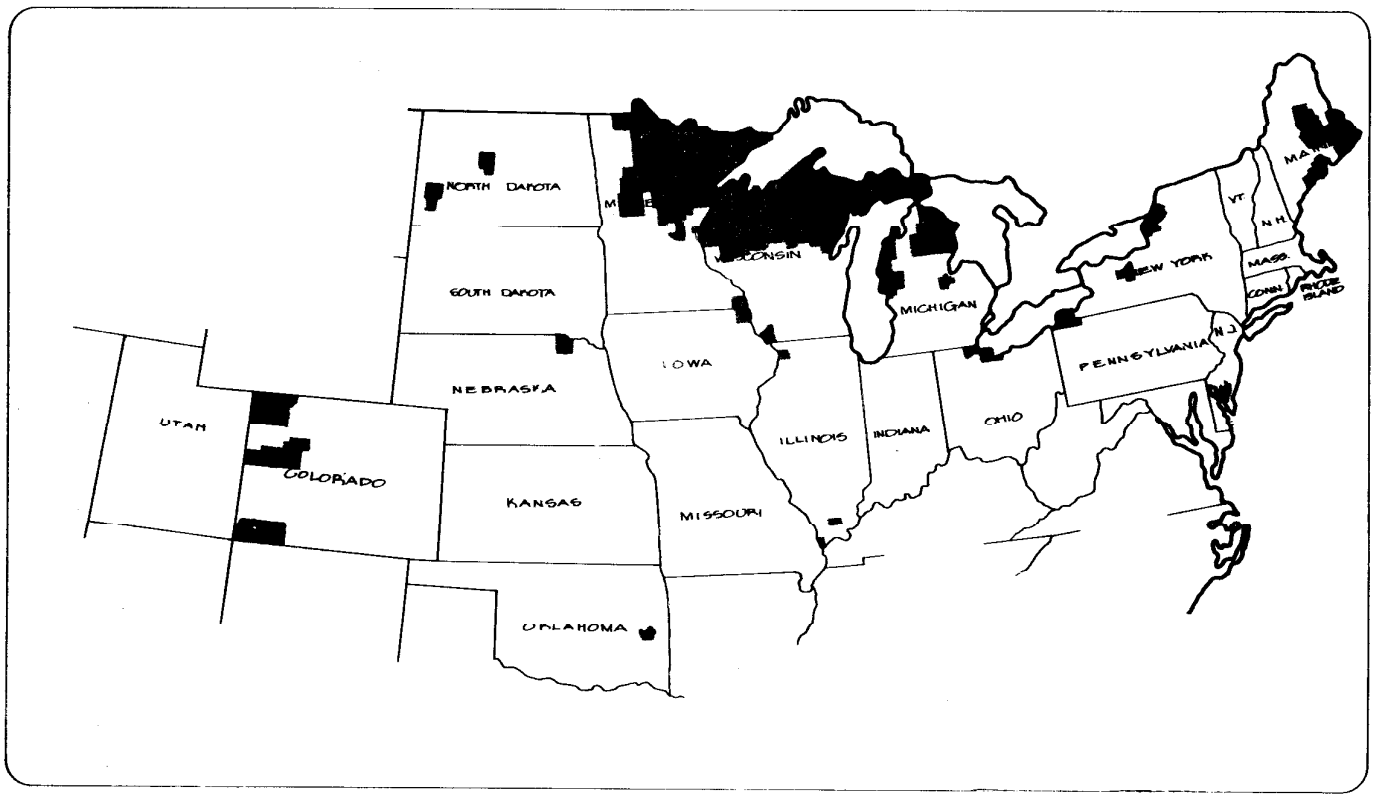


Table 1. Bald eagle productivity[a] in the Northern States Region during 1981[b].

| State | Number of known Breeding areas | | | Young/nest | |
|---|---|---|---|---|---|
| | Known occupied | Known successful | Young produced[c] | occupied | successful |
| Colorado | 5 | 3 | 5 | 1.00 | 1.67 |
| Connecticut | 0 | 0 | 0 | 0 | 0 |
| Illinois | 2 | 1 | 2 | 1.00 | 2.0 |
| Indiana | 0 | 0 | 0 | 0 | 0 |
| Iowa | 1 | 0 | 0 | 0 | 0 |
| Kansas | 0 | 0 | 0 | 0 | 0 |
| Maine | 64 | 34 | 49 | 0.77 | 1.44 |
| Massachusetts | 0 | 0 | 0 | 0 | 0 |
| Michigan | 102 | 63 | 105 | 1.03 | 1.67 |
| Minnesota | 190 | 132 | 242 | 1.27 | 1.83 |
| Missouri | 2 | 0 | ( 2 reintro.) | 0 | 0 |
| Nebraska | 0 | 0 | 0 | 0 | 0 |
| Nes Hampshire | 0 | 0 | 0 | 0 | 0 |
| New Jersey | 1 | 0 | 0 | 0 | 0 |
| New York | 2 | 0 | (23 reintro.) | 0 | 0 |
| North Dakota | 0 | 0 | 0 | 0 | 0 |
| Ohio | 6 | 3 | 6( 3 reintro.) | 1.0 | 2.0 |
| Oklahoma | 1 | 0 | 0 | 0 | 0 |
| Pennsylvania | 4 | 3 | 4( 1 reintro.) | 1.0 | 1.33 |
| Rhode Island | 0 | 0 | 0 | 0 | 0 |
| South Dakota | 0 | 0 | 0 | 0 | 0 |
| Vermont | 0 | 0 | 0 | 0 | 0 |
| Utah | 0 | 0 | 0 | 0 | 0 |
| Wisconsin | 188 | 137 | 227 | 1.21 | 1.66 |
| TOTAL | 568 | 376 | 640 | 1.13 | 1.70 |

[a]Includes a few artifically reintroduced and translocated young.

[b]Most recent year for which data are collected on region-wide basis.

[c]Large nestlings or fledglings at time of latest survey.

The best wide-scale information for the wintering period is from the nationwide midwinter (January) survey coordinated by the National Wildlife Federation. Results of the 1979-81 surveys are presented in Table 2. These data are not directly comparable between states or years because survey coverage is variable. Nevertheless, the data probably do reflect the use of the various states by bald eagles during January.

Vermont and Rhode Island have no known records of former use by wintering eagles, and there is little current use. Wintering bald eagles occur in relatively low numbers in New Hampshire, Connecticut, Massachusetts, Pennsylvania, New York, New Jersey, Ohio, Indiana, Michigan, Wisconsin, Minnesota, and North Dakota, which together accounted for only about 4% of birds counted in the Region during January 1981. There may be more birds wintering in dispersed, relatively inaccessible parts of Michigan, Wisconsin, and Minnesota, however, than have been observed or suspected. Although these states appear relatively unimportant in terms of the total number of birds supported, some sites may be key wintering areas for birds from breeding areas within the Region.

Maine and Iowa with peak counts of approximately 100 and 200, respectively, support noticeably larger wintering populations than the aforementioned states; however, they apparently are not used to the same extent as the remaining states in the region. Colorado, Illinois, Kansas, Missouri, Nebraska, Oklahoma, South Dakota, Utah, and the Mississippi River each support several hundred eagles every winter. Collectively these accounted for over 90% of the eagles recorded in the midwinter surveys in the region and nearly 50% of the nationwide total.

Table 2. Bald eagles counted in the Northern States region during the National Wildlife Federation midwinter bald eagle surveys, January 1979-1981.

| State | Number Counted | | |
|---|---|---|---|
| | 1979 | 1980 | 1981 |
| Colorado | 316 | 595 | 536 |
| Connecticut | 20 | 11 | 26 |
| Illinois[a] | 149 | 599 | 405 |
| Indiana | 3 | 5 | 6 |
| Iowa[a] | 41 | 128 | 202 |
| Knasas | 165 | 324 | 308 |
| Maine | 109 | 107 | 107 |
| Massachusetts | 8 | 25 | 19 |
| Michigan | 30 | 37 | 44 |
| Minnesota[a] | 3 | 16 | 8 |
| Missouri[a] | 178 | 948 | 955 |
| Nebraska | 204 | 442 | 440 |
| New Hampshire | 0 | 3 | 8 |
| New Jersey | 6 | 13 | 9 |
| New York | 41 | 36 | 35 |
| North Dakota | 30 | 40 | 54 |
| Ohio | 6 | 7 | 10 |
| Oklahoma | 581 | 569 | 542 |
| Pennsylvania | 5 | 11 | 26 |
| Rhode Island | 1 | 0 | 1 |
| South Dakota | 62 | 407 | 372 |
| Utah | 627 | 661 | 743 |
| Vermont | 0 | 0 | 1 |
| Wisconsin[a] | 53 | 70 | 88 |
| Mississippi River[b] | 1,350 | 945 | 1,098 |
| Total | 3,988 | 5,999 | 6,043 |
| Nationwide Total[c] | 9,115 | 12,340 | 12,903 |

[a]Does not include eagles counted along the Mississippi River.

[b]From approximately Minneapolis, Minnesota, to Hickman, Kentucky/Dorena, Missouri.

[c]Results do not include pairs occupying breeding areas in southern States.

## PRESENT MANAGEMENT

Aside from legislation such as the Bald Eagle Act of 1940, and related occasional enforcement, management efforts and research interests in bald eagles were extremely limited prior to the early 1960's. The National Audubon Society's Continental Bald Eagle Project, initiated in 1960, was the first organized attempt to assess the breeding population and to monitor reproductive success of the species across the United States.

As habitat loss and declines in reproduction became known, interest in eagles increased dramatically among federal and state agencies, universities and private organizations. The first agency to develop a specific habitat management program for protection of bald eagle nests was the U.S. Forest Service. In 1963 buffer zone constraints were established at all known nest sites on National Forest lands in the Great Lakes Region. Since then the biology and habitat requirements of the species have been researched andmanagement strategies have been implemented in additional breeding areas and a few wintering areas.

The U.S. Fish and Wildlife Service and state agencies also began showing more interest in the species during the same period, often recording eagles during waterfowl surveys or conducting specific surveys for the eagles. The National Wildlife Federation, through a corporate grant, established a Raptor Information Center during the 1976 bicentennial with special emphasis on the bald eagle. They published a comprehensive bald eagle bibliography and initiated the nationwide midwinter survey.

Population monitoring efforts in breeding and wintering areas, which in the early years were confined largely to the mid-west and east have increased, and now large portions of the nation are covered by surveys to locate breeding and wintering areas and to monitor nesting success. In the east and mid-west these surveys are handled cooperatively by the U.S. Forest Service, U.S. Fish and Wildlife Service, state wildlife agencies and private volunteers. In the west other agencies, such as the Bureau of Land Management and Bureau of Reclamation have joined in the overall effort.

Organizations such as the National Wildlife Federation, The Nature Conservancy, and Eagle Valley Environmentalists have been effective in acquiring and protecting some key habitats, especially wintering areas.

Efforts have been underway through cooperative arrangements between state and federal agencies to bolster or re-establish breeding

populations by moving captive-bred young or young from relatively secure populations in the Great Lake states and Alaska to suitable but empty habitat in New York, Ohio, Missouri, Massachusetts, and other locations outside the Northern States Region.

Contaminant monitoring, captive breeding, law enforcement and population monitoring have been major activities of the U.S. Fish and Wildlife Service. When the bald eagle was declared an endangered or threatened species in 1978 under the Endangered Species Act, U.S. Fish and Wildlife Service responsibility was further extended to include administration of the Act and the attendant actions necessary for the recovery of the species. The Bald Eagle Act and the amended (1972) Migratory Bird Treaty Act provide for national protection of bald eagles. Most states also have laws providing for their protection.

## ESSENTIAL HABITAT

### DEFINITION AND SIGNIFICANCE

Essential habitats are locations that biologists consider necessary for continued survival and recovery of a species.

The species requirements considered in the legal designation of Critical Habitat are used here to identify essential habitat. These requirements include, but are not limited to:

1. space for individual and population growth and normal behavior,
2. food, water, air, light, minerals or other nutritional or physiological requirements,
3. cover or shelter,
4. sites for breeding, reproduction, rearing of offspring, and
5. protection from disturbance.

Essential habitat areas should receive appropriate management. Recommended guidelines for identifying essential habitat in the Region are described below. Specific areas of essential habitat have not been identified in the Plan; that task is the responsibility of state and federal agencies as identified in section 1.2 of the step-down plan. However, as these areas are identified, the appropriate Fish and Wildlife Region should be contacted as to the locations. Critical habitat for the bald eagle has not been determined.

## BREEDING HABITAT

Breeding habitat, including all potential and occupied breeding areas, alternate (defined in Appendix D), and infrequently used areas hould be considered essential habitat. General guidelines for delineations at each area are as follows:

1. Essential habitat at each nest site is considered generally to encompass a minimum of 640 acres, including aquatic and terrestrial habitat used for foraging, and essential features of air, water, land, and solitude necessary for the breeding pair at the site. Where sufficient information exists to show that 640 acres probably are not sufficient, a larger area should be considered essential; likewise, if it can be documented clearly, less than 640 acres may suffice and in some instances tracts may be considered (see Appendix E).

2. The configuration of essential habitat at each site may vary, but should correspond to legal land lines or survey descriptions to facilitate listing and identification in public documents. The actual nest structure(s) does (do) not need to be at the center of the area nor must the area be in any particular configuration (e.g., square).

3. In areas of high nesting density, a larger single unit of essential habitat may be more appropriate than several smaller ones.

4. Essential habitat should be contiguous unless feeding areas or other essential habitat components are relatively far removed from the nesting area.

5. Essential habitat may include private as well as public land.

6. Essential habitat designations associated with breeding areas that become abandoned should remain in effect, provided the sites remain suitable for reoccupation. If the breeding areas are rendered permanently unsuitable the essential habitat designation may be removed.

7. Essential habitat associated with unoccupied and potential breeding areas is difficult to determine. This is best done by considering areas that are similar to known occupied sites and by consulting with knowledgeable persons.

## LOCATIONS USED BY NONBREEDING EAGLES

Locations perennially used by adult or immature nonbreeding bald eagles during the breeding or post-breeding period should also be designated essential habitat.

1. Essential habitat in these areas is not necessarily associated with nest sites.

2. Essential habitat includes terrestrial areas, lakes, coastal shorelines, or river segments associated with important food sources, and a zone for perching, feeding, or roosting that provides a visible screen from human disturbance.

3. The configuration of essential habitat in each area should correspond to legal land lines or survey descriptions to facilitate listing and identification in public documents.

4. Decisions on the importance of an area, depending on the number of birds involved and availability of other habitat, must be made on a regional basis in consultation with the U.S. Fish and Wildlife Service.

## WINTERING AREAS

Survival of individual bald eagles, particularly those in their first year of life, probably depends heavily on conditions they encounter during the wintering period. The physiological condition of adults at the beginning of each breeding season, an important factor influencing reproductive success, also is affected by how well their energy demands are met in wintering areas. Thus, the survival and recovery of nesting populations in the Region depends in part on the eagles having suitable locations to use throughout the wintering period each year.

Although wintering areas unquestionably are important, it is impossible to determine which particular locations, or how many, are essential for the survival and recovery of the nesting populations in the Region. This is because several thousand eagles from nesting areas in Canada are present in the Region during winter and it is impossible to distinguish between them and birds from U.S. nesting populations. To insure the survival and recovery of birds from U.S. nesting populations, significant wintering areas must be protected and managed. Also, the possibility exists that some birds raised at nests in Alaska and Canada establish breeding areas in the lower 48 states, serving as an important source of natural recruitment. Furthermore, from a legal standpoint all bald eagles, regardless of their origin, have threatened or endangered status when present in the contiguous states. Thus the fact that some wintering areas are used primarily by eagles from Canadian or Alaskan breeding populations should have little bearing on decisions to protect wintering habitat.

Assuming that the presence of birds indicates the presence of required habitat, as listed above, wintering areas in the Northern States Region that meet any of the following criteria should be considered essential habitats ("locations" refer to reasonable localized, not extensive, areas).

1. Locations used annually for two weeks or longer by adult or immature wintering eagles known (or strongly suspected) to be from nearby breeding areas.

2. locations (excluding those along the Mississippi River) used annually by five or more eagles for two weeks or longer in Connecticut, Indiana, Iowa, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, Vermont, and Wisconsin.

3. Locations used annually by 16 or more eagles for two weeks or longer in Colorado, Illinois, Kansas, Missouri, Nebraska, Oklahoma, South Dakota, Utah, or along the Mississippi River.

4. Locations used by bald eagles during periods of extremely harsh weather, when suitable feeding areas and night roost sites are

limited in number. (The minimum two week period of use does not apply to this criterion.)

The rationale for the first criterion is that the presence of suitable winter habitat near breeding areas reduces the energy expenditure and risks entailed in migration, and could result in increased survivorship for resident eagles of all age classes and higher reproductive success for resident adults.

The second, third, and fourth criteria deal with areas used by migrant eagles. Hundreds of these areas exist and there is considerable variation in the use they receive. Ultimately, the importance of any location is determined by its contribution to survival and reproductive success, but there is no way to measure this directly. Instead, consideration is given to factors such as the length of time an area is occupied by eagles each year, the amount of use it receives and its potential for supporting more use, the regularity of use over a period of years or during extreme weather when suitable habitat is most limited, and the number and extent of other wintering areas in the vicinity. Ideally, the importance of wintering areas should be assessed on the basis of a standard index which takes these factors into account. Perhaps such an index can be developed but at present none exists nor have many areas been studied sufficiently to provide the data for such calculations. Consequently, the second and third criteria are based on limited data from the 1979 and 1980 midwinter bald eagle surveys, plus the opinions of several researchers. The adequacy of these criteria will be reassessed in updates to the Plan, as more data become available. Except for locations used primarily during winters with severe weather, essential habitats should have a history of long-term use (e.g., five years or more) or, if such documentation is lacking, there should be evidence that the area is capable of supporting bald eagles on a long-term basis.

Two weeks, which is roughly eight to 12% of the wintering period for most migrants, was chosen somewhat arbitrarily as the minimum period a site must be occupied annually to be considered an essential habitat. Most essential habitats probably are used longer than this, while relatively unimportant areas (except for locations used during severe weather conditions) are used for shorter time periods.

Levels of use in the second and third criteria also are based on analysis of midwinter survey data plus input from eagles researchers, and differ throughout the Region. The numbers (5 and 15) should be considered as reference points. Areas demonstrating historic consistent use should be regarded as essential habitat if still suitable regardless of present use, even if fewer than 5 or 15 birds are present. The Great Lakes and Northeast support a low percentage (probably less than 15%) of the winter use now occurring in the Region. Within these states a location that regularly supports 5 or more eagles is quite unusual. Preserving such sites is important for three reasons: (1) suitable wintering habitat should be available throughout the Region, (2) the amount of suitable habitat remaining in the Great Lakes and northeast states may be quite limited, and (3) they should be maintained for

future use by eagles from the nesting populations that hopefully will be restored in the eastern portion of the region. The situation farther west is different because the numbers of wintering areas and eagles are much higher. Management is recommended for any location in the western portion of the Region that annually support 15 or more eagles. Management of sites with fewer eagles is strongly encouraged, although not at the expense of preserving areas that support more. Concerned parties in each state should work together to establish priorities for inventory and management of wintering habitats.

