

**THE NORTH AMERICAN BANDERS' MANUAL  
FOR  
WATERFOWL  
(Family - ANATIDAE)**

**A product of the  
NORTH AMERICAN BANDING COUNCIL**



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*This manual is a living document. Edits and comments should be sent to:*

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## TABLE OF CONTENTS

1. Introduction.....	1		
2. Permits .....	1		
2.1 Federal, Provincial, and State.....	1		
2.2 NABC Certification .....	2		
3. Bander Objectives .....	3		
4. Training Advised for Personnel .....	3		
5. Banding Program Guidelines .....	3		
6. Trap Site Selection.....	4		
7. Baiting the Site.....	4		
8. Precautions to Reduce Predation.....	5		
9. Capture Methods.....	5		
9.1 Bait traps.....	5		
9.1.1 Clover-leaf .....	8		
9.1.2 NBL (Benning trap) .....	8		
9.2 Mist nets.....	8		
9.3 Cannon or rocket nets .....	9		
9.4 Drive traps.....	9		
9.5 Net guns .....	10		
9.6 Night-lighting.....	10		
9.7 Dogs for capturing .....	11		
9.8 Gill nets/Submerged mist nets.....	11		
9.9 Floating duck trap .....	11		
9.10 Lift Nets .....	12		
10. Handling Waterfowl.....	13		
10.1 Ducks .....	13		
10.2 Geese.....	14		
10.3 Swans .....	14		
		11. Ageing and Sexing Waterfowl .....	16
		11.1 External characters to determine age and sex ...	17
		11.2 Dabbling ducks.....	17
		11.3 Diving ducks .....	18
		11.4 Geese .....	18
		11.4.1 Canada Goose.....	18
		12. Health of banders .....	19
		12.1 Salmonellosis .....	19
		12.2 Chlamydiosis.....	19
		12.3 Highly Pathogenic Avian Influenza .....	19
		12.4 Other common zoonotic diseases .....	20
		13. Bird Safety .....	21
		13.1 Bird capture, management and handling .....	21
		13.2 First Aid .....	22
		14. Euthanasia .....	22
		15. Data management .....	22
		15.1 Four Letter Alpha Codes Explained .....	22
		16. Equipment sources .....	23
		17. Literature cited .....	23
		18. Related web pages .....	24
		Appendix A. The North American Banding Council .....	25
		Appendix B. Age (Year Class) Codes .....	26
		Appendix C. Feather Groups of the Duck Wing .....	27
		Appendix D. NBL Trap Design.....	28
		Appendix E. Types of Wear on Wing Feathers .....	29
		Appendix F. Waterfowl Banding First Aid Kit .....	30
		Appendix G. Wildlife Mortality Response.....	31
		Appendix H. AOU codes and band sizes.....	33

THIS DOCUMENT IS INTENDED FOR USE BY BANDERS AND POTENTIAL BANDERS WHO WILL BE USING STANDARD WATERFOWL BANDS OR OTHER MARKERS THAT ARE SUPPLIED DIRECTLY BY THE U.S. BIRD BANDING LABORATORY OR THE CANADIAN BANDING OFFICE. THIS DOCUMENT DOES NOT COVER OTHER RESEARCH ACTIVITIES SUCH AS BLOOD OR FEATHER COLLECTION, ADDITIONAL MARKERS, OR RADIO OR SATELLITE TELEMETRY, THAT MAY TAKE PLACE AT A BANDING STATION. THIS MANUAL FOCUSES MAINLY ON BAIT TRAPPING OF DUCKS FOR BANDING. EXOTIC NON-NATIVE WATERFOWL ARE NOT COVERED.

