

**GUIDELINES FOR PROTECTION & MITIGATION OF  
IMPACTS TO GREAT BLUE HERON ROOKERIES  
IN VERMONT**

**VERMONT FISH & WILDLIFE DEPARTMENT  
AGENCY OF NATURAL RESOURCES**



**Signed on 1/16/2002 by Ron Regan, Commissioner, VFWD**

Signed: \_\_\_\_\_

Commissioner  
Vermont Fish & Wildlife Department

Date: \_\_\_\_\_



Table of Contents

Introduction..... page 3

Background Information.....page 3

Justification for Protection of Heron Rookeries.....page 4

Procedure.....page 6

    Project Considerations.....page 6

    Protection & Mitigation Strategy.....page 7

    Review Process.....page 10

References.....page 12

**Abstract**

The Vermont Fish & Wildlife Department (VFWD) has developed Guidelines for the Protection and Mitigation of Great Blue Heron Rookeries to protect Vermont’s limited and concentrated great blue heron nesting sites. The guidelines are intended for application by private landowners, state and municipal governments and environmental organizations, to protect the integrity of great blue heron rookeries. Great blue herons congregate at nesting sites in early spring and nesting occurs from 15 March to 1 August. Nesting sites (rookeries) are located in proximity to prime feeding areas. Numerous studies have shown that human disturbance, from land development to recreation, can affect the success of great blue heron rookeries. Potential impacts include: cooling or breakage of eggs; young being accidentally kicked from the nest or falling from the nest after being frightened; increased predation; and complete nest abandonment (Vos et al. 1985). To prevent impacts to great blue heron rookeries, a three-tiered buffer zone is recommended. The primary buffer zone requires no habitat modification or human activity during the nesting season, while the secondary and tertiary zones allow activities such as farming, recreation, and selective harvesting to occur. The VFWD will follow a procedure in reviewing development projects that threaten great blue heron rookeries. The rookery will be placed into a resource category depending on its size and stability, proposed impacts will be reviewed, and an analysis of alternatives may be required. In small, low quality rookeries where development alternatives are not available, mitigation options may be considered. Mitigation options could include habitat management plans, conservation easements, or habitat compensation. By applying these guidelines, protection of Vermont’s great blue heron population can occur while allowing planned development to take place.

## **I. Introduction:**

This document provides Vermont Fish & Wildlife Department (VFWD) wildlife biologists with guidelines to ensure consistent, objective application of conservation, protection, and mitigation measures where great blue heron nesting habitat is threatened by development and human activities. These guidelines offer a framework for the development of biological opinions in the Act 250 process and other local, state, and federal regulatory processes that apply to the protection of heron rookeries in Vermont.

Furthermore, these guidelines set forth a decision-making process by which VFWD determines the level of impact and necessary avoidance, minimization and mitigation/compensation measures that apply to a proposed development's impact on heron rookeries. Therefore, these guidelines are used to make recommendations to Act 250 District Environmental Commissions, Vermont Environmental Board, Vermont Water Resources Board and other local, state and federal regulatory decision-makers for permit conditions, mitigation agreements, land conservation instruments (e.g., easements), and, if necessary, permit denials.

These guidelines are designed for application on a case-by-case basis in order to allow for the use of professional judgement and discretion by the VFWD. Case-by-case determinations will be made by the VFWD and will be based on past precedent and individual circumstances. The environmental review process established by these guidelines relies on the direction of the Agency of Natural Resources' Conservation Procedure (1996), the Vermont Fish & Wildlife Department's "Position Regarding Wildlife Habitat Impact Assessments in the State of Vermont"(1998), the language of 10 V.S.A. section 6086 ((8)(A)(i-iii)), and extensive legal precedent as set by the Vermont Act 250 process, Vermont Wetlands Rules, and other applicable regulatory processes.

## **II. Background:**

Great blue herons (*Ardea herodias*), due to their large size, graceful flight, and interesting feeding behavior, generate much attention among the public. For many people, observing a great blue heron is often a memorable and meaningful wildlife experience. From an ecological perspective, the great blue heron is a top predator in the food chain, and can serve as an indicator of habitat condition and food availability. Great blue herons are widespread in Vermont and nesting sites are usually situated in areas subject to forestry and recreational activities and/or land development. All colonial wading birds, including great blue herons are classified as nongame species, and are protected under the Federal Migratory Bird Treaty Act.