Guidelines for delineating the boundaries of essential habitats are as follows:

1. The configuration of each essential habitat should include roost sites and associated aquatic and terrestrial feeding areas, prey habitat, and other biological or physical features necessary for continued use of the site.

2. Essential habitat boundaries should correspond to legal land lines or survey descriptions to facilitate identification.

3. The configuration of each essential habitat should be contiguous unless feeding areas and night roosts or other essential habitat components are physically seperate.

4. Essential wintering habitat may include private as well as public land.

Recommendations concerning essential winter habitat are for the Northern States Region only. Many adult and immature eagles from breeding areas in the Region rely heavily on wintering areas outside the Region. This is one of several issues that needs to be coordinated in the five bald eagle recovery plans.

# PART II

# RECOVERY

## GENERAL COMMENTS

PRIMARY OBJECTIVE: To re-establish self-sustaining populations of bald eagles in suitable habitat throughout the Northern States Region. The initial, tentative goal is to have 1,200 occupied breeding areas distributed over a minimum of 16 states within the Region by the year 2000, with average annual productivity of at least 1.0 young per occupied nest.

The primary objective is viewed as that point of recovery when the bald eagle population is secure and may be taken off the threatened and endangered species list. For purposes of this recovery plan, the eagle population within the region will be treated as a unit and reclassification would occur when the objective is met. The terms endangered and threatened are legal definitions and do not necessarily reflect the biology of the species. When 1,200 occupied breeding areas have been reached, the threats identified for listing the species will have to be reassessed but may be assumed to have been alleviated.

Within their geographic range bald eagles make varied and irregular movements, use a variety of habitats, and are affected by complex environmental factors. Faced with this multidimensional problem the plan starts with the following sequence of recovery: 1) find out what we already have, 2) determine what is needed for the continued and safe existence of bald eagles, and 3) implement the necessary management. Communication is so important that it is treated as a separate, fourth, item in the Plan (Figure 3). The plan is organized on a logical basis. Priorities for different steps are established in the implementation section, Part III.

Enough is known about bald eagle populations to recommend initial, tentative population goals based on our subjective understanding of bald eagle population sizes and dynamics. Specific management programs are recommended for initiation or expansion (see Appendices E and G).

The initial goal of 1,200 occupied breeding areas (as an index of the number of breeding pairs) is the summation of estimated safe and reasonable numbers needed in various states (Table 3). The goal for each state was obtained by considering historical information, known numbers of occupied areas, and estimated available habitat. State and federal agencies plus researchers working in particular states have been

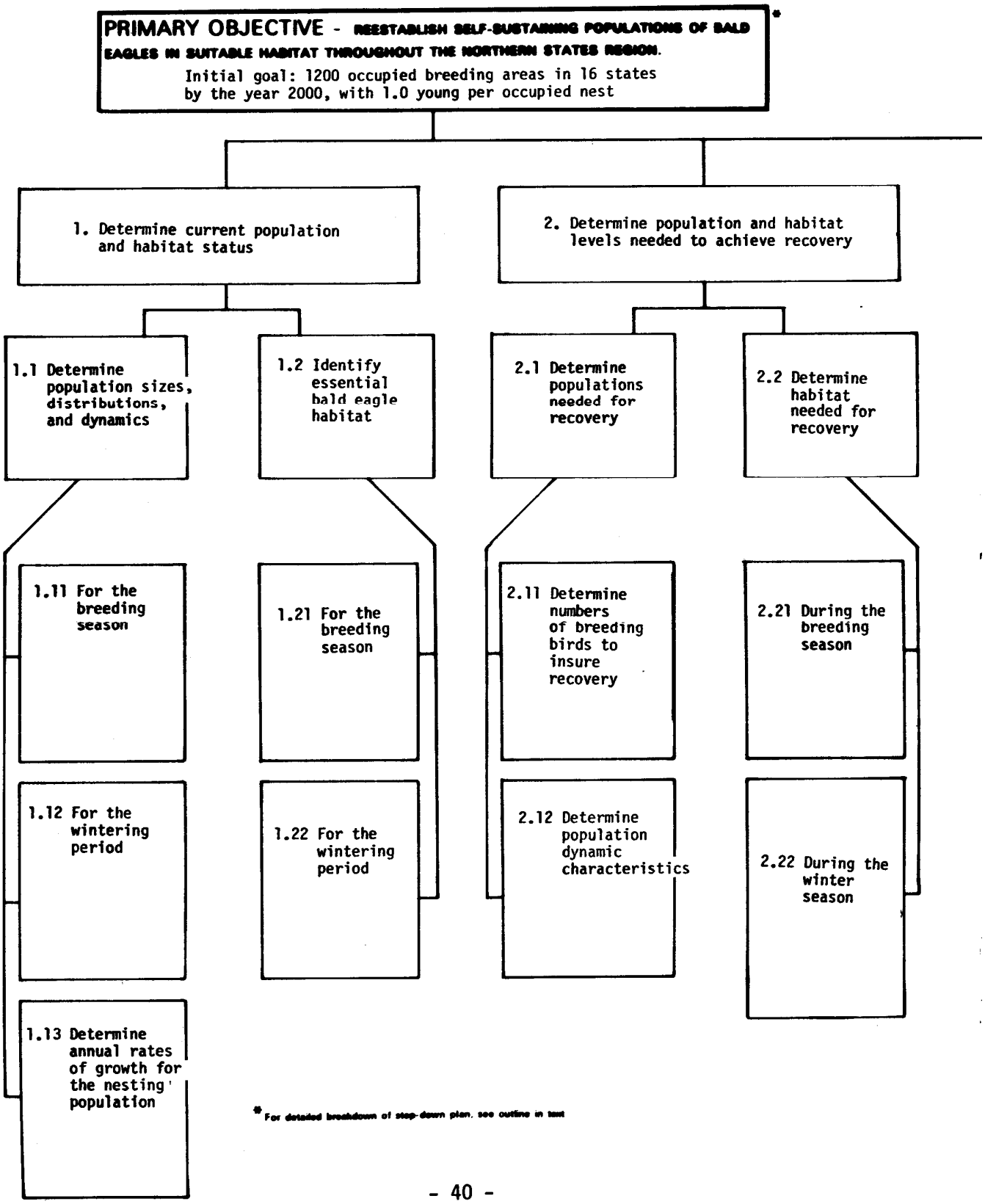
contacted for their opinions. For states presently with few or no nesting bald eagles, consideration was given to whether a goal of any nesting eaagles was reasonable. If so, a more or less arbitrarily goal of at least 10 occupied breeding areas was used unless more specific values were provided from that state.

Given that there are approximately 570 known pairs (occupied breeding areas) in the region and assuming exponential growth and adequate resources, the goal of 1,200 could be reached by the year 2000 with an overall population growth rate of about 4% per year, a reasonable population growth rate for bald eagles. (The maximum growth rate, with highest reasonable rates of reproduction and survival, would be around 11% per year.) As more refined population and habitat data become available, the numerical goal may be adjusted in subsequent revisions of the Plan.

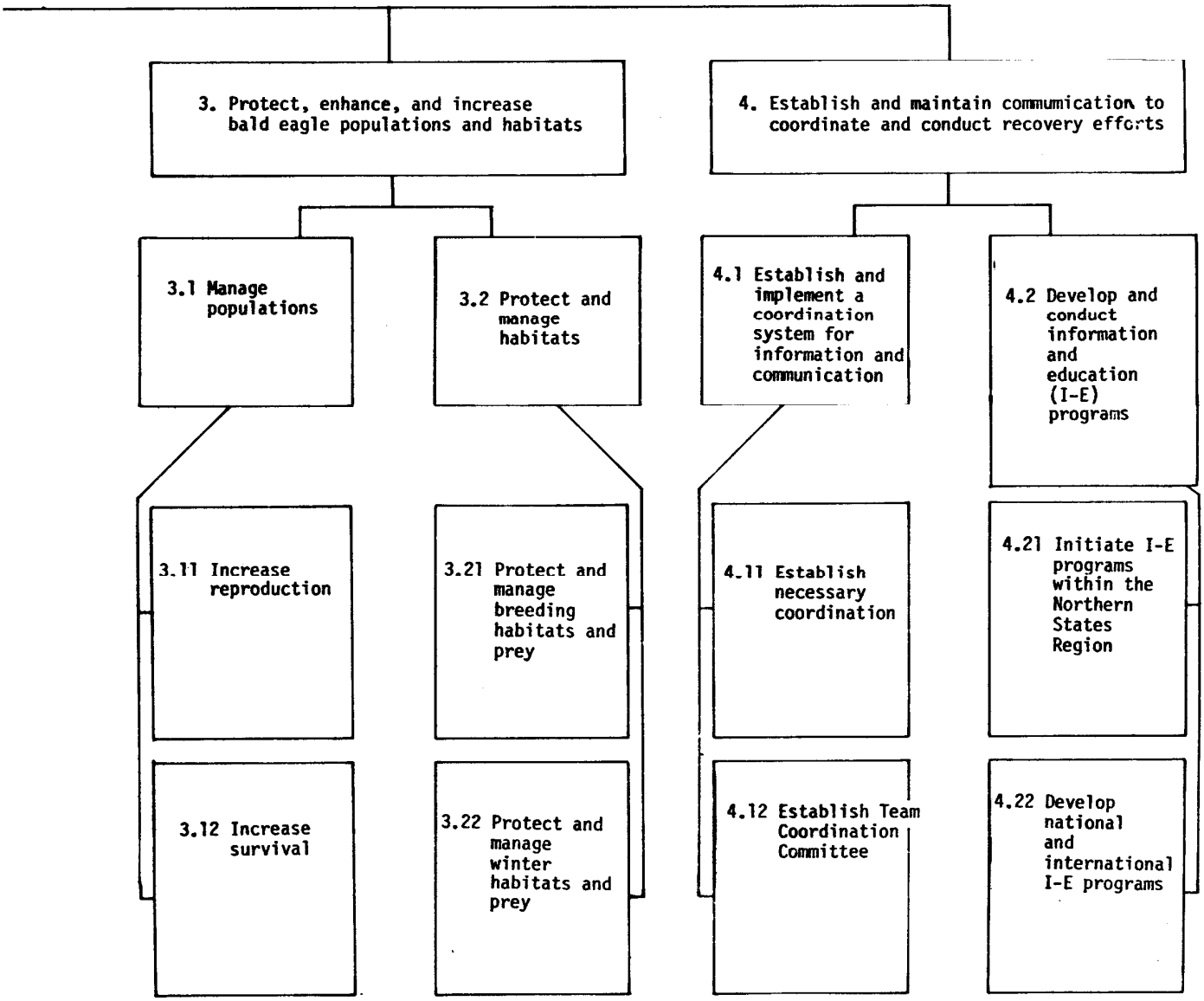
Table 3. Number of occupied bald eagle breeding areas in the Northern States Region.

| State | Known as of 1981 | Goal for 2000 AD |
|---|---|---|
| Colorado | 5 | 10 |
| Connecticut | 0 | 10 |
| Illinois | 2 | 20 |
| Indiana | 0 | 5 |
| Iowa | 1 | 10 |
| Kansas | 0 | 0 |
| Maine | 64 | 150 |
| Massachusetts | 0 | 10 |
| Michigan | 102 | 140 |
| Minnesota | 190 | 300 |
| Missouri | 2 | 50 |
| Nebraska | 0 | 10 |
| New Hampshire | 0 | 5 |
| New Jersey | 1 | 10 |
| New York | 2 | 50 |
| North Dakota | 0 | 10 |
| Ohio | 6 | 20 |
| Oklahoma | 1 | 10 |
| Pennsylvania | 4 | 10 |
| Rhode Island | 0 | 0 |
| South Dakota | 0 | 0 |
| Vermont | 0 | 0 |
| Utah | 0 | 10 |
| Wisconsin | 188 | 360 |
| Total | 568 | 1,200 |

Figure 3. **MAJOR STEPS IN THE**



## NORTHERN STATES BALD EAGLE RECOVERY PLAN



## NORTHERN STATES BALD EAGLE RECOVERY OUTLINE

PRIMARY OBJECTIVE: To re-establish self-sustaining populations of bald eagles in suitable habitat throughout the Northern States Region. The initial, tentative goal is to have 1,200 occupied breeding areas distributed over a minimum of 16 states within the Region by the year 2000, with average annual productivity of at least 1.0 young per occupied nest.

1. Determine current population and habitat status.

1.1 Determine population sizes, distributions and dynamics.

1.11 For the breeding season.

1.111 Annually inventory and map bald eagle breeding areas. (Appendix D)

1.112 Determine the distribution and abundance of immatures and nonbreeding adults.

1.12 For the wintering period.

1.121 Determine distribution and abundance throughout the wintering period.

1.1211 Analyze existing data.

1.12111 Analyze data for the Mississippi River.

1.12112 Analyze National Wildlife Federation Midwinter Bald Eagle Survey data on a nationwide basis.

1.12113 Analyze state and federal agency data.

1.12114 Synthesize information from 1.12111-1.12113.

1.1212 Conduct surveys. (Appendix F)

1.1213 Determine habitat use in local areas.

1.122 Band and color mark nestlings.

1.123 Radio tag nestling, immature, and adult eagles.

1.13 Determine annual rates of growth for the nesting population.

1.131 Estimate rates from changes in actual numbers of breeding eagles (from 1.111).

1.132 Estimate rates from life equation modeling.

1.1321 Estimate rates of reproduction.

1.1322 Estimate age- and time-specific survival rates.

1.133 Obtain and record supplementary information from all bald eagles found dead or injured (Appendix B).

1.2 Identify essential bald eagle habitat.

1.21 For the breeding season (Appendix E).

1.211 Current or recently occupied habitat.

1.2111 Assess the attributes, including prey resources, of each area that contains a nest in usable condition.

1.2112 Assess areas used by nonbreeding birds, particularly immatures.

1.212 Unoccupied habitat which appears suitable.

1.2121 Develop criteria for evaluating unoccupied habitat.

1.2122 Evaluate suitability of historic sites.

1.2123 Evaluate suitability of potential sites (such as newly created reservoirs).

1.22 For the wintering period (Appendix G).

1.221 Assess the attributes of feeding areas and night roosts in occupied habitat.

1.222 Unoccupied habitat which appears suitable.

1.2221 Develop criteria for evaluating unoccupied habitat.

1.2222 Evaluate historic sites.

1.2223 Evaluate potential sites.

2. Determine population and habitat needed to achieve recovery.

2.1 Determine populations needed to achieve recovery.

2.11 Determine numbers of breeding birds to insure recovery.

2.111 Determine number of breeding and nonbreeding birds.

2.112 Determine distribution of breeding and nonbreeding birds.

2.12 Determine population dynamic characteristics.

2.2 Determine amount and quality of habitat needed for recovery.

2.21 During the breeding season.

2.211 Determine the amount, distribution, and quality of habitat needed for recovery of the breeding population (cf. 2.111).

2.212 Determine habitat needed for nonbreeding birds during the breeding season.

2.22 Determine amount, distribution and quality of habitat necessary for the winter-season survival of eagles.

3. Protect, enhance and increase bald eagle populations and habitats.

3.1 Manage populations.

3.11 Increase reproduction.

3.111 Transplant and foster wild or captive-produced young to suitable areas.

3.112 Conduct research on efficient captive-breeding techniques for contingency production of young.

3.1121 Propogate bald eagles in captivity for reintroduction.

3.1122 Establish communication among all facilities and projects with captive bald eagles.

3.12 Increase survival.

3.121 Reduce shooting mortality.

3.1211 Develop and conduct public education programs (also see 4.2).

3.1212 Increase emphasis on enforcement of the Bald Eagle Act, Endangered Species Act, and cooperation with the Indian Religious Freedom Act.

3.12121 Develop state and federal law enforcement strategy plans.

3.12122 Seek maximum penalties for convicted violators.

3.122 Reduce accidental trapping of eagles.

3.1221 Revise fur-bearer trapping regulations where significant problems and or mortality are documented.

3.1222 Conduct education programs for trapping.

3.123 Avoid exposure to, and reduce effects of environmental contaminants.

3.1231 Measure and report contaminants in all carcasses and eggs that become available, and periodically sample prey for contamination.

3.1232 Deal with point and area sources of known contaminants.

3.12321 Rigidly enforce existing pollution laws and regulations and seek additional restrictions as required. This involves U.S. EPA working in conjunction with state pollution control agencies.

3.12322 Respond to emergency situations involving hazardous materials.

3.1233 Participate in pollution contingency planning for agency response to chemical spill emergencies.

3.1234 Use steel shot in waterfowl hunting where significant problems concerning bald eagles are demonstrated or documented.

3.1235 Use measures to eliminate the effects of acid rain.

3.124 Reduce accidental power line electrocution of eagles.

3.1241 Identify lines causing electrocutions.

3.1242 Modify existing problem lines and construct new lines in accordance with recommended standards.

3.125 Rehabilitate sick and injured eagles at specialized clinics.

3.2 Protect and manage habitats.

3.21 Protect and manage breeding season habitat and prey resources (Appendix E).

3.211 Develop and implement site-specific management plans for known breeding areas and important habitat used by

nonbreeders, whether on state, federal, or private property (Appendix E).

3.212 Develop and implement management plans for potential or degraded habitat.

3.22 Protect and manage habitat and prey resources used by wintering eagles.

3.221 Develop and implement site-specific management plans for essential wintering areas.

3.222 Develop and implement management plans for potential or degraded habitat.

4. Establish and maintain communication to coordinate and conduct recovery efforts.

4.1 Establish and implement a coordination system for information and communication (Figure 4).

4.11 Establish necessary coordination.

4.111 Establish coordination for the Northern States Region.

4.112 Establish coordination in each state or federal agency to coordinate all eagle work for that state or agency.

4.12 Establish an inter-recovery team coordination committee.

4.2 Develop and conduct information and education (I/E) programs designed to protect and restore the bald eagle.

4.21 Initiate I/E programs within the Northern States Region.

4.211 Inform and educate the general public.

4.2111 Develop and disseminate brochures and posters. Currently available materials should be used where appropriate.

4.2112 Develop press release kits for newspapers, radio stations and TV stations.

4.2113 Develop audio-visual programs for loan to schools and interested groups and organizations.

4.2114 Establish guided tours or viewing stations of wintering areas where possible.

4.2115 Provide displays of post signs at public boat landings in areas used by bald eagles.

4 2116 Prepare magazine articles to inform identified target groups.