IF ADDITIONAL ACTIVITIES AFFECTING THE BIRDS ARE REQUIRED WHILE WATERFOWL BANDING, THE PROPER HANDLING AND COLLECTION PROTOCOLS FOR THOSE ACTIVITIES MUST BE SUPPLIED BY THE RESEARCHER OR BY RELATED LITERATURE SEARCHES. THIS MANUAL MUST BE USED IN CONJUNCTION WITH THE *NORTH AMERICAN BIRD BANDING MANUAL: VOLUME 1* (CANADIAN WILDLIFE SERVICE AND U.S. FISH AND WILDLIFE SERVICE 1991) AND *THE NORTH AMERICAN BANDERS' STUDY GUIDE* (NORTH AMERICAN BANDING COUNCIL, 2000)

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Photographs used are from the *Duck Banding Video*. Environment Canada, Canadian Wildlife Service. ISBN: 0-662-75258-9, Catalogue No. CW66-231/2003. Photographs by Norm North unless noted with the photo.



## ***The Bander's Code of Ethics – Waterfowl***

- 1. *Banders are responsible for the safety and welfare of the birds under their control and must ensure stress and risks of injury or death are minimized. Some basic rules:***
  - **handle each bird carefully, gently, quietly, with respect, and in minimum time**
  - **ensure that you have enough personnel present on site so that you capture and process only as many birds as you as you can safely handle**
  - **close traps or nets when predators are in the area**
  - **do not band in weather or conditions that puts the birds at risk**
  - **frequently assess the condition of traps and nets and repair them quickly**
  - **properly train and supervise students**
  - **properly close all traps and nets at the end of banding**
  - **do not leave gill or mist nets set and unattended. This includes rocket, cannon or net blasters**
  - **use the correct band size and banding pliers for each bird**
  - **treat any bird injuries humanely**
  - **check traps as often as recommended for each trap type and as appropriate for weather conditions**
  - **ensure the safe release of banded birds as well as those birds left unbanded**
- 2. *Continually assess your own work to ensure that it is beyond reproach.***
  - **reassess your methods if an injury or mortality does occur or there is a risk of it occurring**
  - **ask for and accept constructive criticism from other banders on both capture methods and handling techniques**
- 3. *Offer honest and constructive assessment of the work of others to help maintain the highest standards possible.***
  - **publish i.e. transfer verbally or through notes to other banders regarding any innovations in banding, capture, and handling techniques**
  - **educate prospective banders and trainers**
  - **report any improper handling of birds to the bander**
  - **if no improvement occurs, file a report with the Banding Office**
- 4. *Ensure that your data are accurate, complete and that it is legible by others.***
- 5. *Obtain prior permission in writing to band on private property and on public lands where authorization is required. This may involve obtaining permits depending on banding location.***





## 1. INTRODUCTION

In 1916, the Migratory Birds Convention was signed by Britain, on behalf of Canada, and the United States. The Convention set out a system of protection for migratory birds and regulated the killing of the birds in both countries. In 1936, when the United States signed a treaty with Mexico, that protection was extended to cover all of North America.

Government agencies that were given the responsibility of administering the Convention also coordinated banding efforts. The Canadian Bird Banding Office was established in 1923 to issue permits, supply bands, and keep records of Canadian banding activities. It is now administered by the Canadian Wildlife Service (CWS), Environment Canada in Ottawa. In the United States, the U.S. Bureau of Biological Survey, now the U.S. Fish and Wildlife Service (USFWS), was established in 1920 with similar responsibilities and the Bird Banding Laboratory in Washington, D.C., became the centre for American banding activities. The Bird Banding Laboratory is now administered by the U.S. Geological Survey (USGS). Close coordination is maintained between the Bird Banding Laboratory and the Banding Office. Files at the Banding Laboratory contain the data for all birds banded in North America. Migratory bird banding has focused on waterfowl species that are harvested during hunting seasons. Waterfowl have relatively high recovery rates compared to many other species of banded birds. These recoveries are often in the form of shot birds that have been harvested during the hunting season, although many encounters come from retraps (birds that have been caught in other banders' traps). Other recoveries come from birds that have been inadvertently killed by other human activities and include mortality from road kills, fur trapping, and wire and tower strikes.