Great blue herons congregate during the breeding season in rookeries for the purpose of courtship, nest building, egg-laying and incubation, and chick-rearing. The nesting and chick-rearing period in Vermont is from 15 March until 1 August. Generally, great blue herons re-use nest sites from the previous year, and rookeries will often grow in size over time. The largest great blue heron rookery in Vermont is in Missisquoi Bay. It contains more than 500 nests and is reported to have been active since at least the 1940s.

Rookeries in Vermont are found in beaver ponds, swamps, river oxbows, and on peninsulas, islands in rivers or ponds, and on forested slopes. Locations of approximately 32 rookeries have been mapped by the Vermont Fish & Wildlife Department's Nongame & Natural Heritage Program, however a statewide inventory has not been completed. While most of the larger rookeries are known, many smaller ones remain unknown. Of the 32 known rookeries, nine occur on public land.

Great blue herons typically nest in the crowns of live or dead trees, often near water but sometimes on hillsides. The main determinant in rookery selection is proximity to lakeside and emergent wetlands, and secondarily to scrub-shrub and riverine wetlands for feeding habitat. Herons appear to locate colonies near important feeding habitat, and will travel up to 15 kilometers to feed (Gibbs and Kinkel 1997). Protection of these wetland feeding habitats and their buffers is imperative for maintaining the integrity of great blue heron rookeries. Buffers up to 300 feet may be required to prevent disturbance of critical feeding areas, depending on site conditions and project design. Impacts to important feeding habitat for great blue herons is considered by the Vermont Wetland Rules and Act 250. The Water Resources Board has dealt with this issue in a number of case decisions, including In re Larry Westall, Docket No. CUD-99-02 (March 15, 2000); In re James and Catherine Gregory, Docket No. CUD-99-03 (March 15, 2000); In re Scanlon Bog, Docket No. 91-01 (December 22, 1992); In re North Shore Wetland, Docket No. WET-2000-03 (September 19, 2000) The issue of buffers and protection of critical feeding areas has also been addressed under Act 250, see Re: John Larkin, Inc., #4C0626-6C.

### **III. Justification for Protection of Heron Rookeries:**

Hérons typically nest in areas isolated from human disturbance; however, they will occasionally nest near human disturbance, possibly because of excellent feeding opportunities or because the incremental growth in an area has not yet resulted in displacement of herons or abandonment of the rookery (Bowman and Siderius 1984). In Minnesota, rookeries were found to be at least two miles from human dwellings, and averaged 0.8 miles to the nearest paved road (Mathisen and Richards 1978). In a Chesapeake Bay study, distance to buildings had the strongest influence on rookery location, followed by secondary roads and unimproved roads (Watts and Bradshaw 1994). Henny and Lurtz (1978) believed that isolation of the nesting site, an adequate food supply, and tree height could be important factors in determining nest site selection.

Effects of human disturbance vary in response to a number of factors, including stage of nesting cycle, degree of habituation to disturbance, rookery size, surrounding habitat(s) and land uses, and nature of the disturbance. Repeated human disturbance frequently results in nest site abandonment by herons. Housing and industrial development, water recreation, and highway construction have resulted in the abandonment of rookeries (Simpson and Kelsall 1979). Another recent threat to colonial nesting birds, is the increase in the double-crested cormorant (*Phalacrocorax auritus*) population. Colonies of black-crowned night herons (*Nycticorax nycticorax*) and cattle egrets (*Bubulcis ibis*) have been displaced by nesting cormorants on Young Island in Lake Champlain. Heron

species tend to desert nests and entire rookeries if repeatedly disturbed during the periods of pair formation, nest construction, or egg laying (Buckley and Buckley 1978). Adults do not develop a strong attachment to the nest until young are present. Tremblay and Ellison (1979) found that people visiting black-crowned night heron rookeries in Quebec just before or during laying caused abandonment of newly constructed nests, and that visits early during nesting inhibited egg laying.