4.212 Inform and educate public resource management agencies.

4.2121 Develop and conduct seminars and technical training workshops.

4.2122 Initiate, produce and disseminate a periodic newsletter on progress of recovery effort.

4.22 Develop national and international I/E programs.

4.221 Develop films on the bald eagle in North America.

4.222 Develop press release packages for release at the national/ international level.

RECOMMENDED LINES OF COMMUNICATION
TO IMPLEMENT THE NORTHERN STATES BALD EAGLE RECOVERY PLAN

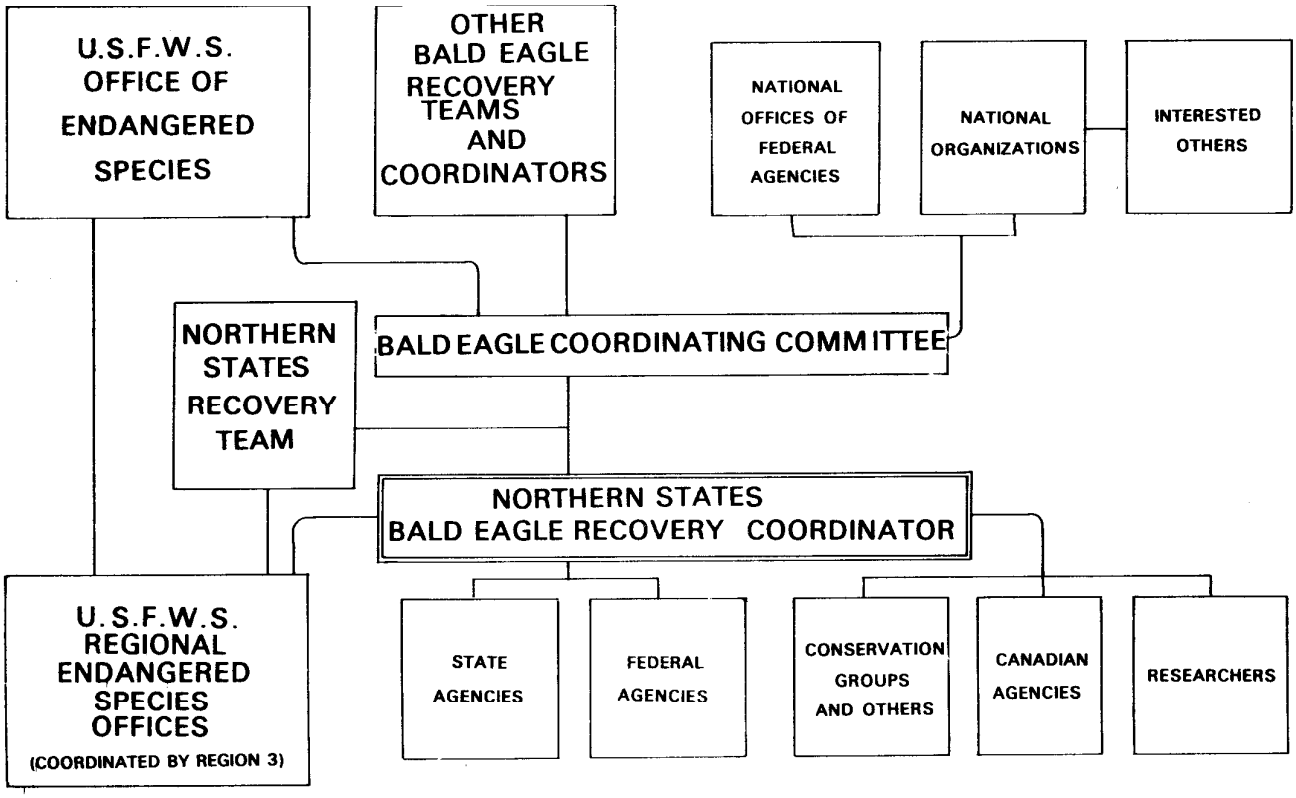



*Figure 4*

## RECOVERY OUTLINE NARRATIVE

Note: Items not considered to need discussion or where discussion is covered in substeps are listed by title only.

1. Determine current population and habitat status. Several years of work by agency and individual researchers have yielded much information on the status of the bald eagle in the Region. Information is particularly good for nesting birds; probably 75% or more of all breeding areas are known. But coverage has been uneven from state to state and only partially coordinated between states. To evaluate changes in status and effects of management activities, we need more complete and standardized information about the present status of regional populations and their habitats. Also, information from parts of this step of the outline is necessary for some of the determinations called for in the second major step.

Few persons have the experience that qualifies them for surveying eagles in the field. Much of the work is specialized and cannot be conducted safely or reliably by unqualified persons, including many biologists who may be experienced in working with other species. The expertise of qualified persons should be used in field operation and in the recruitment and training of new workers. Experience also is needed by pilots of aircraft used in specialized low-altitude surveys.

1.1 Determine population size, distribution, and dynamics. Actual size and dynamics characteristics (reproduction and survival) need to be determined for the region. These two classes of information (actual numbers vs. dynamics) provide independent measures of status. By comparing the two approaches, overall interpretations regarding whether the status of the species is reasonable and can be confirmed. If the outcomes do not agree, problems can be detected and means of rectifying the discrepancies can be sought. Information on distribution will enable us to form a better overview of possible distinctions among geographically separate subdivisions of the regionwide population. Also, information on distribution will be used to identify locations where management is needed.

1.11 For the breeding season.

1.111 Annually inventory and map bald eagle breeding areas. (Appendix D) This annual survey provides the single most important index to the

size and health of the eagle population. Productivity data are required for step 1.1321. A total inventory may be unlikely, but searching for unrecorded breeding eagles is needed to make the list as complete as time, funds and manpower will permit. It is particularly important to find new breeding areas and to monitor the breeding population as it increases in size. This provides the most practical measure of the status of the endangered population and progress toward the goal for which we are managing. The annual breeding area survey is thus by far the single most important management need. An attempt should be made to count all occupied breeding areas.

In addition to monitoring known productivity and finding previously unknown breeding areas, inventorying replacement nests is needed. Annual losses of nest structures, resulting from wind and weak trees or supporting branches, may be as high as 12%.

Annual summary statistics on breeding areas should be sent to the appropriate FWS Region and other concerned federal and state agencies. Maps and specific locations, as in site-specific management plans, should not be centralized. A concentration of specific location information at one point could expose too much of the population at one time to risks from unauthorized access to the data. If the location data remain dispersed with state or other agencies, smaller segments of the population would be vulnerable at one time, unauthorized accesses would be slowed, and there would be increased chances of detecting unauthorized uses. Legitimate access to the local data as needed, such as for Section 7 consultation, would still be possible through an appropriate communication system (see task 4.1).

1.112 Determine the distribution and abundance of immatures, and nonbreeding adults. Breeding adult eagles are the most visible and obvious members of the population during the breeding season. There are, however, immatures and some adults that are not breeding. These constitute the so-called "floating" segment of the population. Those nonbreeding birds may enter the breeding population during subsequent years and the future welfare of nesting eagles in the contiguous states depends on their survival. We must remain alert to their presence and importance and take steps to provide for their welfare. By the very nature of their less-obvious presence, these nonbreeding birds are usually more difficult to locate. Personnel in the field must remain alert and watch for the presence of these birds, and researchers should seek more reliable ways (other than chance encounters) to locate and follow such birds, perhaps through radio-telemetry.

1.12 For the wintering period.

1.121 Determine distribution and abundance throughout the wintering period. Locations used during the fall and late winter migration

periods, as well as those used during midwinter when many eagles are relatively sedentary, contribute significantly to the physiological condition of the birds and hence affect survival, reproductive success, and population growth. Thus, the identification and management of major wintering areas is of considerable importance in the recovery effort.

1.1211 Analyze existing data. Some of the information needed to identify important wintering areas already exists, but is scattered in the form of file data, unpublished theses and reports, or other documents. Comprehensive analyses of existing data should be undertaken to determine what information is already available. Surveys can then be designed in a manner that assures that additional data needed to identify important habitat (or needed for related recovery tasks) are obtained. By making full use of existing data, redundancy of survey efforts can be eliminated and their cost-effectiveness improved. Analysis of the data on wintering eagles along the Mississippi River is needed.

1.12111 Analyze data for the Mississippi River. The U.S. Fish and Wildlife Service is identified as the lead agency but this could be done on a contract basis.

1.12112 Analyze National Wildlife Federation Midwinter Bald Eagle Survey data on a nation-wide basis. Financial and technical support for this work, which also could be done on a contract basis is needed. The analysis should be for the entire country, not just the Northern States Region. Analyses by individual state and federal agencies (cf. 4.112) should be coordinated within each state and also with the U.S. Fish and Wildlife Service.

1.12113 Analyze state and federal agency data. State and federal agency personnel (cf. 4.112) should review, analyze, and summarize their existing data; cost is included in the budget for 4.112.

1.12114 Synthesize information from 1.12111-1.12113. A much-needed task is for someone/group to pull the previous three items together and sort usable from unusable data. This could be done by a northern states Regional Coordinator. Note also that the analysis of existing data is to precede intensive winter survey work (1.1212). The analysis, setting of priorities, interagency coordination, planning etc. will take at least a year, hence tasks related to the surveys/habitat assessments probably should not begin before year two.

1.1212 Conduct surveys. (Appendix F.) Some areas support relatively high numbers of birds for several weeks or months nearly every year. These locations can be identified (as some already have been) by conducting surveys. Numerous intensive surveys may be needed in local areas to determine the period(s) of use and to locate key feeding areas

and communal roost sites. Priorities for such studies should be identified in a coordinated manner by state and federal agencies (cf. 1.1211 and 4.112). We do not believe that total counts or statistical verification of abundance estimates are feasible or necessary at this time. However, reliable indices of abundance definitely are required to assess the relative importance of various wintering areas. The importance of using qualified personnel and standard survey procedures, as described in Appendix F cannot be over-emphasized.

1.1213 Determine habitat use in local areas. In some locations feeding and night roost areas are relatively obvious and can be identified during aerial or ground surveys. In other locations, important habitat will have to be identified from radio-telemetry (also see below, 1.1222). Priority for determining habitat use through radio-telemetry or other means, should be given to studies in areas identified as essential habitat. Information concerning young birds (through age two) is especially important, since mortality is highest for these birds. Telemetry studies, including the capture of birds, should be conducted or supervised by persons with demonstrated expertise. Information obtained by completing this step will be used to develop site-specific management plans (cf. 3.222).

1.122 Band and color-mark nestlings. Returns from birds banded as nestlings provide valuable information concerning the extent of seasonal movements. Banding a large number of nestlings (ca. 500/year) in conjunction with adult bandings should assure sufficient recoveries to estimate the age-specific survival rates needed for population modeling (cf 1.1322).

Sightings of color-marked bald eagles (Appendix C) provide data on seasonal use areas, migration routes, and fidelity to areas used in the nesting and wintering periods. Protocol for marking should be followed to eliminate problems of identifying geographic origins of color-marked birds.

There has been some concern that climbing to nests and banding nestlings may interfere with reproduction during that same or subsequent years. One or two possible adverse incidents have been called to the Recovery Team's attention but only two or three birds were involved and the evidence was circumstantial. On the other hand, evidence from well over 3,000 bandings of nestlings and a large-scale, controlled experiment (Grier 1969) designed specifically to test for potential disruptions from banding have shown no such problems. Climbing to nests and banding of nestlings by properly qualified, experienced personnel has not been demonstrated to pose a threat to the eagles or their productivity.

1.123 Radio tag nestling, immature, and adult eagles. Traditional radio-telemetry techniques such as tracking with fixed-wing aircraft

have provided much useful information and should be continued. For following larger numbers of birds at lower cost, satellite tracking of radio-telemetered birds should be developed. Feasibility studies of this technology are underway and should be continued. The initial costs of satellite tracking technology may be high. However, the technology would vastly improve our capabilities and should be more cost-effective in the long run. Such technology could provide data in several areas simultaneously, including daily and seasonal movements (which will show where the birds are and what habitat they are using). Tracking subadult and nonbreeding adult birds would give better access to the so-called "floating" population. Satellite tracking would permit more readings on larger numbers of eagles over wider areas and for longer periods of time at a much lower cost than by following individual birds from the ground or with aircraft, as at present. Satellite tracking of large numbers of birds could provide signigicant data on survival rates (see 1.1322, below).

1.13 Determine annual rates of growth for the nesting population.

1.131 Estimate rates from changes in actual numbers of breeding eagles (from 1.111). This is one of two main approaches toward measuring rates of total population increase or decrease. The difference from one year to the next will provide the finite rate of change for that year. The finite rate is then easily converted to the instantaneous rate of change. This approach to deriving the rate of change uses only actual population sizes and not information on reproduction and survival. This is the most practical approach to determining and monitoring the status of the species. The importance of this point underlines the importance of maintaining annual nesting surveys and of having as complete coverage as possible, including potential nesting areas.

1.132 Estimate rates from life equation modeling. Life equation modeling (several models are available, the "Life Table" is perhaps the most familiar) is the second major approach for deriving estimates of rates of population change. These methods are somewhat more complicated and less direct but they provide, with suitable data on reproduction and survival, an alternative and check on estimates derived from population numbers alone. Note that this method uses only reproduction and survival information and not information on actual population sizes.

Preliminary work already has been conducted and published (Grier 1980). As results become available, new data should be incorporated into the modeling work. Relative to much of the other research, this work will require minimal funding.

1.1321 Estimate rates of reproduction. The usual information required is the average number of female offspring per adult female (usually

obtained by determining nesting success and by assuming 50:50 sex ratios among fledglings). The problem is that this information is needed for the entire adult population, i.e., including nonbreeding adult females. Thus, in addition to the information routinely gathered for eagles occupying breeding areas, it also would be desirable to determine the proportions of adults at such areas. This will require new research and new techniques. Satellite and ground tracking of sufficient numbers of adults radio tagged at wintering locations, for example, would permit us to follow individuals into the breeding season to determine the percentages of nesting and non-nesting birds. Many birds trapped at wintering sites will be from Canada and will not provide information that specifically applies to the birds in our Region. However some, perhaps many, winter-captured birds will be from nesting areas within our Region. In the meantime, and from a practical standpoint, our best short-term hope is for good year to year information on actual numbers of nesting birds (see 1.131).

1.1322 Estimate age- and time-specific survival rates. Information on survival is almost completely missing at present. Survivorship cannot even be estimated crudely without making some large and probably unrealistic assumptions. At present there is a major need for useful survival estimates, but such information is extremely difficult to obtain. Possible techniques for obtaining survival information which need to be further explored include increased banding of nestlings, a large effort to trap and band adults by qualified personnel, and the following of large numbers of eagles that are individually marked in other ways.

Proper statistical techniques for analyzing banding data require recoveries of birds banded as adults. Radio-telemetry of large numbers of birds, enough to give information on rates, is an alternative to banding. Again, adult captures are needed. Therefore, a significant part of the research needs to be the development of safe and reliable techniques for catching wintering and breeding adults. Adult bald eagles have been trapped and tagged during the wintering period in the central and western U.S. and in different seasons in Alaska, but attempts to capture adults nesting in the upper midwest have met with little success. Initial pursuit of the problem could be by one or more persons in university or federal/state agency capacities. When techniques have been perfected, trapping by qualified personnel should be encouraged on a larger scale.

1.133 Obtain and record supplementary information from all bald eagles found dead or injured (Appendix B). This step does not constitute a major thrust of the recovery plan, but provides an opportunity to obtain incidental and supplemental information on the species. Information from birds found dead, injured, or which otherwise come into our hands from the wild populations should be organized, standardized, and centralized. Useful categories of information include morphological, physiological, and population-related data. The latter category includes such things as causes of death or injury, geographical

locations of different types of problems, and whether birds are marked or unmarked. Standardized procedures should be developed by the National Wildlife Health Laboratory in consultation with eagle researchers.

1.2 Identify essential bald eagle habitat.

Assessments at a particular site should be carried out by the state or federal agency responsible for habitat management of that site, e.g., states would do evaluations on state-owned land, the U.S. Forest Service on national forest lands, and so on. Habitat assessments that involve private property should be conducted by the U.S. Fish and Wildlife Service or cooperating state agencies, with the consent of landowners. Coordination among the various agencies engaged in this task is essential to assure that data are collected in a standard format and to minimize duplication of effort.

1.21 For the breeding season (Appendix E).

1.211 Current or recently occupied habitat.

1.2111 Assess the attributes, including prey resources, of each area that contains a nest in usable condition. The first step in preparing management plans for the protection and perpetuation of eagle breeding habitat is to locate nest sites precisely and assess existing habitat conditions and features of the immediate area.

Appendix E details the information needed for this task. A standardized format for recording information needs to be developed. This would provide for an orderly system of data collection throughout the Region. Land controlled and managed by state or federal resource agencies generally will provide more flexibility and security for the breeding birds than will privately-owned lands. Thus, an inventory of land ownership patterns within essential habitat is an important element to consider in management planning. This inventory will be the basis for task 3.211. We know very little of the relationship between aquatic prey populations and the conditions that make them available in sufficient quantity to support eagles. Factors such as lake and river morphometry, water chemistry and hydrology need to be quantified and analyzed for occupied breeding areas. Such data may permit management to enhance prey availability and prevent habitat degradation. Bird, mammal, and fish prey and carrion species should be considered.

1.2112 Assess areas used by nonbreeding birds, particularly immatures. During the breeding season, a significant number of non-nesting eagles utilize habitats dispersed throughout the breeding range. Immatures are thought to comprise the majority of these nonbreeders, and their habitat requirements are poorly understood. Documentation of the characteristics of habitats used by immatures will allow development ofcomprehensive management strategies to include this important segment of the population.

1.212 Unoccupied habitat which appears suitable.

1.2121 Develop criteria for evaluating unoccupied habitat. At present we have insufficient understanding to recommend criteria for evaluating unoccupied habitat. In general this habitat will resemble occupied habitat but specific criteria need to be developed.

1.2122 Evaluate suitability of historic sites. Breeding habitats formerly used by eagles should be inventoried and evaluated. Priorities for subsequent management should be established based on their restoration potential.

1.2123 Evaluate suitability of potential sites (such as newly created reservoirs). Certain unoccupied natural or man-made habitat might be usable by eagles. These areas should be identified, based on their suitability for supporting eagles during the breeding season.

1.22 For the wintering period.

1.221 Assess the attributes of occupied wintering areas. As with nesting areas, the initial step in managing important wintering habitats is to assess existing conditions, particularly at feeding areas and night roosts. Appendix G details the information needed for this task. Priority should be given to assessing the characterisitcs of essential habitats.

1.222 Unoccupied habitat which appears suitable. Bald eagles are widespread during the wintering period and we suspect that most habitats with suitable food resources and night roost sites are occupied. However, there may be a few suitable historic locations that are not being used. There are also several locations where the potential for use may be good if missing elements in the environment are developed. Suitable historic and potential areas should be identified and managed. Many of these sites could become increasingly important as currently occupied habitats become unsuitable for use. At present there is insufficient understanding to recommend criteria for evaluating unoccupied habitat. In general this habitat will resemble occupied habitat but specific criteria need to be developed.