Much of the information collected from recoveries is used by wildlife managers to help set hunting regulations that reflect the temporal and spatial realities of waterfowl populations. Some waterfowl banding occurs during research projects and these banding operations often collect more individual information about a bird than operational pre-season banding. Pre-season banding focuses on banding large numbers of birds. Age, sex, date, and location of banding are the usual criteria recorded for each bird. Most waterfowl are banded before the onset of hunting. The associated recoveries provide information on harvest distribution, harvest derivation, survival rates, and harvest rates. Auxiliary markers such as neck bands or wing tags

provide additional information for specific research projects and are accompanied by a standard metal leg band. Radio and satellite transmitters are becoming more common and help researchers answer specific questions.

The collection of blood and feathers for stable isotope and DNA studies is occurring more commonly at banding sites. These and similar activities that may affect the individual bird require that a different status code be assigned to the bird.

Portions of this document summarize parts of the North American Bird Banding Manual: Volume 1 (Canadian Wildlife Service and U.S. Fish and Wildlife Service 1991 (see electronic version-<http://www.pwrc.usgs.gov/bbl/manual/manual.htm>).

The North American Banding Council waterfowl banding manual is to be used in conjunction with the banding manual distributed by the Canadian and American bird-banding offices. This manual was developed to be used with the duck banding video referred to in this document. For the section on ageing and sexing of waterfowl we relied on much information contained in Frank Bellrose's book *Ducks, Geese and Swans of North America*. Bellrose's book is useful for the identification of the various waterfowl mentioned in this manual.

This NABC waterfowl banding manual will focus on various techniques used from capture to release.

Detailed ageing and sexing techniques for individual species of waterfowl are covered in various waterfowl guides, scientific literature, the waterfowl banding video, and on the Internet. Pyle 2008 is a useful guide.

## 2. PERMITS

### 2.1 Federal, Provincial, and State

Waterfowl are migratory game birds and are subject to the Migratory Birds Convention Acts of Canada and the U.S. Therefore, one needs a banding permit from the U.S. Banding Laboratory (USGS, PWRC, Bird Banding Laboratory, 12100 Beech Forest Road, STE-4037, Laurel, Maryland 20708-4037 ([bbl@usgs.gov](mailto:bbl@usgs.gov)) to band waterfowl in the United States, or from the Canadian Banding Office (CWS, Environment Canada, NWRC, 1125 Colonel By Drive, Raven Road, Carleton University, Ottawa, Ontario, K1A 0H3 ([EC.BBO.EC@canada.ca](mailto:EC.BBO.EC@canada.ca)) to band waterfowl in Canada. Special permission to use certain capture techniques may be required. For details regarding provisions associated with the permit refer to the North American Banders' Study Guide (North American Banding Council, 2000).

Many institutions require an Animal Care Permit before handling wild animals. Check to see if it is required for your studies. Often one requires a provincial or state research and/or land use permit as well and possibly a similar federal permit if the work is to be carried out on federal land. Parks may have additional permit requirements, as may specific land owners i.e. First Nation land. In Canada and the U.S. banding permits must include specific authorization if one is taking blood or feather samples or is colour marking with colour bands, nasal saddles, or neck collars. Approvals to work on endangered species projects often require separate federal or state/provincial permits. These projects may be recommended by appropriate Recovery Teams.

Permit conditions (Canada, January, 2017):

1. This permit is not transferable and is not valid unless it is signed by the person to whom it is issued. By signing this permit, the permittee agrees to abide by all conditions stated below and confirms that all information contained in their application was accurate. Banders must have their signed permit on their person at all times. Permit holders are responsible for the actions of the individuals under their supervision that conduct activities authorized under this permit, if they themselves do not have permits.