Consequences of rookery desertion may include total reproductive failure in relocated rookeries, reduced numbers of nesting pairs and reduced reproductive output per pair, and isolation of breeding populations. Buckley and Buckley (1978) observed that it is not uncommon for herons in a disturbed rookery to shift to another location and experience complete nest failure at the new site, possibly because of the tremendous energy cost to the birds. If forced to relocate, great blue herons may occupy sites of poorer habitat quality (Bowman and Siderius 1984). Desertion of large rookeries can also disrupt reproductive output on a regional basis. Some rookeries have been abandoned after the destruction or alteration of their habitat during the non-nesting season. Vos et al. (1985) point out that human disturbance could have a particularly severe impact on heron productivity in years when other factors, such as weather or food supply, are already limiting.

Intrusion impact tests conducted by Taylor et al. (1981) indicated that great blue herons rarely react unless intruders are visible. After the leaf canopy has developed, activities adjacent to a rookery may have a reduced impact; however, intruders in close proximity to nest sites can still create significant disturbance impacts. Alarming young great blue herons may cause them to leave the nest and fall to the ground where they are most susceptible to predation.

In Oregon, Werschkul et al. (1976) found that mean heron rookery size was significantly larger in undisturbed areas (107.2 active nests) versus areas being logged (36.3 active nests). Nest occupancy was also significantly higher in undisturbed areas (93%) versus areas being logged (67%). The mean distance from a disturbance to an active nest was 718 ft, and to an inactive nest was 485 ft. Parker (1980) concluded that heron abandonment of rookery sites was influenced most by loss of isolation and suitable nest trees. Several authors (Vermeer 1970, Buckley and Buckley 1978, Markham and Brechtel 1978, Bowman and Siderius 1984) recommend buffer zones of at least 1000 feet around heron rookeries.

Hérons can habituate to various repeated human activities that pose no direct threat, however, there are still significant risks to reproductive effort and success from most types of human disturbance, regardless of habituation (Taylor et al. 1981). Birds nesting in large rookeries and those accustomed to a certain amount of disturbance are less likely to desert a rookery. Taylor et al. (1981) determined that herons could tolerate limited recreational use during the nesting period beyond 570 ft of the rookery. Existing farming activities within 280 ft of an active rookery apparently had no adverse effects on nesting in Indiana (Taylor et al. 1981). Boating activity was reported by Vos et al. (1985) and other authors to have less disturbance impact than other activities, probably because of

habituation. However, if a threat is perceived by the herons from lingering boats, machinery or people, disturbance will occur. Habituation of animals often results in undesirable effects by both the habituated species as well as other species. For instance, herons habituated to human activities can have a reduced predator avoidance response and thus, become more susceptible to common nest predators such as raccoons. Raccoons become more abundant in areas of human development, partly for their attraction to garbage left by people. This behavior can result in an artificial increase of predators near a rookery. Maintenance of trees and shrubs around a rookery provides a buffer against human activities, preventing disturbance to the rookery.

Hérons and other wading birds are sensitive to human activities and development, particularly during the reproductive period of their annual life cycle when they rely on rookery habitat. These birds are habitat specialists with respect to their reproductive requirements and their survival is contingent upon the availability of suitable nesting habitat. Habitat suitability in this case is dependant on isolation from human disturbance and suitable nest trees.

#### **IV. Procedure:**

The Agency of Natural Resource's environmental review process, in general, involves assessment of alternatives to impacts, impact avoidance, impact mitigation, and finally habitat replacement. The following information explains considerations the VFWD incorporates into the review process for impacts to great blue heron rookeries.

##### **Project Considerations**

###### *1. Resource Categorization*

The Vermont Fish & Wildlife Department places habitat types into one of three "resource categories" (RC's) which determine mitigation options. This allows the Department to consider a habitat's quality and determine its relative significance. Heron rookeries are assigned to the following resource categories based on the number of active nests. The RC thresholds reflect knowledge gained from a ten year study by the Audubon Society of New Hampshire of more than 150 great blue heron rookeries, and considers the relative size of Vermont nests.

RC1- highest value, rare and irreplaceable on a statewide basis: An active rookery containing more than 25 active nests.

RC2- high value, unique, and irreplaceable on a regional basis: An active rookery containing 8-25 active nests.

RC3- moderate value, scarce on a regional basis: An active rookery containing 2-7 nests.