1.2221 Develop criteria for evaluating unoccupied habitat.

1.2222 Evaluate historic sites. (See 1.2222.)

1.2223 Evaluate potential sites. Some areas are unoccupied because they lack suitable food resources, hunting perches, night roost sites, or some other critical element. Features of potential sites should be compared with characteristics of occupied habitat (cf. 1.221) to determine the presence or absence of key features. Identifying and subsequently providing these missing elements may be feasible in some locations. For example, suitable fish might be introduced to bodies of

water devoid of suitable prey. Similarly, there may be areas where food resources are present but suitable hunting perches or night roost trees are absent, and could be planted.

2. Determine population and habitat needed to achieve recovery. When actual population sizes and dynamics, including reproduction, survival, and growth rates, are better known and when better estimates of reasonable upper and lower limits of these parameters are obtained, it will become possible to simulate bald eagle population dynamics. Such simulations, utilizing a variety of different models and done with the aid of computers will provide much more insight into critical population dynamics and sizes than we currently possess. It is presumed that there will be refined information and definitions of what constitutes endangered vs. non-endangered species and populations in general within the foreseeable future. Improved information, insights, and perspectives will allow us to refine our initial population goals. When we have better estimates of necessary numbers for self-sustaining populations, in conjunction with information on amount of habitat needed, we also will be able to more objectively refine habitat goals.

Most of the substeps listed under this section simply outline the population and habitat items that we feel need to be determined. As such it is a list that may be added to, subtracted from, or reorganized with future thinking.

2.1 Determine populations needed to achieve recovery.

2.11 Determine numbers of breeding birds to insure recovery of birds during the breeding season.

2.111 Determine number of breeding and nonbreeding birds.

2.112 Determine distribution of breeding and nonbreeding birds.

2.12 Determine population dynamic characteristics.

2.2 Determine amount and quality of habitat needed for recovery.

2.21 During the breeding season.

2.211 Determine the amount, distribution, and quality of habitat needed for recovery of the breeding population (cf. 2.111).

2.212 Determine habitat needed for nonbreeding birds during the breeding season.

2.22 Determine amount, distribution and quality of habitat necessary for the winter-season survival of eagles.

3. Protect, enhance and increase bald eagle populations and habitats.

3.1 Manage populations. Though the Recovery Plan treats the eagles in the Northern States Region as one population, specific geographic areas must be managed individually.

3.11 Increase reproduction.

3.111 Transplant and foster wild or captive-produced young to suitable areas. Intensive work with transplanting ("hacking") nestlings in New York since 1976 has demonstrated the potential of this technique for reintroducing bald eagles to areas where former populations have been reduced or eliminated. Color-marked eagles introduced in 1976 successfully nested and raised young in New York during 1980. Another introduced eagle in New York paired in 1981 with an older eagle that recently had lost its former mate. Criteria governing populations needing artificial enhancement should be developed. Procedures for insuring the health of translocated birds also should be developed. Supplemental related techniques include fostering of young in nests that fail but continue to be attended by adults. (For current policy, see Appendix H.)

3.112 Conduct research on efficient captive-breeding techniques for contingency production of young. It is not yet necessary to use captive breeding as the only source of young. Adequate numbers of young probably are being produced in the threatened populations of Minnesota, Wisconsin, and Michigan and in the non-endangered populations of Alaska to permit limited, judicious use of those birds for reintroductions. However, captive-produced young should be used for transplanting whenever possible, and successful captive-breeding programs should be maintained. Research on the behavior, physiology, and efficient management of captive-breeding bald eagles should be continued at the Patuxent Wildlife Research Center to prepare for the possibility that captive breeding might be the only feasible or permissible source of young.

3.1121 Propogate bald eagles in captivity for reintroduction. Because bald eagles currently are being bred in captivity at the Patuxent Wildlife Research Center, the continuation of Patuxent's research-oriented facility should operate in conjunction with all of the bald eagle recovery programs. A centralized national captive-breeding

facility (in conjunction with FWS regions) is the most cost effective method of captive propogation.

3.1122 Establish communication among all facilities and projects with captive bald eagles. A number of bald eagles currently are in captivity in zoos and other facilities. Some are breeding and producing young, and occasionally birds become available for relocation. Organized communications are needed to insure maximum use of captive-bred young for reintroductions, exchange of excess or unwanted adults, and exchange of information on management and breeding techniques.

3.12 Increase survival.

3.121 Reduce shooting mortality.

3.1211 Develop and conduct public education programs (also see 4.2). State and federal agencies working in cooperation with hunter organizations, hunter safety programs and local governments should develop and implement programs designed to reduce illegal shooting of eagles.

3.1212 Increase emphasis on enforcement of the Bald Eagle Act, Endangered Species Act, and cooperation with the Indian Religious Freedom Act.

3.12121 Develop state and federal law enforcement strategy plans. It has been demonstrated illegal shooting in one of the greatest causes of adult mortality. Additionally, disturbances during breeding season is a problem in some areas.

3.12122 Seek maximum penalties for convicted violators.

3.122 Reduce accidental trapping of eagles. Several states recently have enacted legislation or regulations to reduce the number of eagles and other raptors accidentally caught in traps set for furbearing animals. The problem has largely (but not entirely) involved exposed baits visible from the air or nearby perches. The regulations in North Dakota, for example, state:

> It is unlawful to place traps within 25 feet of any sight-exposed bait. A sight-exposed bait is defined as any bait weighing in excess of one pound, composed of animal flesh, fur, hide, entrails, or feathers placed in such a manner that it can be seen by any soaring hawk, owl, or eagle.

North Dakota, in its trapper education series, also produces a handout for trappers explaining the regulation, its purpose, and alternate trapping methods (title: "The Carcass Or Exposed Bait Set," available from North Dakota Game and Fish Department, 2121 Lovett Ave., Bismarck, ND 58505). Other states that have not done so should adopt

similar regulations and educational programs. Spring trapping of beaver and otter, where permitted, usually overlaps with the spring migration of eagles. Data from raptor rehabilitation centers show that eagles are particularly vulnerable to trapping at this time. Winter trapping seasons are recommended for this season. Attention to techniques of trapping also may be required in animal damage control efforts.

3.1221 Revise fur-bearer trapping regulations where significant problems and or mortalities are documented.

3.1222 Conduct education programs for trappers. These programs are needed to enlighten trappers and reduce the potential for accidental trapping of eagles. These effects should be focused on in problem identified areas. 3.123 Avoid exposure to and reduce effects of contaminants.

3.1231 Measure and report contaminants in all carcasses and eggs that become available, and periodically sample prey for contamination.

3.1232 Deal with point and area sources of known contaminants.

3.12321 Rigidly enforce existing pollution laws and regulations and seek additional restrictions as required.

3.12322 Respond to emergency situations involving hazardous materials.

3.1233 Participate in pollution contingency planning for agency response to chemical spill emergencies. Federal and state agencies that have legally mandated emergency programs for responding to chemical spills usually prepare contingency plans. These deal largely with response procedures and delegations of on-scene authority. Agencies also can identify sensitive habitats, especially those that include endangered species, and can list organizations and persons that have specialized expertise to deal with spill emergencies. Vulnerable eagle habitat should be identified in pollution contingency plans along with names of key organizations and persons who could provide technical advice and assistance.

3.1234 Use steel shot in waterfowl hunting where significant problems concerning bald eagles are demonstrated or documented. 3.1235 Use measures to eliminate the effects of acid rain.

3.124 Reduce accidental power line electrocution of eagles. Eagle electrocutions on power lines have been documented in several states, primarily in the west. The problem lines are those with wires so close together that an eagle is apt to simultaneously touch two wires while attempting to land on a pole. Recent work by the U.S. Fish and Wildlife Service in Colorado, Utah, and Wyoming has led to the discovery of several problem lines and hundreds of dead eagles (primarily golden, but also bald) beneath them. The problem seems to be most severe in terrestrial habitats where few suitable natural hunting perches are available. We recommend that the inventory of power lines be continued

and expanded into other states. Existing problem lines should be modified, and new lines built, according to guidelines in Olendorff et al. (1981) available from: Raptor Research Foundation, Department of Veterinary Biology, College of Veterinary Medicine, Univ. of Minnesota, St. Paul, MN 55108.

3.1241 Identify lines causing electrocutions.

3.1242 Modify existing problem lines and construct new lines in accordance with recommended standards.

3.125 Rehabilitate sick and injured eagles at specialized clinics. The Raptor Research and Rehabilitation Unit at the University of Minnesota, College of Veterinary Medicine provides evidence that the rehabilitation of injured bald eagles is one way of reducing mortality. Of 1,544 raptors treated at this facility, 126 were bald eagles. Over 60% of the eagle admissions have been the direct or indirect result of human encounters, e.g., traps, shooting, automobile accidents. Approximately 41% of bald eagles admitted have been released, and recently the figure has approached 50%. Of the 55 bald eagles succesfully reintroduced into their natural habitat, ten have been sighted one or more times in good health. Several have nested successfully after release. Prior to return to the wild, rehabilitated birds should be certified to be free of disease.

In addition to the return of eagles to the wild, rehabilitation facilities accumulate significant baseline data on normal hematology, microbiology, and digestive physiology of the birds. This information provides the basis for improved treatment of future cases which should yield a further increase in the number of birds returned to the wild. Rehabilitation facilities also provide basic information for assessing the health of wild eagles by means such as blood sampling. The rehabilitation effort provides training for veterinarians and wildlife graduate students in the areas of medicine, surgery and physiology of eagles and other raptors, producing an increasing group of people that can provide a high degree of professional health care to bald eagles and other raptors. Further, and perhaps most important, rehabilitation plays a role in public education regarding eagle injuries and encounters with people (including shooting problems).

3.2 Protect and manage habitats. The survival and recovery of bald eagles depends on the maintenance, in perpetuity, of suitable nesting and wintering habitat. Agencies responsible for managing bald eagle habitat should incorporate management guidelines in their land use plans. These agencies should develop and implement site-specific habitat management plans for nesting and wintering areas under their jurisdiction. Coordination among the various agencies is essential (cf. 4.1). In addition, there is a special need to spend time with and encourage private landowners to protect and manage bald eagle habitat (e.g., see letter in Appendix E).

3.21 Protect and manage breeding season habitat and prey resources. The Team recommends habitat management planning similar to that presently being used by the Eastern Region of the U.S. Forest Service and others. These plans describe actions that are prohibited or permitted within specific breeding areas, and will identify essential habitat features that require protection or enhancement (Appendix E).

3.211 Develop and implement site-specific management plans for known breeding areas and important habitat used by nonbreeders, whether on state, federal, or private property (Appendix E).

3.212 Develop and implement management plans for potential or degraded habitat. Many areas undoubtedly exist that could support eagles if certain habitat elements could be provided or modified. Areas identified as suitable or potentially suitable breeding habitat in task 1.2121 should have management plans prepared as described above for occupied breeding areas. Plans should emphasize maintenance of existing habitat, including the prey population, and identification and elimination of limiting factors to permit population expansion into the area by natural or artificial means.

3.22 Protect and manage habitat and prey resources used by wintering eagles (see Appendix G).

3.221 Develop and implement site-specific management plans for significant wintering areas. Management plans for winter habitat, including, but not limited to, areas identified as essential habitat should be developed. Theses plans should enhance important habitat features such as roost sites and food resources. Plans should include maps displaying important habitat in each area.

As in the case of nesting areas, long term protection and implementation of management plans on private lands sometimes may not be possible unless land owners are willing to transfer their land to public ownership or encumber the land through easement, cooperative agreement, or other form of partial interest. State and federal resource management agencies should pursue habitat protection measures such as agreements with private land owners to assure protection of important locations that involve private land.

3.222 Develop and implement management plans for potential or degraded habitat.

Management plans similar to those described above (cf. 3.221) should be prepared for the areas identified in task 1.222. Plans should emphasize maintenance of existing habitat, including the prey base and historic or potential night roost sites, and identification and elimination of limiting factors to permit population expansion into the areas by natural means.

4. Establish and maintain communication to coordinate and conduct recovery efforts.

4.1 Establish and implement a coordination system for information and communication (Figure 4). In addition to items discussed below we mention international coordination and communication. Although we have not laid out specific steps for international contact, it is important that it not be overlooked. The boundary between southern Ontario and the U.S., which artificially bisects a remnant bald eagle population and where the species is declared as endangered on both sides of the U.S. and Canadian border, is particularly important.

4.11 Establish necessary coordination.

4.111 Establish coordination for the Northern States Region. Present personnel in the U.S. Fish and Wildlife Service are committed fully to existing jobs. It is neither the role of the Recovery Team nor within the scope of their limited resources to engage in necessary coordination of all bald eagle-related matters within the 24 state Northern States Region (or perhaps all 49 continental states if the step were to be a joint effort among all Teams and Alaska). To be performed properly, the magnitude of the job may necessitate a a full-time person to be hired or assigned with additional clerical and/or technical support.

4.112 Establish coordination in each state or federal agency to coordinate all eagle work for that state or agency. Many state and federal resource agencies conduct surveys and studies of bald eagles. For the most part, however, results have not been compiled for large areas, nor have research efforts been well coordinated within or between agencies to assure standardization of procedures. Consequently, there is confusion and uncertainty as to what, where, and how well studies have been done. Further, there is a need to coordinate future research and management efforts within and among agencies. Therefore, it may be necessary for each state and federal agency involved with the recovery effort to assign or hire at least one person to handle coordination of recovery tasks, consolidate information, and serve as spokesperson for that state or agency on issues relating to eagles. It is essential that these persons have or obtain considerable knowledge and, preferably, direct experience with bald eagles and their habitat requirements. New York has, for example, assigned four full-time biologists in a well-coordinated program directed at bald eagles, which has been reflected in a highly successful program. In addition to improved coordination within agencies, it may be necessary to establish interagency groups to coordinate work wherever deemed necessary, advisable, or where there is interest in forming such groups. In states where two or more government agencies have major responsibilities identified in the Plan, the formation of "interagency working groups" is suggested as a means of assuring communications and coordination. Additional clerical and/or technical support may also be needed.

4.12 Establish and inter-recovery team coordination committee. Team leaders may be utilized.

4.2 Develop and conduct information and education programs designed to protect and restore the bald eagle. Many of the information and education programs are ongoing and simply need to become more widespread. All of these tasks would benefit from nationwide coordination; for example, it would be far more cost-efficient to develop one or two posters that could be used nationwide than to have such items produced independently by numerous government agencies and private organizations. At the local level funds could be used to educate and inform the public about local issues that involve the bald eagle.

4.21 Initiate I/E programs within the Northern States Region.

4.211 Inform and educate the general public.

4.2111 Develop and disseminate brochures and posters.

4.2112 Develop press release kits for newspapers, radio stations and TV stations. This should be done for general and site-specific projects.

4.2113 Develop audio-visual programs for loan to schools and interested groups and organizations.

4.2114 Establish guided tours or viewing stations of winter daytime use areas when possible. Wintering eagles at feeding and daytime roosting areas, such as below dams and at some wildlife refuges, provide some of the most accessible opportunities for the general public to view and photograph eagles. When these activities are conducted at a distance, depending on the particular site, the birds are not disturbed. Such opportunities may greatly improve public appreciation and understanding of the birds.

4.2115 Provide displays at public boat landings in areas used by bald eagles. Provide information on eagles, their symbolism, laws protecting them, and guidelines for avoiding disturbance.

4.2116 Prepare magazine articles to inform identified target groups. Amateur and professional birdwatchers, photographers, and members of the general public interested in seeing eagles sometimes approach the birds too closely and cause them to leave feeding, roosting, or nesting sites. Articles which include guidelines for viewing and photgraphing eagles without disturbing them should be prepared and published in wildlife, photography, and related magazines.

4.212 Inform and educate public resource management agencies.

4.2121 Develop and conduct seminars and technical training workshops. The need for this task should be identified by state and federal agencies.

4.2122 Initiate, produce and disseminate a periodic newsletter on progress of the recovery effort.

4.22 Develop I/E programs on the national/international level.

4.221 Develop films on the bald eagle in North America.

4.222 Develop press release packages for release at national/international level.

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# PART III

# IMPLEMENTATION SCHEDULE

Part III of this Plan was prepared by the Region 3 office of the U. S. Fish and Wildlife Service, based on information and suggestions provided by the recovery team.

## General Categories for Implementation

**Information Gathering - I or R**

1. Population status
2. Habitat status
3. Habitat requirements
4. Demographic studies
5. Migration
6. Environmental contaminant
7. Other information

**Other - O**

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

**Management - M**

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Other management

**Priorities for Implementation**

Priority one (1) - Those actions absolutely necessary to prevent extinction of the species.

Priority two (2) - Those actions necessary to maintain the species' current population status.

Priority three (3) - All other actions necessary to provide for full recovery of the species.

**Federal Agency Abbreviations**

| | |
|---|---|
| BLM | Bureau of Land Management |
| BR | Bureau of Reclamation |
| CE | Corps of Engineers |
| EPA | Environmental Protection Agency |
| FS | U. S. Forest Service |
| NPS | National Park Service |

**State Abbreviations**

| | | | |
|---|---|---|---|
| CO | Colorado | NE | Nebraska |
| CT | Connecticut | NH | New Hampshire |
| IL | Illinois | NJ | New Jersey |
| IN | Indiana | NY | New York |
| IA | Iowa | ND | North Dakota |
| KS | Kansas | OH | Ohio |
| ME | Maine | OK | Oklahoma |
| MA | Massachusetts | PA | Pennsylvania |
| MI | Michigan | RI | Rhode Island |
| MN | Minnesota | SD | South Dakota |
| MO | Missouri | VT | Vermont |
| | | UT | Utah |
| | | WI | Wisconsin |

## RECOVERY PLAN IMPLEMENTATION SCHEDULE
## BALD EAGLE

| GEN. CAT. | PLAN TASK | TASK # | PRIOR -ITY # | TASK DURATION | RESPONSIBLE AGENCY FWS REGION | RESPONSIBLE AGENCY FWS PROGRAM | RESPONSIBLE AGENCY OTHER | FISCAL YEAR COSTS (EST.) FY 84 | FY 85 | FY 86 | FY 87 | FY 88 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I1 | Annually inventory breeding areas | 1.111 | 2 | Ongoing | 2,3,5,6 | Refuges | BLM,BR, CE,FS, NPS,MI, MN,WI, ME | 60,000 +6,000 | 60,000 +2,000 | 60,000 +2,000 | 60,000 +2,000 | 60,000 +2,000 |
| | and | | | | | | CO,IL, IA, MO, NJ, NY, OH, OK PA, UT | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| IR1 | Determine distribution of non breeding pop. | 1.112 | 3 | Ongoing | 2,3,5,6 | SE, Refuges | Same as 1.111 | | | | | |
| R7 | Analyze winter data-Mississippi River | 1.12111 | 2 | 1 yr | 3 | Research | | 15,000 | | | | |
| R7 | Analyze mid-winter survey data | 1.12112 | 2 | 1 yr | 3 | Research | | 15,000 | | | | |
| R7 | Analyze agency data | 1.12113 | 2 | 1 yr | 2,3,5,6 | SE, Refuges | State & federal agencies | 60,000 | | | | |
| I7 | Winter surveys | 1.1212 | 2 | Ongoing | 2,3,5,6 8 | SE | BLM,BR, CE,FS, NPS,CO, IL,IA, KS,ME, MO,NE, OK,SD, UT | No cost first yr pending completion of tasks under 1.1211 & 4.112 | 100,000 | 100,000 | 20,000 | 20,000 |
| | and | and | | | | | | | | | | |
| R7 | Habitat utilization | 1.1213 | 2 | 4 yr | 2,3,5,6 8 | Research | Remaining 14 States | | 14,000 | 7,000 | 7,000 | 7,000 |

## RECOVERY PLAN IMPLEMENTATION SCHEDULE
## BALD EAGLE

| GEN. CAT. | PLAN TASK | TASK # | PRIOR-ITY # | TASK DURATION | RESPONSIBLE AGENCY | | | FISCAL YEAR COSTS (EST.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | FWS | | OTHER | | | | | |
| | | | | | REGION | PROGRAM | | FY 84 | FY 85 | FY 86 | FY 87 | FY 88 |
| R4 | Band nestlings | 1.122 | 3 | Ongoing | 8<br>8 | Research<br>Research | FS,States<br>States | 10,000<br>25,000 | 10,000<br>25,000 | 10.000<br>25,000 | 10,000<br>25,000 | 10,000<br>25,000 |
| R4 | Determine population growth rates | 1.131 thru 1.1322 | 2 | Ongoing | 8 | Research | | (no cost first 5 years - requires data being obtained) | | | | |
| I7 | Gather information on dead & injured eagles | 1.133 | 3 | | 3 | SE Research | | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 |
| I2 | Assess breeding habitat | All tasks under Section 1.21 | 2 | Ongoing | 2,3,5,6 | SE, Refuges, Research | BLM,BR, CE,FS, NPS, States | 125,000 | 125,000 | 100,000 | 60,000 | 60,000 |
| I2 | Assess winter habitat | All tasks under Section 1.22 | 2 | Ongoing | 2,3,5,6 | SE, Refuges, Research | BLM,BR, CE,FS, NPS, States | 125,000 | 125,000 | 100,000 | 60,000 | 60,000 |
| R4, R3 | Determine population and habitat for recovery | 2. (all tasks | 2 | | 2,3,5,6 | Research | | (no cost first 5 years) | | | | |
| M2 | Transplanting | 3.111 | 3 | Ongoing | 2,3,5,6 | SE | State & federal agencies | 50,000 | 50,000 | 50,000 | 50.000 | 50,000 |
| M1 | Breeding facility | 3.1121 | 3 | Ongoing | 3 | SE | | 100,000 | 50,000 | 50,000 | 50,000 | 50,000 |
| M1 | Breeding communications | 3.1122 | 3 | 1 year | 3 | SE | | <1,000 | | | | |
| M4, 02 | Public education re: shooting | 3.1211 | 2 | Ongoing | 3 | SE | State & federal agencies | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |

## RECOVERY PLAN IMPLEMENTATION SCHEDULE
## BALD EAGLE

| GEN. CAT. | PLAN TASK | TASK # | PRIOR-ITY # | TASK DURATION | RESPONSIBLE AGENCY FWS REGION | RESPONSIBLE AGENCY FWS PROGRAM | RESPONSIBLE AGENCY OTHER | FISCAL YEAR COSTS (EST.) FY 84 | FY 85 | FY 86 | FY 87 | FY 88 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M4, 02 | Law enforcement plans | 3.1212 | 2 | Ongoing | 2,3,5,6 | LE | State | 200,000 | | | | |
| M4, 03 | Revise trapping regulations | 3.1221 | 2 | Ongoing | 2,3,5,6 | SE | States | | | | | |
| M4, 03 | Trapping Education | 3.1222 | 2 | Ongoing | 2,3,5,6 | FA | | 25,000 | 25.000 | 25,000 | 25,000 | 25,000 |
| I6 | Monitor contaminants | 3.1231 | 3 | Ongoing | 8 | ES | | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| M5 | Law enforcement | 3.12321 | 2 | Ongoing | 9 | SE | EPA and state pollution control agencies | | | | | |
| M5 | Hazardous spill response | 3.12322 | 3 | Ongoing | 2,3,5,6 | ES | | | | | | |
| M5 | Spill planning | 3.1233 | 3 | Ongoing | 2,3,5,6 | ES | | | | | | |
| 03 | Steel shot | 3.1234 | 2 | Ongoing | 2,3,5,6 | WR | | | | | | |
| 03 | Power line problems | 3.124 | 2 | Ongoing | 2,3,5,6 | ES | BLM,BR, FS,NPS, States | 50,000 | 30,000 | 15,000 | 15,000 | 15,000 |
| M5 | Raptor rehabilitation | 3.125 | 3 | Ongoing | 3,5,6 | SE | | 100,000 | 50,000 | 50,000 | 50,000 | 50,000 |
| M3 | Territory plans and potential habitat plans | 3.211 and 3.212 | 2 | Ongoing | 3,5,6 | SE | BLM,BR, CE,FS, NPS, States | | | | | |
| | | | 3 | Ongoing | 3,5,6 | SE | | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| M3 | Winter area plans and potential habitat plans | 3.221 | 2 | Ongoing | 3,5,6 | SE | BLM,BR, CE,FS, NPS, States | | | | | |
| | | 3.222 | 3 | 5 years | 3,5,6 | SE | | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| 04 | Eagle coordinator and staff | 4.111 | 2 | 5 years | 3 | SE | | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 |

## RECOVERY PLAN IMPLEMENTATION SCHEDULE
## BALD EAGLE

| GEN. CAT. | PLAN TASK | TASK # | PRIOR-ITY # | TASK DURATION | RESPONSIBLE AGENCY | | | FISCAL YEAR COSTS (EST.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | FWS | | OTHER | | | | | |
| | | | | | REGION | PROGRAM | | FY 84 | FY 85 | FY 86 | FY 87 | FY 88 |
| 04 | Agency coordinators and clerical and technical staff | 4.112 and 4.113 | 2 | 5 years | 2,3,5,6 | SE | BLM,BR, CE,FS, NPS, States | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 |
| 04 | Coordination committee | 4.12 | 2 | 5 years | 3 | SE | | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| 01 | Handouts | 4.2111 | 3 | 5 years | 3 | PAO | | 10,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| 01 | Press kits | 4.2112 | 3 | 5 years | 3 | PAO | States | 10,000 | 5,000 | 2,000 | 2,000 | 2,000 |
| 01 | AV programs | 4.2113 | 3 | 5 years | 3 | PAO | | 10,000 | 2,000 | 2,000 | | |
| 01 | Tours | 4.2114 | 3 | Ongoing | 2,3,5,6 | SE | State & federal agencies | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| 01 | Boat landing display | 4.2115 | 3 | 2 years | 3 | PAO | | 5,000 | 5,000 | | | |
| 01 | Magazine articles | 4.2116 | 3 | Ongoing | 2,3,5,6 | PAO | State & federal agencies | 25,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| 01 | Training workshops | 4.2121 | 3 | 5 years | | SE | | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| 01 | Newsletter | 4.2122 | 3 | 5 years | 3 | SE | | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| 01 | Eagle films | 4.221 | 3 | 5 years | as 3.1211 w/ connections | | | 25,000 | 25,000 | 15,000 | 15,000 | 15,000 |
| 01 | Press release | 4.222 | 3 | 5 years | via coordinating committee | | | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |

## Appendix A

## EMERGENCY CARE OF INJURED AND DISEASED BALD EAGLES

By Patrick T. Redig
University of Minnesota Raptor Rehabilitation Center

Successful treatment of an injured or sick eagle can be greatly enhanced by careful handling and immediate administration of basic emergency care prior to shipping to a clinical facility. Almost any eagle that can be approached closely is either diseased or injured. The problem may range from minor sprains or bruises to severe fractures or debilitating illness, but approximately 80% of all afflicted eagles have been victims of traumatic injury. Often the nature of an injury cannot be determined without the aid of radiographic equipment. Emergency procedures are as follows:

1. If authorized to handle eagles, transport the eagle from the field to a quiet, warm place. If not authorized to do so, contact the nearest U.S. Fish and Wildlife Service Agent or a law enforcement officer. Ambient temperatures of 60-70 degrees F are very beneficial to injured and diseased birds. a cardboard box or burlap sack should be used to transport the eagle.

2. Contact appropriate medical personnel at the University of Minnesota facility. The following phone numbers may be used.

| | | |
|---|---|---|
| Dr. Patrick Redig | 612-373-0816 | Office |
| | 612-376-5642 | Laboratory |
| | 612-484-3489 | Home |
| Dr. Gary Duke | 612-373-0821 | Office |
| | 612-484-4323 | Home |

When calling have ready as much history as is available on the bird and the results of the physical examination. Such information is needed so that proper advice on subsequent

handling can be given. A brief summary of some short-term procedures is given under points 3, 4, and 5. These, however, should not be used in lieu of direct communication with the Rehabilitation Center.

3. If the nature of the problem is not readily apparent, go to point 4. If there is an obvious injury, follow the ensuing procedures:
   a) Where broken wings or legs are noted, search for protruding ends of bones; this is most easily accomplished with the eagle restrained on its back. Wounds surrounding broken bones should be flushed with sterile saline (salt solution, 0.85%) or sterile water (boil water for 20 min.).
   b) After flushing, pack the wound with an antibiotic ointment (e.g., Furacin)[1] and cover it with a non-adhering pad (Micropore[2] ). Though it is preferable for exposed bone to be reinserted under the skin, attempts to position the ends are usually futile and may actually lead to excessive soft tissue damage. Fractures of the wings may be immobilized temporarily at this point by folding the wings and securing them to the body with masking tape. The uninjured wing should be left free to assist the bird in maintaining its balance. Fractured legs should be wrapped snugly with a clinging, self-adhesive gauze (e.g., Kling-gauze[3] ). Eight to ten layers should be applied, taking care not to wrap so tightly as to impair circulation. The gauze should be covered with adhesive tape. Periodically check the toes to see that they are warm and not swollen, which would indicate insufficient circulation.

4. Dehydration followed by starvation are the most severe threats to injured birds, not the wounds or broken bones that initially incapacitated the bird. Oral fluids should be administered at the rate of six tablespoons per pound (eagles weigh between eight and 12 pounds) at four to six hour intervals. A convenient fluid is Gatorade(R) which provides glucose and electrolytes as well as water. If Gatorade(R) is not available, a boiled cola (such as Pepsi or Coca-cola) works well. Administer the fluid with a syringe, poultry baster, small rubber tube, etc., but be careful to avoid getting fluids down the trachea (windpipe).

5. During the insect season (May though October) the eagle should be carefully inspected for the evidence of maggot infestation of wounds. The wrist joints, elbow joints, base of tail and hock joints in the legs are the most common sites. Maggots should be removed by gentle washing of the entire affected area with a

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[1] Furacin Dressing, Norwich-Eaton Pharmaceuticals, Norwich, New York 13815

[2] Micropore Pads, 3M Company, St. Paul, Minnesota 55101

[3] Johnson & Johnson Products, Inc., New Brunswick, New Jersey 08903

screw worm repellent (e.g., Cutter's Screw Worm Bomb).

6. If an eagle must be held a few days prior to shipment, a daily feeding of eight to ten ounces of fresh raw meat will be necessary. Poultry, raw beef, or a fresh road kill is an appropriate diet. Avoid hamburger (suitable for one to two meals) and processed meats. Unfledged eaglets should be fed two times daily with parts of the whole bodies of mammals or birds.

7. Injured eagles should be treated with a broad-spectrum antibiotic to prevent or reduce infections associated with open wounds. Seek the assistance of a veterinarian in obtaining such drugs and determining the dosage. The following orally administered agents may be safely used:

| | |
|---|---|
| Ampicillin or Amoxicillin | 25 mg/lb, two times per day |
| Chloramphenicol | 15-20 mg/lb, four times per day |
| Terramycin (Oxytetracycline) | 30 mg/lb, four times per day. |

Commercial air freight has proven to be a rapid and dependable means of transporting injured eagles to a treatment facility. Direct non-stop flights are preferred. Flights that involve change of aircraft and especially change of carrier can be troublesome and the latter are much more expensive. As of July, 1980, the cost of shipping an eagle anywhere in the U.S. by direct flight was $36.75. Plastic dog carriers large enough for a 40 lb. dog are satisfactory containers. Alternatively, a wooden box constructed of 1/2" plywood that is 24" long, 18" high, and 13" wide with air holes low on the sides is satisfactory. Such a container is reusable and meets postal regulations so it can be returned easily by mail.

## Appendix B

## HANDLING AND DISPOSITION OF EAGLES FOUND DEAD IN THE WILD

Accidents, disease, age, severe weather and vandalism take their toll of young and adult bald eagles. Because of their conspicuous size, eagle carcasses are more likely to be encountered in the wild than those of other bird species. Many are found and reported each year.

By knowing the cause of death of representative members of populations, it may be possible to take management steps to reduce excessive mortality. Accordingly, since the early 1960's, the U.S. Fish and Wildlife Service has studied eagle remains to determine cause of death and to monitor exposure of eagles to pollutants. Carcasses are sent first to the U.S. Fish and Wildlife Service's National Wildlife Health Laboratory (FWHL) in Madison, Wisconsin, where necropsies are performed by specialists in wildlife pathology. Selected tissues from each bird then are sent by FWHL to the Patuxent Wildlife Research Center in Laurel, Maryland. At Patuxent chemical analyses are made to determine the presence and amounts of many pollutants believed to be hazardous to eagle health. A combined necropsy and analytical report is sent from Patuxent to the submitter with copies to agencies involved in eagle management. Periodically, data on several eagles are combined to determine if there are trends in mortality cases, and summary reports are published.

Procedures For Handling Dead Eagles. While the study of eagle carcasses by U.S. Fish and Wildlife Service specialists is important in eagle management, that importance must be tempered with circumspection where the public is concerned. The possession of a bald eagle, or any part thereof, is illegal. Only those persons authorized by permit, primarily eagle researchers, may possess eagles temporarily under stated conditions and for stated reasons. Any person not so authorized who finds a dead or moribund eagle should leave the carcass, where found, if feasible, and report the exact location to the nearest U.S. Fish and Wildlife Service Special Agent or State Conservation Officer. If these individuals are unavailable or unknown, the report should be made to the nearest office of the U.S. Fish and Wildlife Service or State Game and Fish Agency. One reason for not moving the carcass, aside from legal constraints, is that the eagle death itself might have resulted from an illegal act. The site should be examined first by trained investigators.

If the carcass appears fresh, based on known time of death, odor, or some other judgemental criteria, it should be tagged, placed in a heavy plastic bag, and refrigerated as soon as possible. Fresh specimens are

best for necropsy. If the carcass has deteriorated, or if it must be stored for several days, it should be frozen and kept frozen from then on. The tag should contain all pertinent information such as date found, exact location, habitat type, name and address of person finding the carcass, name and address of shipper, and other information that might contribute to a determination of cause of death.

The National Fish and Wildlife Health Laboratory should be called as soon as feasible. Laboratory staff will advise the caller on procedures to follow in packaging and shipping the carcass to Madison. The address and phone number is:

```
+-------------------------------------------------------------------+
!                                                                   !
!     National Wildlife Health Laboratory                           !
!     6006 Schroeder Road                                           !
!     Madison, Wisconsin 53711                                      !
!     608-264-5418                FTS-364-5418                      !
!                                                                   !
+-------------------------------------------------------------------+
```

Disposition of bald eagle carcasses. Collecting bald eagles for scientific study is not possible due to their special protected status. As noted above, bald eagles found dead or moribund in the wild are shipped to the U.S. Fish and Wildlife Service's National Wildlife Health Laboratory in Madison to determine cause of death. This procedure affords an opportunity to obtain additional valuable eagle data.

We recommend that a data form be developed that would become part of the case history of every bald eagle found dead in the U.S. The same form could be adapted for birds found dead in Canada. The form (or format), to be developed later, should incorporate detailed field observations and laboratory measurements. Among the included data would be standard measurements, banding or marking information (including numbers), and FWS necropsy and analytical findings. Where feasible, the format should permit computerized key entering.

Color photographs (prints and negatives) should be included with the form wherever possible. Photographs should include: side of head, outstretched wings and tail spread sufficiently to display any molt and new feather growth, and dorsal and ventral views of the body.

All data should be centralized. They should be made available on request, although publication restrictions may be placed on data from birds that are part of ongoing research projects.

The possession of bald eagle carcasses or parts, even temporarily, is regulated strictly. Persons wishing to make measurements on carcasses prior to their transfer to U.S. Fish and Wildlife Service auspices should be certain that they have legal authority to do so.

Carcasses should be disposed of as follows:

1. Deposited as a study skin or mount in a recognized collection. This is particularly important if the bird was banded as a nestling and, hence, is of known age and geographic origin, and if the plumage is in good condition.

2. Used for skeletal and other scientific, museum purposes, with feathers provided to Indians for bona fide religious purposes. Birds in good shape should be photographed with plumage intact before feathers are removed. Procedures for obtaining eagle feathers, feet, and other body parts for Indian religious rights have not been adequate, resulting in illegal take and black market sales. The Law Enforcement Division of the U.S. Fish and Wildlife Service currently is working actively on correcting the situation to both provide better data and better meet the needs of native Americans.

Carcasses should <u>not</u>:

1. Be destroyed unless badly decomposed.

2. Be stored indefinitely in a freezer following the disposition of court cases.

3. Be deposited as study skin or mount in locations or situations where they would be inaccessible to researchers.

## Appendix C

## REPORTING OBSERVATIONS OF BANDED, COLOR-MARKED, OR RADIOED EAGLES

Many eagles are being banded, color-marked, and/or fitted with telemetry radios each year in the United States and Canada. These birds are encountered occasionally by the public, by state and federal agency personnel, and by other researchers. A color-marking protocol has been developed and it is important that sightings of color-marked birds or findings from banded or radioed birds be relayed to the proper places for both research purposes and to satisfy the curiosity and questions of the persons who report the sightings.

Information on any banded eagles and sightings or findings of color-marked or radioed eagles should be sent to:

```
+-------------------------------------------------------------------+
!                                                                   !
!    Bird-Banding Laboratory                                        !
!    U.S. Fish and Wildlife Service                                 !
!    Laurel, MD 20811       301-776-4880, extension 335             !
!                                                                   !
+-------------------------------------------------------------------+
```

Information on color-marked or radioed eagles should be as specific and detailed as possible and should be written down promptly, not trusted to memory. Record not only the date, location, and circumstances, but the color and shape of any marks and where on the body (including right or left side of the bird) the markers are located. Also include description of plumage to verify species identification.

## Appendix D

## TECHNIQUES AND TERMINOLOGY FOR SURVEYS OF NESTING BALD EAGLES

By Sergej Postupalsky
Department of Wildlife Ecology, University of Wisconsin - Madison

The purposes of this appendix are to describe how nesting surveys of bald eagles are conducted, define some of the terms that are used, and recommend standardized approaches to getting information needed to monitor recovery. Before the above items are addressed, however, some brief background information will be presented.