Rookeries containing more than 25 nests are often active at the same site for decades and may represent a large proportion of New England's heron population. The rookery at Missisquoi Bay is an example of a state significant RC1 rookery. Small rookeries (fewer than eight nests) are generally less stable over time (Audubon Society of New Hampshire, unpubl. material; C. Martin, pers. comm.) However, a rookery of any size isolated by a large distance from other rookeries warrants protection because the site may represent the only suitable nesting habitat within a biological region of the state, or may support the only breeding herons within a biological region (Bowman and Siderius 1984). In order to offset the vulnerability of rookeries, newly established, small rookeries should also be protected as they may become seed colonies in the future (Buckley and Buckley 1978).

## 2. *Direct vs. Indirect Impact Determinations*

Impacts should be categorized as "direct" (e.g., construction resulting in direct loss of rookery habitat) or "indirect" (e.g., disturbance by human-related activities or loss of buffer habitat resulting in changes in nesting behavior). Direct and indirect impacts should not be allowed in RC1 or RC2 heron rookeries. Direct and indirect impacts may be allowed in RC3 heron rookeries only after a complete assessment of alternatives for avoiding or minimizing impacts has been conducted. Determinations of direct and indirect impacts are based on the number of nests impacted, number of heron nesting pairs, acres of habitat and protective buffer zones impacted.

## 3. *Alternatives and Avoidance Analysis*

If direct or indirect impacts to an RC3 rookery are proposed, an alternatives and avoidance analysis will be required. This analysis will examine the feasibility of using alternative sites for development on or off the proposed project parcel. It will also assess strategies to avoid the rookery by redesigning or moving the project so that its size/scope does not interfere with the resource.

# V. **Protection & Mitigation Strategy**

## **Protection Strategy**

This protection strategy utilizes a three-tiered buffer zone approach which provides for maximum protection for those areas closest to the rookery while allowing for some compatible activities at greater, more appropriate distances. Topography, vegetation structure, and past history of human activity may alter the necessary buffer distances required to minimize disturbance (Vos et al. 1985). Also, factors such as rookery size, persistence, and tree height will be considered. Buffer distances are measured from the rookery perimeter, which is determined by plotting the outermost nests in a rookery. Most critical heron breeding activity occurs prior to leaf-out in the spring, so buffer zones should be delineated prior to this time using signing or flagging. The buffer distances given below were developed by the Maine Department of Inland Fisheries and Wildlife (1989) and are consistent with the scientific literature (Vos et al. 1985). Protection of the

following buffer zones around great blue heron rookeries, are recommended by the Vermont Department of Fish & Wildlife.

**Primary buffer zone: within 300 feet of the rookery perimeter:**

- There should be no habitat modification, such as timber cutting, land clearing, and construction of roads, trails, or buildings. Only actions deemed necessary for improving the nesting habitat should be undertaken.
- All human use of this buffer area should be avoided during the nesting period (15 March- 1 August). Recreational activities such as hiking, hunting, fishing, biking, and camping are compatible with protecting heron nest habitat outside the nesting period.

**Secondary buffer zone: from 300 to 650 feet of the rookery perimeter:**

- There should be no sand or gravel extraction, land clearing, or construction of permanent structures or roads.
- Existing farming operations including maple sugaring, and use of existing footpaths by non-motorized traffic are allowed activities which should not result in adverse impacts during the nesting period (15 March – 1 August).
- Activities compatible with protecting heron nest habitat outside the nesting period include: hunting, fishing, hiking, biking, camping, maintenance of existing roads or trails, and selective timber harvest.

**Tertiary buffer zone: from 650 to 1300 feet from the rookery perimeter:**

- Construction of small buildings, temporary roads, or timber harvesting may be feasible outside of the nesting period with the consultation of a wildlife biologist or consulting forester.
- Activities such as hunting, fishing, hiking, and camping may occur in this zone.

**Mitigation Strategy**

1. *Habitat Management Plans*

Habitat management plans may be required as part of a protection or mitigation strategy in order to conserve and enhance the habitat that may be protected or used for compensation. The purpose of habitat management plans must be to maintain and enhance the long-term integrity of the heron rookery. The Vermont Fish & Wildlife Department must review and approve all habitat management plans. Habitat management plans should be based on current habitat specific information including, but not limited to: (1) general character of the nesting area, associated buffer zone, and other related significant habitat elements such as feeding habitat; (2) percentage of tree species composition of the nesting area and associated buffer zone; (3) delineation of individual nest trees within the nesting area and buffer zone; (4) basal area by stand; (5) mean stand diameter; (6) number of existing heron nests and number of potential nesting sites; (7) description of the history of heron use of the rookery. The plan should include a copy of a U.S.G.S. topographic map showing the rookery location. In addition, a property map should be included which shows the nesting habitat area, respective buffer zones, and



other applicable information that may be identified in a habitat management plan (e.g., tree species stand types, or wetland boundaries).