For long-lived birds with delayed reproductive maturity, such as the bald eagle, it is generally assumed that immatures (individuals with brown heads and tails or with changing, mottled heads and tails) do not breed, while adults do. However, matters are not quite this simple. It is important to distinguish between the territorial and non-territorial segments of the total population present on the breeding range. The former consists of mated (paired) adults (rarely individuals still in immature plumage), associated with a breeding area (defined below) containing one or more nest structures, and defending or having exclusive use of some part of this area, usually the vicinity of the currently occupied nest (defined below). Occupation of a breeding area is prerequisite for reproduction. The non-territorial segment of the population consists largely of immature individuals, but is believed to include an unknown and variable proportion of fully adult eagles, which have not succeeded in finding and holding a territory. These adult "floaters" are thought of as a reserve from which individuals are recruited into the territory-holding population. A young adult, upon reaching maturity has three basic options. It can:

1. enter the territorial population by filling a vacancy, that is, replacing an individual that died;

2. find an unattached mate and establish a new breeding area (if suitable unoccupied breeding habitat is available);or

3. failing that, remain a part of the "floating" population until a mate and breeding habitat can be found.

## SURVEYS OF NESTING BALD EAGLES

Surveys of nesting eagles are conducted in many ways and with variable levels of effort and competence on the part of observers. Some observations are conducted from the ground or water below the nest through variable lengths of time and from various distances. Some nest surveys are conducted from the air by flying low over the nest, usually with fixed-wing aircraft but occasionally via helicopter. Some persons climb up to the nest, either in conjunction with banding or simply to get better information on the use of the nest by the eagles, even in cases where there are no young present. Techniques are sometimes dictated by logistics, weather, and safety factors.

Both randomly sampled and systematic or non-random surveys have been employed to measure reproductive success of bald eagles. Unlike surveys to estimate the density of nesting eagles, however, no significant differences have been found in productivity measurements depending on whether the nests are sampled at random or not. Thus, productivity surveys commonly do not employ (and do not need to employ) random sampling techniques.

Surveys of nesting eagles should be conducted only by qualified, experienced observers and pilots, if aerial surveys are used. Aerial surveys are the most accurate, efficient, and preferred method. Climbing to nests provides the most complete information, but should be conducted only after the young have reached a size at which they no longer require brooding and before they become old enough to fledge prematurely or "jump". Climbing should be undertaken only by experienced, qualified personnel under proper weather conditions. Climbing at the egg stage or before is permissible only if needed information cannot be obtained by any other means, and again only by qualified persons. Routine climbing to nests during the incubation period should be avoided, as there is great risk of abandonment imposed by such climbing. As a general rule, climbing or even close approaches to nests prior to hatching should be avoided.

Aerial surveys are not believed to disturb the birds although there have been isolated reports of adult eagles attacking the aircraft. Adult eagles generally respond to aircraft during the incubation period by staying on the nest (thus making it difficult or impossible to count eggs) and, during the nestling stage, by flying from the nest and circling or perching nearby until the aircraft has left. Nestlings vary in their response to the aircraft; some crouch or lay down on the nest but most simply stay as they are and watch the aircraft.

Depending on the intensity of the search and the experience and background of the searchers, based on their familiarity with the biology and subtle field sign of the eagles, one often can determine the recent

presence of eagles even when the birds are not present during the brief period of the survey.

Nest surveys have been conducted at different times during the reproductive period. The generally accepted approach to nesting surveys among bald eagle researchers is to aerially check all known and reported nests once during the early part of the incubation period. A second, follow-up aerial survey is conducted during the latter half of the nestling period, when eaglets are large enough to be seen and counted from the air. Timing of surveys is important. Survey workers must be familiar with the phenology of the eagles' breeding cycle, that is, the timing of key events (egg laying, hatching, and first flights of the fledglings). In areas where ongoing research includes the banding of nestlings, the second aerial survey may be conducted earlier during the nestling stage, even though some young may be too small to be seen clearly and counted from the air, or may be covered by the brooding adult. Such timing of the second survey will determine which nests failed and which are still going. The final count of young approaching fledgling age is then made by the banders.

Due to the variety of workers, techniques, and situations, there has been some disagreement over terminology, recommended techniques, and interpretation of the observations. Discussion among workers over the years has provided some resolution to these problems, and there is now more agreement on terminology.

## TERMINOLOGY

Breeding area. This is the local area associated with one territorial pair of eagles and containing one or more nest structures. The term "breeding area" is more neutral, with fewer behavioral implications than the term "breeding territory" formerly used in this context. Under rare circumstances a breeding area occupied by a pair may lack a nest structure at the time of the survey; this can occur when a nest is destroyed by severe weather prior to the survey.

Alternate (supernumerary) nests. Bald eagles frequently re-use nest structures in subsequent years and often for periods of many years. Quite often eagles will build and use a new nest near a previous nest. Sometimes several nest structures will accumulate in such a manner in a particular area, although only one would be used for a nesting attempt during any given nesting season. There may be as many as seven nest structures associated with a single pair of bald eagles. These groups of nests are generally identifiable by their closeness to each other and distance from the nearest nests of other pairs, but occasionally, such as in areas with high eagle nesting density, the distribution of nests is less clear and the groupings of nests are not as distinct. In such situations the number of pairs present and the "ownership" of individual

nest structures will emerge from the pattern of simultaneous occupancy and use of nests over several years.

Occupied nest (or occupied breeding area). This term also has been used widely under a variety of contexts and involves a number of semantic and interpretation problems. Its use is both entrenched and accepted, however. Also, the term pertains most closely to the real item of interest -- the number of breeding pairs of birds. Therefore, the term should continue to be used, although with care and qualification.

Occupancy basically refers simply to the presence of one or more adult eagles within a breeding area during the breeding season. The biggest problem of determining occupancy revolves around the presence of single vs paired birds and, during surveys, whether one or two birds are seen. A pair of birds may exist within a given breeding area but frequently only one of the pair is seen during a survey. Different workers have handled (or ignored) the problem in different ways so that past data from different sources (including some used in this Plan) are not exactly comparable. An increasing consensus, however, has been to count only nests with evidence of actual pairs of eagles and not count nests occupied by single birds or where the status cannot be determined reasonably.

Based on the above agreement to count occupation by pairs and further based on results of an intensive study of techniques and timing of surveysin the Chippewa National Forest in north-central Minnesota (Fraser 1978), the Team recommends counting as occupied only those nests with evidence of an actual pair of birds in future surveys. Observations of occupancy by unmated, single adults should continue to be recorded and reported for completeness of data and in case they are desired in later analyses but, for the present, they should not be tallied under" occupied nests." Evidence for occupancy under this criterion includes the following: a) young were observed, b) eggs were laid (eggs or eggshell fragments observed), c) one adult observed in incubating ("sitting low") posture on the nest during the incubation period, d) two adults observed at an empty nest or within the breeding area, e) one adult and one eagle in immature plumage at or near a nest, especially if mating or reproductive behavior (display flights, copulation, nest repair, etc.) was observed, and f) an empty nest which shows clear evidence of having been repaired in the current season (sticks with fresh breaks on top, fresh lining material, green twigs, etc. added), or a brand new nest (fresh sticks from the base up). This conclusion rests on the assumption that nest-building behavior in the wild is elicited by the presence of a mate. Droppings and molted feathers alone usually are not sufficient evidence for a pair.

A previously used term was "active" nest. The most generally agreed use for this term is for nests showing evidence of actual breeding by a pair of eagles, such as the presence of eggs, an adult in incubation position (although some birds show the behavior without eggs present), nestlings, or solid evidence of eggs or young having been present during that breeding season. The term has been used under such a variety of

conditions by different workers, including situations without evidence of actual breeding, however, that it potentially is too ambiguous and should not be used further.

Productivity. This depends on the number of young raised each year within the nesting population. After young leave the nest they become much more difficult to observe and count, unless the area is studied intensively, than when they are still confined to the nest. Because of this and because the survival of birds raised to advanced nestling stages is quite high, the young are counted for productivity calculations in most studies just prior to the time of normal fledging. Historically this period has coincided with the banding period because the young are also at the best age for banding at that time.

The recommended measure of productivity for the breeding population is the average number of young per occupied nest, that is, the total number of young produced divided by the total number of occupied nests. Most workers also report the average brood size (total number of young divided by total number of successful nests). Brood size has shown relatively little variation, however, and by itself provides little insight into overall productivity.

While productivity based on total pairs (young/occupied nest) is the ideal measure, it is difficult to attain under some circumstances found outside of the Northern States Region. Where the two-survey technique can not be employed for logistical reasons, such as in Canada and Alaska, productivity is based on all breeding areas. This method, from a single survey during the nestling period, offers a crude estimate of productivity for areas with healthy bald eagle populations in which nearly all available breeding areas are occupied by pairs. Inasmuch as some breeding areas remain unoccupied by eagles, this method overestimates population size and yields a minimum estimate of productivity.

## BALD EAGLE NESTING SURVEYS FOR RECOVERY

Nesting surveys for monitoring population status and productivity for purposes of this plan should consist of two aerial surveys per year, one early in the nesting season to determine occupancy and one later to count the number of nestlings produced. Timing of these two surveys is important, if not critical for reliable data, but may vary from locality to locality depending on local nesting phenology. Timing should be as follows:

1. Early survey. This should be during the average date of completed egg-laying and early incubation. In the Chippewa National Forest of north-central Minnesota, for example, that period is during mid-April.

2. Late survey. This survey should be conducted after the adults are not brooding consistently, the young are large and dark enough to be seen easily from an airplane, and most nestling deaths have occurred. It should be before the young normally begin fledging. The period is when most young are between about five and nine weeks of age. For the Great Lakes States of Michigan, Wisconsin, and Minnesota, this period is generally during June.

If funding is not available for both surveys, serious consideration will have to be given to which information is most important (number of occupied nests or productivity). Both are important at present and both surveys should be maintained.

Although standardized data and reporting forms have not been constructed and adapted, they would facilitate collection, reporting, and comparisons of future surveys. Such forms are highly desirable and recommended as part of the overall coordination and communication effort (Step 4 of the Recovery Plan). It is recommended that actual, raw, observations made during the surveys be stored, rather than interpreted conclusions made by the surveyors or compilers. Raw data, such as the number of birds present, their behavior and position relative to the nest, whether incubating or not, condition (state of repair) of the nest, date, time of day, etc., constitute a much more useful body of information, than do already interpreted records stating that the one or ther other breeding area or nest is "occupied", "inactive", or whatever. The actual observations upon which such interpretations were based are much more informative and have the advantage that they enable other workers to compare them with their own and, if necessary, to re-interpret them in the light of the latest understanding of eagle breeding biology and behavior. The storage of raw, uninterpreted data will be especially important to resource agencies which experience turnovers of personnel.

## Appendix E

## MANAGEMENT GUIDELINES FOR BREEDING AREAS

The purpose of these guidelines is to provide minimum criteria for protecting bald eagles at their breeding areas from human disturbance and to preserve and enhance important habitat features of these areas. The criteria are based on a synthesis of existing guidelines in present use by the U.S. Forest Service (Eastern Region), U. S. Fish and Wildlife Service, and the views of eagle researchers.

Although eagles often use particular nests for many years, they frequently move to different sites. Turnover of existing nests, from losses to wind, changes by the eagles, and other natural factors may be as much as 12% of the sites per year. Eagle "real estate" is much less fixed than for humans. Thus, the conservation and management of nesting habitat is far more important than the identification and preservation of specific nest sites or even breeding areas.

Eagle tolerance of human presence is highly variable, both seasonally and among different individuals or pairs of eagles. Some bald eagles nest and accept people, boaters, hikers, cabins, roads, and other human presence in very close proximity, possibly as a result of habituation. On the other hand, some may be extremely intolerant and be disturbed readily. This variability must be recognized in both research and management. Management should be conservative and assume that intolerant birds may be present now or in the future. We should be especially conservative in areas with low populations.

All nesting eagles are disturbed more easily at some times of the nesting season than at others. Four periods of sensitivity to disturbance can be identified for nesting areas. These are as follows.

1. Most critical period. Prior to egg laying bald eagles engage in courtship activities and nest building. During this and the incubation periods they are most intolerant of external disturbances and may readily abandon the area. The most critical period for disturbances therefore extends from approximately one month prior to egg laying through the incubation period.

2. Moderately critical period. This includes approximately one month prior to the above period and about four weeks after hatching. Prior to the nesting season individual pairs of eagles vary considerably in time of return to the nest site or, if permanent residents, the time they begin to come into physiological condition for breeding and become sensitive to

disturbance. After hatching the chicks are quite vulnerable to inclement weather and need frequent brooding and feeding. Disturbance can keep adults from nests and, depending on the weather and length of time involved, may cause weakening or death of chicks. The adults are quite protective of the nest site as long as one or more healthy chicks are present. Thus, disturbance at this time is less critical, although still potentially detrimental, than during the pre-laying and incubation period.

3. Low critical period. This period extends from the time chicks are about one month of age until approximately six weeks after fledging. During this time adults are still quite attached to nesting areas but tolerate moderate amounts of human presence. Restriction should be decided on a case by case basis.

4. Not critical period. The existence of this period depends on whether adults are permanent residents in their nesting areas. In most regions adults leave the vicinity for a few weeks or months each year. During the time they are gone one need be concerned only with activities that alter the habitat in ways that would make it unsuitable for future nesting.

The timing of these periods depends on geographic location. Eagles tend to breed earlier farther south or in coastal locations. Establishment of critical periods in managment planning will therefore depend on the timing of nesting in each area.

Management of nesting areas will depend on the amount of suitable habitat, numbers of pairs present, extent of the areas used by nesting eagles, and present land uses. Plans should be prepared for each breeding area and planning should encompass larger units when habitat is suitable and many nesting pairs are present. In planning for a large region, particularly if major changes in land use or development are anticipated, the following major items should be addressed:

1. Distribution of habitat modification. Large contiguous areas of habitat should remain suitable, not just small, specific sites where nests currently are located.

2. Upper limit to habitat modification. Limits on habitat modification should be clearly established in advance, and unplanned development should be discouraged or prohibited. Limits set in advance are generally more acceptable to persons desiring further development; the process permits reasonable negotiation and compromise and limits are easier to enforce.

3. Rate of development. Development should only be allowed to approach the upper limit slowly, over a period of years. Sudden, large-scale development should be prevented if possible.

4. Seasonal timing of human activity. Construction and related activities should be confined to the low or non-critical periods of the year described above.

5. Human attitudes toward eagles in the area. Much human-eagle interaction depends on the predominant attitude of human residents of each area. Residents and visitors of some areas are very favorably disposed toward the birds, if not proud and quite protective. They may be careful not to disturb the birds and may help prevent disturbance or destruction by other persons. Such attitudes should be encouraged through education and law enforcement. Illegal shooting of eagles, especially young birds of the year still in the vicinity of nests during the fall hunting season, should be severely penalized.

The above guidelines pertain to larger geographic units where several eagles may be nesting. The following pertain to specific breeding areas.

## SITE-SPECIFIC MANAGEMENT PLANS

A. Basic information and essential habitat. Site-specific management plans should be tailored to the size and configuration of essential habitats, and should address such factors as the prey base, habitat used for foraging, and any other features necessary for maintaining habitat suitability. In addition, management plans should clearly specify restrictions on human activities and habitat alterations in establishing buffer zones around nests (see next point in outline). For basic information forms, see end of this appendix.

B. Disturbance Buffer Zones for Nest Trees. Each nest within a breeding area will be protected by three zones that become less restrictive to human activity as the distance from the nest increases. Some activities need to be restricted only during the nesting season, or critical periods. Guidelines for zones, based on those developed by the U. S. Forest Service in the Eastern Region and used in several parts of the United States, are described below. If buffer zones are used they should be established around all nest sites within a breeding area regardless of their activity status, since alternate nests often are used as feeding platforms and roosting sites.

1. Primary Zone

   a) Size: The boundary of this zone should be 330 feet (5 chains) from the nest.

   b) Restrictions: All land use except actions necessary to protect or improve the nest site should be prohibited in this zone. Human entry and low-level aircraft operations should be prohibited during the most critical and moderately critical periods, unless performed in connection with eagle research or management by qualified individuals. Motorized access into this zone should be prohibited. Restrictions on human entry

at other times should be addressed in the breeding area management plan, considering the types, extents, and durations of proposed or likely activities.

2. Secondary zone

a) Size: This zone should extend 660 feet (10 chains) from the nest.

b) Restrictions: Land-use activities that result in significant changes in the landscape, such as clearcutting, land clearing, or major construction, should be prohibited. Actions such as thinning tree stands or maintenance of existing improvements can be permitted, but not during the most critical and moderately critical periods. Human entry and low-level aircraft operations should be prohibited during the most critical period unless performed in connection with necessary eagle research and management by qualified individuals. Roads and trails in this zone should be obliterated, or at least closed during the most and moderately critical periods. Restrictions on human entry at other times should be addressed in the breeding area management plan, considering the types, extents, and durations of proposed or likely activities.

3. Tertiary Zone

a) Size: This is the least restrictive zone. It should extend one-quarter mile (20 chains) from the nest, but may extend up to one-half mile (40 chains) if topography and vegetation permit a direct line of sight from the nest to potential activities at that distance. The configuration of this zone, therefore, may be variable.

b) Restrictions: Some activities are permissible in this zone except during the most critical period. Each breeding area management plan may identify specific hazards that require additional constraints.

C. Other Management Guidelines.

1. Abandoned Nest Trees

a) When a tree containing an eagle nest has blown down or has been damaged so it can no longer support a nest, remove all buffer zones. The breeding area management plan itself, however, should remain in effect or be revised, such as by removing buffer zones until a new nest is established.

b) When a nest structure disappears but the nest tree remains the buffer zones should remain in effect through at least the following three breeding seasons. If the nest is not rebuilt, remove the zoning but still consider the area as essential habitat and protect it accordingly.

c) When a nest is classified as a remnant, that is, one that has been unoccupied for five consecutive years, and is not being maintained by eagles, retain only the primary zone.

Roosting and Potential Nest Trees.

a) Three or more super-canopy trees (preferably dead or with dead tops) should be identified and preserved within one-quarter mile of each nest as roosting and perching sites.

b) In areas identified as potential nesting habitat, there should be at least four to six over-mature trees of species favored by bald eagles for every 320 acres within 1320 feet of a river or lake larger than 40 acres. These trees should be taller than surrounding trees or at the edge of the forest stand, and there should be clear flight paths to them.

c) Artificial nest structures may be provided where suitable nest sites are unavailable in occupied or potential habitat. Structures may be placed in trees containing dilapidated nests; in trees without existing nests, but which otherwise appear suitable; or in man-made structures such as powerlines or tripods. Nest platforms should be approximately five to six feet in length and width (25-36 square feet) and be made to last for several years. Roosting structures may be erected using powerpoles with several horizontal perches near the upper end.

3. Prey Base Management

a) Fisheries management should strive to maintain a prey base consistent with eagle food habits.

b) In some breeding areas, particularly in the west, mammals form a portion of the diet of bald eagles. Land management in these areas should maintain an adequate prey base in terrestrial habitats.

c) Feeding of eagles may be considered a valid management tool in areas where natural prey are highly contaminated or temporarily unavailable for some reason. This management option rarely will be used.

d) In some regions, commercial and sport fishermen may be providing an important but unrecognized (by people) food source for eagles by dumping rough fish. Many commercial fishermen are also suffering from reduced catches of game fish and quotas imposed for the purpose of managing fisheries. Subsidization perhaps in the form of monetary or tax incentives might benefit eagles, fishermen, and possibly the fisheries.

SITE-SPECIFIC MANAGEMENT PLANS

Outline for data file and breeding area management plans

---

Breeding Area No. and Name: _____

Nest No.(s): _____

Location: _____

Date: _____

By: _____

I. Breeding Area Characteristics

A. General Description
Nest Site Relationships
Overview of Habitat and Land Uses

B. Feeding Areas (Known and/or Assumed)

C. Known or Potential Perch/Roost Trees

D. Potential Nest Sites Available

E. Land Owernship within Breeding Area
Identify Acquisition Needs

F. Post-nesting Use of Habitat

II. Nest Site Characteristics (Each nest in territory)

A. Tree Measurements (height, DBH, size); Nest Measurements

B. Condition of Nest Tree

C. Date Constructed

D. Timber Type, Size and Density

E. Distance to Water

F. Distance to Roads and Other Development

G. Accessibility

H. Relation of Nest Height to Surrounding Canopy

I. Precise Directions for Reaching Nest

III. Pair Behavior and Biology

A. Response to Human Instrusion, if Known
Analysis of Existing and Potential Disturbance Hazards

B. Summary of Nesting History

C. Research and Study Data Available

IV. Management Constraints

A. Roads and Trails to be Closed or Re-routed

B. Buffer Zone Configuration

C. Modification of Existing or Proposed Timber Sales, Roads, Recreation Development, etc.

D. Essential Habitat

V. Special Hazards

e.g., Powerlines, Recreation Activity, etc.

Recommend low-level (500') aerial photographs taken in each cardinal direction with nest in the center; important features of the breeding area, including perch sites and alternate nest sites, can be shown. A map (recommend scale of 4" = 1 mile) should be a part of the plan showing all important aspects of the management plan contents.

Example of form used by
U.S. Forest Service (Eastern Region)

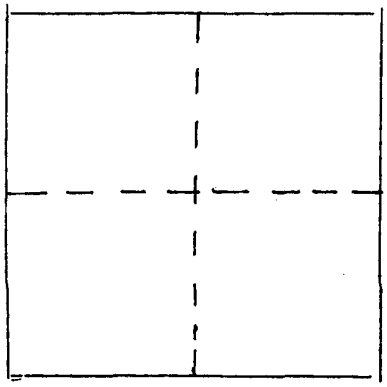
| BALD EAGLE NEST RECORD | | | Territory Name | |
|---|---|---|---|---|
| | | | Nest Code | |
| | | | Prepared By | Date |
| State | County | Forest | District | Legal Description |

| LANDOWNERSHIP | NEST TREE | NEST |
|---|---|---|
| /___/ National Forest<br>/___/ Other Fed. or State<br>/___/ County, City, etc.<br>/___/ Private | Species _____ DBH____ Ht.___<br>Condition of Tree _____<br>Remarks: | Height_____ Apx. Size_____<br>Date Constructed<br>Accessibility: ___D ___M ___E1/<br>Visibility: |

| NEST HABITAT | DEVELOPMENT |
|---|---|
| Timber type, size, & density_____<br>Distance to open water (.1 mi.)_____mi.<br>Dist. to lake-100 Ac. or larger (1.5 mil.)___mi.<br>Dist. to major river (.5 mi.)_____mi.<br>Dist. to swamp (.1 mi.)____mi. T.S & D._____<br>Nest trees available?_____ Apx. No._____<br>Remarks: | Distance to nearest main road (.1mi)____mi.<br>Distance to woods (LUR) road (.1mi)_____mi.<br>Structural developments nearby_____<br>___ Wild ___ Mod. developed ___Well develope<br>Timber cutting in area? _____<br>I.S.I. Planting, etc.? _____<br>Remarks: |

FEEDING AREA:

MANAGEMENT CONSIDERATIONS AND REMARKS;

| MAP | DIRECTIONS TO REACH NEST |
|---|---|
| Scale -  | |

1/D-Difficult to reach; M-Moderately easy to reach; E-Easy to reach nest site.

SUGGESTED FORM FOR LETTER TO PRIVATE LANDOWNERS

(Modified from letter being used in the state of Maine)

Dear [ ]:

You are one of the few fortunate individuals in the continental United States to have a bald eagle nest on your property. As you probably are aware, the bald eagle population declined for many years. Pesticides, shooting, trapping, and other human activities all have been involved. Another important factor is the loss of nesting habitat.

We are contacting you because of this last concern. As part of a coordinated effort by the [ ], U. S. Fish and Wildlife Service, [and ... ,] to manage bald eagles, we have developed management guidelines for every bald eagle nest known in the state.

The attached report deals specifically with the pair of eagles nesting on your property. It summarizes everything we know about the nest location, site characteristics, nearby areas used by the eagles, nesting history of the pair, and any other research data available (food habits, behavior, contaminant levels, etc.). The last section provides some guidelines to help maintain the integrity of the nest site and to maintain or improve the eagles' nesting success. We want to stress that these are only suggestions, not hard and fast rules or regulations.

Eagles exhibit a high degree of loyalty to a nest site over time. Occasionally a nest is not used for several years. This may be due to death of one or both adults, disturbance, or some other factor. Our data now indicate that these sites merit protection because eagles will return to nest in the same area, often in an old nest or rebuild in the same nest tree, after an absence of 10 or more years. Therefore, we have prepared guidelines for all nest sites which are currently suitable, even if unused for several years. We hope that these sites will be reoccupied as our eagle population recovers. Maintenance of good nesting habitat is the key to the bald eagle's future.

In addition to your help and cooperation in protecting these valuable eagle areas, we would appreciate receiving any further information, comments, questions, and ideas that you may have. We welcome reports of feeding areas, perching areas on other properties, or nearby developments which threaten the nest site. Please contact us or your local state wildlife personnel:

Regional biologist: [ ]

Conservation officer: [ ]

Should you decide to sell or modify the nest site or adjacent property, please notify us first. Perhaps together we can work out a solution that will maintain the area as good eagle habitat. We hope this information has been of some help and that mutually we can benefit the bald eagles.

Thank you.

Sincerely, [ ]

## Appendix F

## GUIDELINES FOR WINTERING PERIOD SURVEYS

Thousands of locations throughout the U.S. are used each year by wintering bald eagles. Biologists and land managers must decide which of these areas will receive management attention. Their decisions are based, in part, on information obtained during surveys which provide data on the distribution and abundance of bald eagles during the winter period. The most important areas are regularly used feeding sites and night roosts, the primary focus of site-specific management plans.

The guidelines in this appendix address four main questions: 1) What areas should be surveyed?, 2) How often are surveys needed?, 3) What information should be obtained?, and 4) What procedures should be used?

### Survey Locations

The vicinities of known nest sites should be checked to determine whether eagles are resident during part or all of the non-breeding season. If eagles are present, attempts should be made to identify their feeding area(s) and night roost(s), and to determine the period of time the eagles remain in the area.

The selection of survey locations outside of nesting habitat depends on whether the objective is to check feeding areas or to obtain information concerning night roosts. Feeding areas and night roosts usually are checked in separate surveys because they may be as much as 15 miles apart (the highest recorded distance is approximately 17 miles), and because the number of eagles present at them varies with the time of day and several other factors.

To date, most surveys of feeding areas have been confined to locations associated with water. However, where food other than fish or waterfowl is available, open water is not a habitat requirement. Food resources from terrestrial habitats, such as big game and livestock carrion, jack and cottontail rabbits, and ground squirrels are the major food items of wintering bald eagles in several locations. Thus, in addition to aquatic habitats, surveys of feeding areas should include terrestrial habitats.

Priorities for areas to check can be established on the basis of known or suspected levels of prey availability. Other things equal, the

number of eagles is likely to be greatest where the most food is available.

Night roosts are found in a variety of habitat types and are not necessarily in the immediate vicinity of feeding areas. Trees in ravines, on the leeward side of hills, or in other wind-protected situations are the most likely to be used, particularly during harsh weather. In relatively flat terrain where few trees are present, eagles usually roost in trees that are clumped or screened from the prevailing wind by other vegetation. As a general rule, trees in exposed sites are occupied only during mild weather.

## Survey Frequency

The number of surveys needed in local wintering areas depends on the amount of information available for site-specific management plans. If the approximate date when bald eagles first arrive in an area is not known, surveys should begin in mid- to late October. The main value of an early survey is to establish the initial date for seasonal restrictions on human activity in important wintering areas.

At locations where peak periods and levels of use have not been determined, or where preferred feeding sites and night roosts are not known, surveys are recommended at 7 to 21 day intervals throughout the winter period. Survey frequency can be adjusted so that areas with the greatest potential for high use are checked most frequently.

Biologists unfamiliar with the characteristics of wintering eagles might question the need for more than one or two surveys each winter, especially because only two surveys are recommended for the breeding season. The need for repeated surveys stems from the high mobility of wintering bald eagles. Some remain in one location for months, but others move quite frequently. Reasons for the movements are not fully understood, although some clearly are related to changes in prey availability and weather conditions. As a result of these movements, distribution and abundance of eagles in local areas fluctuates considerably during the winter. For example, a location where an average of 10 eagles are seen in January might have an average count of 40 in February and a peak of 60 in March. Preferred feeding sites within an area could shift from open water early in the winter to adjacent terrestrial habitat later in the season. The level of use at night roosts also is variable. Thus, to identify important feeding areas and night roosts, surveys are needed throughout the winter period. In many locations a high level of survey effort probably will be required for at least two winters to identify regularly used sites. Thereafter, survey frequency can be reduced to whatever is desired for monitoring a particular area of interest.

Survey Information.

For each survey of a roost or feeding are a complete record should be made of the date, time, personnel, procedures, route, and weather conditions. Determining the distribution of wintering bald eagles is as important as determining their abundance. Therefore, the locations of eagles observed during surveys should be plotted as precisely as possible on maps. Consistently-used feeding areas and even individual hunting perches are identified by comparing the observations plotted over a number of surveys. Detailed information of this type is essential for delineating the boundaries and special features of wintering areas where site-specific management plans are needed. This level of detail also is needed for Endangered Species Act (Section 7) formal consultations.

Survey Procedures.

To the extent possible, survey procedures should be the same all winter. Because observer competence is a major source of variability in winter survey results, the same experienced observer(s) should conduct all surveys in a particular area, with the same pilot and aircraft for aerial surveys. Recording detailed information during a survey may require a primary observer to look for eagles and a recorder to plot the locations of eagles, carrion, waterfowl, stretches of open water, or other items of interest and value. Eagles missed by the primary observer but seen by the recorder or the pilot should be noted separately.

Surveys can be conducted from the air, the ground, or by boat. Visibility from a boat usually is limited by shoreline vegetation or topography, therefore, surveys by boat are advisable only for locations inaccessible from the ground or unsafe for aerial survey. Surveys from the ground are recommended where vegetation and terrain do not restrict visibility, e.g. small lakes or rivers where the entire shoreline can be seen from a few fixed points. Aerial surveys are recommended for large wintering areas, and locations where ground access is poor, or visibility is limited. Some feeding areas and roosts appear suitable for both ground and aerial surveys. At such locations, initial surveys can be conducted simultaneously from the ground and the air to assess which procedure is better.

Safety is the foremost consideration during aerial surveys. Pilots should have considerable prior experience conducting wildlife surveys that require slow, low-level flying. The route and the location of potential hazards such as powerlines should be determined before each flight. Tight turns should be minimized.

Aerial surveys can be conducted from helicopters or fixed-wing aircraft. More eagles are likely to be detected from helicopters because eagles usually flush ahead of them and are quite noticeable. However, flushing eagles from roosts or feeding areas on a regular basis could lead to abandonment of these essential wintering sites by some or all of the affected birds. Also, the cost of using a helicopter (about five times the hourly cost of a fixed-wing aircraft) is seldom justified. Therefore, helicopters are recommended only where use is dictated by safety dictated by safety considerations.

A small plane such as a Piper PA18 ("Super Cub") is ideal for aerial surveys by one observer. For surveys that require two observers, a small four-seater capable of slow flight (e.g. Cessna 172 or 180) is recommended. During aerial surveys a speed of 60 to 75 mph is optimal; up to 90 mph is acceptable. Detection of bald eagles drops sharply above 90 mph. The recommended survey height is 100 to 300 feet above ground or tree level. Flights above 300 feet are of limited value because many less conspicuous eagles are missed. During surveys along rivers both shorelines should be visible from one side of the plane. Where tree cover is dense, or a river is braided or so wide that both shorelines cannot be seen adequately on a single pass, the plane should circle and make additional passes until the area is covered thoroughly.

Surveys in feeding areas should coincide with the time of day when most bald eagles are foraging. This usually is one to three hours after daylight. It is advisable to check night roosts just before an early morning survey of feeding areas, and to delay the survey until later in the morning if a large number of birds are still at roosts. Surveys late in the morning or in the afternoon are not recommended because some bald eagles soar when weather conditions are appropriate, and others move to roosts or other protected sites to rest after feeding.

Both direct and indirect methods can be used to determine whether bald eagles hunt in terrestrial habitats adjacent to water. One indirect, highly recommended method is checking beneath roost trees for prey remains and regurgitated pellets of undigested material. Do this only when no eagles are at the roost, e.g., at mid-day. Because eagles can digest fish completely, few castings are found where fish are the major item in the diet. Vegetation from fish stomachs sometimes is regurgitated in pellet form, and fish scales and cartilage occasionally are found in castings that contain feathers or hair. A large proportion of castings with hair indicates that eagles are obtaining carrion or live prey in terrestrial habitats. By analyzing castings it may be possible to determine which mammals are fed upon; in many instances one species clearly is dominant. These data can be used to infer that eagles hunt at particular sites or in certain vegetation types known to support the prey species. Roost sites should be checked for castings on a regular basis, e.g., once per month.

Another indirect means of determinging whether terrestrial habitats are used is to count eagles at night roosts and compare the results with a count made the following morning in aquatic feeding areas. The morning survey should be preceeded by a check of roost areas to

determine how many eagles are still there. A night roost count that substantially exceeds the count from the morning aquatic area survey is an indication that some of the eagles may be in terrestrial areas.

The general pattern of eagle distribution in terrestrial feeding areas usually can be determined directly by conducting surveys in suitable prey habitat. Where there are few suitable sites for bald eagles to hunt, each site can be checked. However, where the potential hunting area is vast, aerial surveys along transect lines are recommended. This type of survey provides an index of eagle distribution in relation to vegetation types and other habitat characteristics. Transect lines spaced 1.5 miles apart are suggested. The length of the lines depends on the suitability of vegetation as prey habitat. In any case, transects normally need not extend further than 15 miles from roosts. It should be recognized that a survey along transect lines provides an index of distribution and information on the extent of feeding areas: it does not provide accurate data on abundance. In wintering areas where terrestrial habitats receive high use by eagles, the best means of assessing abundance is to count at night roosts.

Night roost surveys are conducted at dusk or dawn. Dusk is preferred because most eagles return to roosts before dark, while there still is enough light to see them, whereas some eagles leave roosts at or before daybreak, when it is too dim for an accurate count. It is important to search periodically for roosts, until there is a high degree of confidence that all regularly used sites have been identified.

Occasionally, counts at roosts cannot be made safely from the air, nor can roosts be seen directly from the ground. In these situations observers watch from a distance and count eagles as they fly toward the roost site (or from it, if the survey is done in the morning). This procedure underestimates the actual number of birds using a roost because eagles remaining there all day are not seen, and some flying to (or from) the roost could be missed.

## Other Considerations

There has been confusion over the interpretation of winter survey data, particularly with regard to abundance, and a discussion of the matter is appropriate in these guidelines:

1. Because of visibility biases inherent to surveys, a survey provides an index rather than an absolute count of the eagles present at a particular time.

2. Counts at night roosts generally provide more accurate indices of abundance than counts in feeding areas, provided all roosts in a wintering area are checked.

3. The total number of eagles using a particular location during winter cannot be determined because individual birds vary in the length of time they remain in any one place. Therefore the "wintering population" in a particular location, county, state, or region is dynamic, not fixed in size. At present the range, average, and peak number of eagles observed in feeding areas or at roost sites are the most meaningful measures of use in wintering areas. Better indices (e.g. estimates of "bald eagle use days") for comparing levels of use in various locations are desirable and hopefully will be developed in the future.

4. Fluctuations in use occur between winters and within winters. As a general rule, however, wintering areas where suitable prey resources are regularly available, relatively abundant, and easy for eagles to obtain are used each year and support far more eagles than do surrounding, less suitable locations. Properly conducted surveys should reflect these types of differences.

Surveys do not provide all the information necessary for the preparation of site-specific management plans. Additional studies are needed for the following:

1. identifying and assessing important habitat for major prey species;

2. assessing tree regeneration at night roosts and in feeding areas; and

3. identifying vegetation or terrain features that screen roosts and feeding areas from human activity or wind.

Also, in some locations intensive observations or telemetry studies will be necessary to adequately define the extent of bald eagle hunting areas. This is particularly true where eagles use terrestrial habitats extensively.

## Appendix G

## MANAGEMENT GUIDELINES FOR WINTERING AREAS

Wintering bald eagles have not received the wide-spread, long-term attention given to nesting bald eagles. Information on wintering birds for the longest period of years comes from the region along the Mississippi and associated rivers, particularly in Wisconsin, Iowa, and Illinois. The information consists chiefly of counts of birds and records of wintering locations. A few detailed studies of night roosts, feeding areas, and eagle movement patterns have been conducted at scattered places in the Northern States Region, particularly in Illinois, Wisconsin, Missouri, Utah, Colorado, South Dakota, and Nebraska. However, these generally have been short-term studies concerned with limited geographic areas, and much of the information has not been synthesized and reported.

In addition to the paucity of information on wintering eagles, the birds use a much wider variety of habitat than when nesting; their behavior is much more variable in their use of that habitat; and they are much less faithful in their use of particular sites. That is, some wintering sites are used only for short periods and the eagles may or may not return to the same site in subsequent years. This apparently depends on factors such as weather, quantity and concentration of food, availability of alternate locations, and human disturbance. At nesting sites adult eagles invest considerable effort and resources in construction of nests, laying and incubation of eggs, and rearing of young. Such is not the case with wintering sites. One would not, therefore, expect bald eagles to evince as much site tenacity at wintering areas.

As a result of both lack of information and variability of habitat use by wintering eagles, less is understood about what wintering birds require and management is more difficult. The objective of management at wintering areas is to maintain or improve their suitability for bald eagles. Because we do not know yet the best ways to accomplish that, the Team can provide only general guidelines for starting the task. We recommend more research into the needs of wintering eagles and better communication among persons attempting to manage wintering eagles.