## 2. *Conservation Easements for Conserved Heron Rookeries*

Habitat that is used for compensation of impacted habitat will usually be protected through the development of a conservation easement. All lands that are covered under an easement shall be delineated on town tax maps, as well as on property or development plans, and a copy of the applicable U.S.G.S. map. All conservation easements that are used to satisfy VFWD interests in habitat conservation must be reviewed and approved by the VFWD prior to being recorded in the town land records. Typically, the VFWD will request that a permit not be issued until such time as the necessary easement(s) have been agreed upon by all parties, finalized, and recorded in the town land records. The VFWD will request a permit condition make reference to the conservation easement and any critical habitat conservation provisions in the easement in order to ensure an understandable connection to the permit. As explained later in this document, a variety of conservation groups, organizations or public institutions may serve as grantee to an easement including: (1) the Vermont Department of Fish & Wildlife; (2) the Vermont Department of Forests, Parks, and Recreation; (3) The Nature Conservancy; (4) the Vermont Land Trust; (5) a Town; (6) a local conservation group or organization; and (7) others. The VFWD will assist in the determination of an appropriate grantee to an easement. The exact language of any conservation easement must be coordinated with the reviewing biologist, VFWD, and Agency Land Use Attorney. Examples of acceptable easements may be provided upon request.

## 3. *Habitat Compensation Ratios*

Compensation for the direct, physical loss of heron nesting habitat or the loss of functional value from unavoidable indirect impacts (i.e., loss of buffer zone) may be considered only for RC3 rookeries. Compensation may take the form of permanently protecting the portion of impacted rookery that is determined to remain functional, permanently protecting another rookery of equal or greater value or enhancing the functional value of the protected rookery. Compensation for lost rookery habitat shall be accomplished at a ratio of 3:1. For each nest/acre impacted directly or indirectly, three nests/acres must be protected. Protected habitat must be located within the same biological region as the impacted habitat, if other active rookeries are present. Biological region may be defined by watershed boundaries or biophysical region. A 3:1 ratio will allow for impacts in 25% of the RC3 rookeries or 12% of the total rookeries, while protecting enough rookeries to maintain the heron population in Vermont. About half of Vermont's rookeries are considered RC3. Literature on great blue heron rookeries indicates that small rookeries may be ephemeral. However, the literature also states that a small rookery representing the only breeding habitat within a watershed or biophysical region, may become a seed colony for future growth. Ultimately, case-by-case review of the habitat and project proposal will determine the appropriate protection and mitigation strategy to be used for each site. Rookery habitat used for compensation must be

protected by a conservation easement as discussed below, unless otherwise authorized by the Vermont Fish & Wildlife Department.

### **Review Process**

In assessing mitigation options, the following process should be applied (refer to Table1):

- A. Analysis of Alternatives
  - i. A determination should be made as to whether an alternative site, on or off the proposed project parcel, is available to accommodate the project. If the determination results in positive findings (i.e., yes, an alternative site exists), then no direct impacts should be allowed. Indirect impacts may be allowed pursuant to the adoption of mitigation strategies outlined below.
  - ii. If the determination results in negative findings (i.e., no, an alternative site does not exist), then proceed to step B.
- B. Resource Categorization (RC) Determination
  - i. A determination should be made regarding whether the project site is located within or adjacent to an RC1, RC2, or RC3 heron rookery, or portion thereof. In making this determination, the Department will consider the parameters established in section IV, Procedure, Project Considerations.
  - ii. If this determination results in a finding that a rookery is RC1 or RC2 then direct or indirect impacts should not be allowed and a the protection strategy (section V) should be established pursuant to these guidelines.
  - iii. If this determination results in a finding that a rookery is RC3 then proceed to step C.
- C. Application of Mitigation Strategies
  - i. A determination should be made regarding whether an applicant is willing to apply all feasible and reasonable mitigation strategies, as determined by the VFWD.
  - ii. If this determination results in positive findings (i.e., yes, an applicant is willing to apply necessary mitigation strategies) then mitigation options (section V) should be applied for all direct and/or indirect impacts.

- iii. If this determination results in negative findings (i.e., no, an applicant is not willing to apply necessary mitigation strategies) then no impacts should be allowed.

Table 1. Steps for Determining Mitigation Alternatives for Great Blue Heron Rookeries.

Step 1: Is an alternative development site, on or off the project parcel, available to avoid impacts?	
<p style="text-align: center;">YES</p> <p style="text-align: center;">* No Direct Impacts Allowed * Utilize Guidelines for Indirect Impacts</p>	<p style="text-align: center;">NO</p> <p style="text-align: center;">* Go to Step 2</p>
Step 2: Is the project within a heron rookery, or portion thereof, with unique or irreplaceable public or biological values on a statewide or regional basis (RC 1 or RC 2)?	
<p style="text-align: center;">YES (RC 1 or 2)</p> <p style="text-align: center;">* No Direct Impacts Allowed * Utilize Guidelines for Indirect Impacts</p>	<p style="text-align: center;">NO (RC3)</p> <p style="text-align: center;">* Go to Step 3</p>
Step 3: Is the Applicant willing to apply feasible and reasonable mitigation measures per Guidelines?	
<p style="text-align: center;">YES</p> <p style="text-align: center;">* Utilize Guidelines for Direct and Indirect Impacts</p>	<p style="text-align: center;">NO</p> <p style="text-align: center;">* No Direct Impacts Allowed * Utilize Guidelines for Indirect Impacts</p>

## References

- Bowman, I. and J. Siderius. 1984. Management guidelines for the protection of heronries in Ontario. Unpubl. report, Ontario Ministry of Natural Resources. 44p.
- Buckley, P.A. and F.G. Buckley. 1978. Guidelines for the protection and management of colonially nesting waterbirds. North Atlantic Regional Office, National Park Service, Boston, MA 02109. 54p.
- Gibbs, J.P. and L.K. Kinkel. 1997. Determinants of the size and location of great blue heron colonies. *Colonial Waterbirds* 20:1-7.
- Henny, C.J. and J.E. Kurtz. 1978. Great blue herons respond to nesting habitat loss. *Wildlife Society Bull.* 6:35-37.
- Markham, B.J. and S.H. Brechtel. 1978. Status and management of three colonial waterbird species in Alberta. *Proc. of the Colonial Waterbird Group* 1978:55-64.
- Mathisen, J. and A. Richards. 1978. Status of great blue herons on the Chippewa National Forest. *Loon* 50:104-106.
- Parker, J. 1980. Great blue herons in northwestern Montana; nesting habitat use and the effects of human disturbance. M.D. Thesis, University of Montana, Bozeman.
- Rodgers, J.A., Jr. and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conserv. Biol.* 9:89-99.
- Rodgers, J.A., Jr and H.T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Conserv. Biol.* 25(1): 139-145.
- Simpson, K. and J.P. Kelsall. 1979. Capture and banding of adult great blue herons at Pender Harbour, British Columbia. *Proc. 1978 Conf. Colonial Waterbird Group* 2:71-78.
- Taylor, T.T., M. Reshkin, and K.J. Brock. 1981. Recreation land use adjacent to an active heron rookery: a management study. *Proc. Indiana Acad. Sci.* 91:226-236.
- Tremblay, J. and L.N. Ellison. 1979. Effects of human disturbance on breeding of black-crowned night herons. *Auk* 96:364-0369.
- Vermeer, K. 1970. Insular great blue heron colonies on large Manitoba lakes. *Blue Jay* 28:84-86.
- Vos, D.K., R.A. Ryder, and W.D. Gaul. 1985. Response of breeding great blue herons to human disturbance in northcentral Colorado. *Colonial Waterbirds* 8:13-22.

Watts, B.D. and D.S. Bradshaw. 1994. The influence of human disturbance on the location of great blue heron colonies in the lower Chesapeake Bay. *Colonial Waterbirds* 17 (2): 184-186.

Werschkul, D.F., E. McMahon, and M. Leitschuh. 1976. Some effects of human activities on the great blue heron in Oregon. *Wilson Bull.* 88:660-662.