Management of wintering eagles should focus, at least initially, on areas that are known to be used consistently each year by concentrations of birds. Therefore, the first step is to conduct surveys of numbers and specific locations of birds, as described in the previous appendix. In any geographic region the most important sites will be those where the greatest number of birds are found over the longest periods of time.

The second step, after determining which areas are being used consistently by large numbers of eagles, is to begin thinking about site-specific plans for the protection and management of those areas. The most important considerations will depend on whether a particular site is a night roost or a feeding and daytime use area. For night roosts, the prime considerations should be habitat maintenance and prevention of human disturbance, both while the birds are present and over the long term. Disturbance when eagles are arriving or present at a roost may cause them to abandon an area altogether. Long term activities, including some when the birds are not present, may alter the suitability of the habitat for future use. At feeding sites the prime consideration in most cases will be continued availibility of food, but prevention of human disturbance is a second important consideration.

The next step involves consideration of known historical and present circumstances and characteristics of a site. If bald eagles are using an area, initial management should be directed toward maintaining present conditions. Changes should be made only after careful deliberation and knowledge of what can be done to improve the area for eagle use. If the birds are using areas away from human disturbance, increased human activity should not be permitted unless it is consistent with the birds' welfare (such as biological studies by experienced researchers or distant viewing facilities to increase awareness and appreciation by the general public). Other areas, however, may be situated in the vicinity of much human activity. Some feeding and daytime use areas in the midwest and east, for example, are located below dams in or at the edge of towns and cities. In such cases, where the eagles are clearly accustomed to human presence and activity or in areas that are used less consistently by the eagles, management may be less restrictive.

In some cases, management plans may incorporate some form of zoning, with the intensity of restriction and management varying with distance from the site, as has been used for nest sites. The zone approach should not distract from the real needs of the birds, however, and, in general, the Team recommends site-specific plans with size and shape tailored to the particular location. Easements, cooperative agreements with land owners, or acquisition from willing sellers might be necessary for management of most privately owned sites (See example of letter at end of previous appendix). Management on public lands should be emphasized in locations of mixed ownership.

After considering past and present circumstances and deciding the boundaries of the area to be managed, plans need to address two broad categories of management: <u>habitat maintenance</u> and <u>enhancement</u>. The following points identify some of the items to be considered for night roosts and feeding areas respectively.

## GUIDELINES FOR NIGHT ROOSTS

Management areas for night roosts should encompass the tree(s) in which eagles actually spend the night, trees used for perching during arrival or departure, and other trees or physical features such as hills, ridges, or cliffs that provide wind protection. Flight corridors regularly used by eagles moving to or from roosts should be included in the plan. In all cases land use decisions must consider the nature of the action, its temporal and spatial relationship to the roost, and the current level of disturbance in the area. Publicity regarding roosting areas may increase human disturbance to a level causing eagles to abandon the area. Locations of all roosting sites thus should be treated as sensitive information and should not be publicized.

A. Maintenance.

1. To the extent feasible, control human activity in the vicinity of roosts during the time of year when bald eagles are present. Allowable activities include eagle research or management by qualified persons and existing activity being tolerated by roosting eagles. Certain recreational activities, such as hiking, cross-country skiing, and birdwatching, that occur further than 1320 feet from the a roost might be tolerated by eagles, especially if there is complete visual screening of the area where these activities take place. At locations where eagles already have habituated to a high level of human activity even relatively loud, noticeable disturbances such as road repairs may be tolerated, particularly if such activities take place only during the day when most eagles are away from roosts. However, at every site there probably is a threshold of disturbance which, if exceeded by the cumulative effect of several activities, or a sudden increase above ambient levels, will cause abandonment of the roost by some or all of the eagles using it. Therefore, human activity should be minimized to the fullest extent possible, or allowed with the stipulation that it must cease if it disrupts use of the roost site.

   Occasional activity that does not permanently affect the suitability of the site for roosting can be allowed, provided the activity is brief (e.g. one to five hours), and that it takes place during the time of day when no eagles are present. There should be sufficient monitoring to insure that the activity does not disrupt use of the site by eagles.

2. Maintain trees in the roost area. This may require restrictions on land uses that would result in the destruction of roost trees.

3. Prohibit alteration of physical features such as cliffs or ridges if the alterations would significantly lesson the visual screening and wind protection these features provide.

4. Prohibit construction of highways, roads, railroads, gravel pits, mines, buildings, airports, or other structures.

5. Control or prohibit use of the area by livestock if it is determined that unrestricted use is adversely affecting tree regeneration to the extent that the long-term suitability of the roost is jeopardized.

B. Enhancement

1. Minimize immediate threats to trees, e.g. stabilize banks, control erosion, place protective screening or fencing around trees in areas where damage by beavers, livestock, or other animals is a problem.

2. Plant young trees in locations where natural regeneration is not sufficient to provide roosting, perching, or wind-buffered trees on a sustained basis, or where additional buffering from human disturbance and wind is desired. Also, new roosts could be created by planting trees in suitable wind-protected sites where no trees currently exist.

3. Maintain openings that allow eagles easy access to roost or perch trees in dense stands. Provide access to potential roost or perch trees in dense tree stands by creating openings or selectively thinning.

## GUIDELINES FOR FEEDING AREAS

A. Maintenance.

1. Prohibit or discourage actions that are likely to reduce the abundance or availability of suitable prey to such an extent that fewer eagles would be supported in any area. This is the most important management consideration in feeding areas.

2. Control human access, particularly in areas of concentrated use, during months when bald eagles are present. The posting of important concentration areas should be considered to reduce innocent intrusions. A distance of 1320 feet (one-quarter mile) is suggested as a minimum buffer zone for human presence (e.g., birdwatchers) in feeding areas. A larger zone may be needed if the eagles have line-of-sight vision to activities beyond 1320

feet. Allowable activities in feeding areas include eagle research or management by qualified persons, current activities being tolerated by eagles, and occasional activities of short duration (e.g. repair of telephone line, checking stockponds). Within large wintering areas where eagles are widely dispersed there might be small areas which, for a variety of reasons, are rarely used and have low potential for future use by bald eagles. Some human activity can occur in such places without significantly affecting bald eagles.

3. Prohibit or discourage land uses that would destroy, or otherwise make unsuitable, trees or other habitat features used as hunting or resting perches, if few alternative perches are available.

4. At locations where suitable perches are in limited supply, identify and protect sites where young trees can be planted.

5. Control or prohibit use of feeding areas by livestock if unregulated use is adversely affecting tree regeneration to the extent that the long-term suitability of a site is jeopardized.

6. Prohibit the use of toxic materials in local rodent or predator control programs and the use of exposed-bait furbearer traps.

7. Land uses that would result in destruction of vegetation or physical features that screen feeding areas should be prohibited or discouraged.

B. Enhancement

1. Improve habitat for prey species. To the extent possible, provide conditions that promote regular prey availability from both terrestrial and aquatic habitats.

2. Increase the number of hunting and resting perches in locations where suitable perches are few in number and in locations where tree regeneration is insufficient to maintain perches on a sustained basis. In aquatic habitats the practices described below will be most beneficial when applied within 100 feet of water because trees in this area, especially those with limbs very near or hanging over water, are preferred perches. In terrestrial habitats preferred perches are trees with commanding views of prey habitat; for example, solitary trees or edges of woodlots or forests.

   Perches may be created by measures such as the following:

   a) Create a clear flight path to suitable perches by cutting selected branches or trees.

b) Plant young trees; use indigenous species preferred by eagles. If necessary, selectively thin dense stands to provide better growing conditions for the remaining trees.

c) Plant trees or tall shrubs if additional screening is needed for feeding areas.

d) Provide artificial poles with perches or erect and install large dead trees brought in from elsewhere, such as from log jams above dams.

## Appendix H

## U.S. FISH AND WILDLIFE SERVICE BALD EAGLE TRANSLOCATION POLICY

### BACKGROUND

The previous decline of bald eagle populations in the U.S. appears to have stabilized. Throughout its range, the present status of the bald eagle is thought to be relatively constant or perhaps slightly increasing. The Fish and Wildlife Service (FWS), as well as the public, has shown a great deal of interest and support for the return of bald eagles, despite their low recovery priority. In response to this support, many Federal, State, and private agencies have given top priority to bald eagles in their non-game and Endangered species programs and budget their resources accordingly. Since 1974, various Federal, State and private agencies have been using translocation techniques to augment or reestablish bald eagle populations in their historic range. Such reintroductions involve the movement of eggs, eaglets, or free flying birds from a wild population of relative abundance or a captive population (including captive-bred, rehabilitated and confiscated birds) to an area with no or comparatively low numbers of breeding birds. Hacking (a modified version of the falconer's technique for training raptors for release into the wild), fostering, and egg/clutch manipulation have also been utilized in reintroduction efforts. Review of the various bald eagle translocation projects being conducted throughout the country has demonstrated the need for coordination and the establishment of national guidelines.

Recognizing that translocation is a legitimate management tool, it is paramount that a Service-wide policy be adopted which outlines major responsibilities and priorities, provides the framework and appropriate iinterface for the orderly execution of translocation projects nationally, and prescribes maximum resource protection.

This document establishes basic national guidelines and criteria while allowing individual Regions the flexibility to review, approve, or disapprove, and coordinate translocation activities consistent with the intent of the Endangered Species Act (ESA), the Bald Eagle Act (BEA), and the Migratory Bird Treaty Act (MBTA).

## GENERAL FISH AND WILDLIFE SERVICE POLICY

The complex and intricate interdependencies of living organisms dictate that conservation efforts be focused on the community and ecosystem level. The purpose of the ESA is "to provide a means whereby the ecosystems (emphasis added) upon which Endangered species and Threatened species depend may be conserved,..." It is the policy of the Service to focus attention on habitat improvement management in its efforts to restore bald eagle populations. Whenever there is evidence that natural pioneering or wild birds are present in small or depressed (including declining) populations, their protection, management, and enhancement should receive higher priority than translocation. However, it should be recognized that in most cases protection and management of eagles and eagle habitat is compatible with translocation efforts.

When translocation is selected as a management tool, all such actions, regardless of technique used, will be conducted in accordance with the following guidelines and the policy of the affected state(s).

## TRANSLOCATION GUIDELINE PROCEDURES

1. Preliminary Planning Process.

The party initiating the translocation project request (recipient area) must provide a project description to the Regional Director serving their area. This document should include (but not be limited to):

a) An assessment of the recipient area.

i) An evaluation of past, present, and future ownership and management of the area.

ii) An evaluation of historical records regarding previous use of the area by nesting bald eagles.

iii) An analysis of the prey base and eagle foraging areas, including the presence of key habitat features required by prey species.

iv) An evaluation of the availability and suitability of nest and perch sites.

v) A determination of the effects of disturbance by the public, including proximity of translocation sites to

urban areas, industry, recreational areas, and future development in the area.

vi) An analysis of limiting factors which contributed to the initial decline, i.e., environmental contaminant levels, habitat destruction, indiscriminate shooting, and trapping.

vii) A review of local public sentiment toward reintroduction in the recipient area.

b) A statement of long range goals and objectives to be achieved including:

i) The number of breeding pairs of eagles to be established, desired production levels (number of young fledged per occupied nest), etc.

ii) A breakdown of the number of donor birds requested per year.

iii) Suggested sources for obtaining the required number of birds.

iv) The estimated duration of the translocation project.

v) A description of how the project relates to the appropriate Bald Eagle Recovery Plan(s) and reference to the specific citation in the plan calling for translocation.

c) Funding and personnel requirements including:

i) Funding source(s)

ii) Annual and total project costs

iii) Identification of key personnel involved in the translocation project, their affiliation, and qualifications for attaining the goals and objectives of the program.

2. Coordination Responsibilities

The Regional Directors will have the authority to review, evaluate, approve, or disapprove, and coordinate translocation activities. Translocation project descriptions and justifications which receive final approval will be transmitted to OES for Washington Office review and information. All translocation projects must comply with Section 7 of the ESA, as well as Federal (including ESA, BEA, and MBTA permits as appropriate) and State permit requirements.

Once Regional approval has been granted for a translocation project, it will be the responsibility of the Regional Director serving the recipient area to make the necessary arrangements with the affected Federal, State, or private agency for the acquisition of eagles. The Regional Director may choose to delegate this responsibility to the agency conducting the translocation project. However, for translocation projects where the donor and recipient areas are located in separate Regions, close coordination must be maintained between Regions throughout the duration of the project.

The Regional Directors must keep OES informed of both the availability of the donor birds and the number of birds required for each Regionally approved project. If the number of birds needed for aproved projects exceeds the number available, OES will work with the Regional Directors and their staffs, striving for the most effective placement (from a national standpoint) of the limited birds available for translocation, while endeavoring to meet at least those projects in each Region that fall into the priority A category. In attempting to interface the policy guidelines contained herein with the needs of each translocation project, consideration will be given to well established ongoing projects which have received prior Regional approval.

These guidelines and the following priority system do not supersede State authority as manifested in their existing bald eagle management programs or approved Cooperative Agreements under Section 6 of the ESA.

3. Translocation Project Priority

The Service identifies the priority of distributing eagles for translocation as follows:

a) To maintain relict populations (defined as a population of at least one breeding pair that has attempted to breed or occupied a breeding area in at least 1 of the last 5 years).

b) To reestablish extirpated populations.

c) To enhance established population (defined as a population of breeding pairs greater than 25 percent of the known or suspected historical level) that are not otherwise adequately increasing their numbers.

4. Donor Sources

The priorities for sources of birds for translocation are:

a) Captive breeding; including Patuxent Wildlife Research Center, zoos, and private breeding programs.

b) Incidentally obtained birds, such as confiscations, nest blow-downs, or healthy rehabilitation cases.

c) Limited use of wild-produced nestlings from the nearest available healthy population.

d) Limited use of wild-produced young from distant populations.

Emphasis should be placed on obtaining donor birds from categories A and B whenever possible. However, OES does not encourage or support the development of new captive breeding facilities specifically for bald eagle propagation purposes. It is recognized that, for long range planning purposes, it will not be possible to anticipate the availability of birds from category B. When incidentally obtained birds do become available, every effort must be made to use these in a reintroduction program before taking birds from the wild.

The International Species Invertory System (ISIS) maintains a data bank on bald eagles in zoos, including information on breeding, egg hatching success, and lineage when known. Various zoos have contributed captive-produced young to reintroduction projects in the past, and it is anticipated that this participation will continue and perhaps expand as more zoos improve their breeding capabilities for bald eagles. Rehabilitation and research centers make the offspring from their permanent resident birds available for introduction to the wild. When birds are obtained for release into the wild from these sources, every effort should be made to match the donor birds lineage (including population origin) with that of the recipient area.

Release of birds which have become imprinted upon humans shall be prohibited as it is likely these birds would be incapable of breeding and would have a diminished capability of surviving in the wild. Under no cincumstances should birds from either captive or wild sources which are infected with an avian disease, or are suspected of having been exposed to disease, be used for translocation purposes. The agency conducting the translocation activity is responsible for the health of the birds. There are numerous wildlife disease authorities within the FWS which may be contacted for instructions regarding test procedures for donor bald eagles.

The decision regarding the number of birds that may be removed safely from wild nest for translocation purposes should be made by the Regional Director and the State management agency serving the donor area, in consultation with the different information and advisory sources available. It is Service policy that birds may be taken only from a wild population which is at least maintaining a stable population i.e., the number of breeding pairs and the productivity figures are relatively constant or increasing, with no serious problems/threats existing with regard to nesting success. Both the short- and long-term trends of a donor population should be considered.

The Service believes that 5 percent of the previous year's productivity (successfully fledged young), or 5 percent of the mean annual productivity over the past 5 years, whichever is lower, may be taken without causing serious impact to healthy donor populations. These figures are somewhat arbitrary but appear to be conservative based on bald eagle population modeling. An understanding of the percent survivorship to breeding age in a population will prove most useful in determining the number of young which may be safely "harvested" for translocation projects. Individual donor states may exercise their option to reduce the percentage of birds which may be taken. Nests with three young are preferred for taking of nestlings, but two-birds nests may also be used. At least one nestling should be left in the nest unless the nest is doomed to failure (imminent destruction or known death of adults). Only under circumstances where donor and recipient agencies and other involved parties are in agreement may all birds from a single nest be taken. Attempts should be made to remove nestlings from as many different nests as possible, in an effort to reduce the possibility of in-breeding in the recipient area. The removal of nestlings from donor nests in subsequent years is prohibited.

5. Techniques for Translocation

As there are circumstances unique to each translocation project, the Service finds it imprudent to outline specific translocation procedures. Eagles should be translocated only in conjunction with properly organized programs, which include subsequent monitoring and evaluation. Efforts such as observation at the hack/nest site, color-marking, radio-telemetry, banding, or other means of identifying and following individual birds subsequent to fledging, should be taken (as appropriate) to monitor the outcome of translocations. All marking and radio-telemetry schemes must be consistent with the national protocol for such activities, as identified by the FWS Bird Banding Laboratory.

A concerted effort must be made to monitor those nests from which birds are taken to determine what effects (if any) the nesting disturbance and removal of a nestling have on the fledging success of the remaining young, as well as the behavior and productivity of the parents in subsequent years. If the agency providing birds from the wild for translocation projects is unable to conduct follow-up studies of the donor nests to determine subsequent productivity and nesting territory tenacity of the adults, it will be the responsibility of the recipient agency to insure that these studies are performed. The results of this monitoring will affect future decisions regarding the removal of birds for translocation projects.

The party initiating the translocation project must work cooperatively with the Regional Director serving their area, the affected State management agency, and recognized authorities in the development of the most pracitical and efficient techniques for successful reintroduction of bald eagles. These techniques

will be subjected to careful scrutiny through the review processes described herein.

## Conclusion

The Service will continue to fulfill its commitment to review and revise this translocation policy as new information becomes available. The Regional Directors will assume the major responsibility for insuring compliance with and adherence to the Policy established herein, including the initial review, approval, and coordination of translocation activities. OES will work together with the Regional Directors and their staff to insure that the guidelines and priorities reflected in this policy are implemented successfully on a national basis, and are consistent with the ultimate goal of recovery of the bald eagle.

(Approved by Robert A. Jantzen, director)

This is the completed Bald Eagle (Northern States) Recovery Plan. It has been approved by the U.S. Fish and Wildlife Service. It does not necessarily represent official positions or approvals of cooperating agencies and it does not necessarily represent the views of all recovery team members, who played the key role in preparing this plan. This plan is subject to modification as indicated by new findings and changes in species status and completion of tasks described in the plans. Goals and objectives will be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints.

Additional copies may be obtained from:

Fish and Wildlife Reference Service
3840 York Street, Unit 1
Denver, Colorado 80205
Telephone: 303/571-4656

Approved: F. Eugene Hester
Acting Director, U.S. Fish and Wildlife Service

Date: July 29, 1983