2. Permit holders will adhere to the North American Banding Council's Bander's Code of Ethics ([www.nabanding.net/banders-code-of-ethics/](http://www.nabanding.net/banders-code-of-ethics/)) and the Canadian Council on Animal Care documents relevant to bird banding (CCAC guidelines on: the care and use of wildlife [[www.ccac.ca/Documents/Standards/Guidelines/Wildlife.pdf](http://www.ccac.ca/Documents/Standards/Guidelines/Wildlife.pdf)], CCAC species-specific recommendations on: Birds [[http://www.ccac.ca/Documents/Standards/Guidelines/Add\\_PDFs/Wildlife\\_Birds.pdf](http://www.ccac.ca/Documents/Standards/Guidelines/Add_PDFs/Wildlife_Birds.pdf)]).

3. The issuance of this permit does not exempt the permit holder from compliance with all relevant Canadian, Provincial and Territorial Laws, and Regulations otherwise applicable, nor does it exempt the permit holder from complying with applicable jurisdictional bylaws.

4. A holder of a scientific permit to capture and band migratory birds may salvage birds found dead, or killed as a result of normal banding operations, for the purpose of donating them to a public, scientific or educational institution.

5. The shipment or transport of any migratory birds or parts thereof taken under the authority of this permit must be labelled as per S.13.(1) of the Migratory Birds Regulations.

6. Unless otherwise stated, this permit does not authorize the targeted capture, banding or disturbing of species listed under the Species at Risk Act. Federally listed species at risk may be banded if captured incidentally, provided it can be done safely.

7. Only the methods specified on this permit can be used to capture birds.

8. Unless otherwise stated on this permit, the permit holder will use only the official numbered leg bands issued by the Canadian Wildlife Service.

9. Unless otherwise stated, this permit does not authorize the collection of blood, feathers and other avian biological materials.

10. The name, phone number, address and e-mail address of the permit holder will be stored in the shared North American Bird Banding Laboratory database, and may be shared with people reporting an encounter of a band used under this permit.

11. Banding and encounter data may be released to researchers and other users.

12. Permit holders will submit all required data to the Bird Banding Office as outlined in the Banding Data Submission Guidelines (see [www.ec.gc.ca/BBO/](http://www.ec.gc.ca/BBO/) or request a copy from the BBO) or within 30 days of receiving a written request from a representative of the Minister. Note: This permit may be suspended or cancelled if the person to whom it was issued has failed to comply with any condition set out in the permit.

### **2.2 NABC Certification**

The North American Banding Council (NABC) has developed a bander certification program to set standards for the knowledge, experience, and skills that should be acquired by banders. This entails a written test, workshop participation and field experience. Certification is optional and not a requirement for obtaining banding permits. NABC certification recognizes the bander's accomplishments and may facilitate an application for a banding permit or open new opportunities for banding. A bander certified as a Trainer may be involved in NABC instructional

programs and evaluate the competency of banders applying for certification. Three levels of certification are available: Assistant (not valid for waterfowl), Bander, and Trainer. An Assistant is competent to handle and band birds under direct supervision but does not wish to undertake the responsibilities of record keeping. A Bander is competent to (a) design and carry out meaningful studies involving the capturing, handling, identifying, ageing, sexing, banding, and measuring of birds, (b) record data, and (c) complete timely accurate banding schedules. A Trainer is a Bander with exceptional experience, knowledge, skill, and demonstrated teaching ability. For more information about the NABC, refer to its web site: <http://nabanding.net/>.

### **3. BANDER OBJECTIVES**

The first and most important factor to consider before capturing waterfowl is the purpose of the study. This will identify the species, season, location, and number of each species necessary and the type of marking that will best answer the questions involved.

### **4. TRAINING ADVISED FOR PERSONNEL**

It may be difficult to get training specifically for banding waterfowl because there are few on-going programs, and those may be for short periods of time at distant locations. Reading appropriate technical literature and communication with others who are involved in waterfowl banding can provide information on availability of training and opportunities to gain experience in handling wild waterfowl.

A trainer of waterfowl banders should have extensive experience with identification of many waterfowl species, their plumages, sex and age characteristics, and knowledge of methods of capture at different locations, under different environmental conditions, and at different stages in the life history of targeted species. Trainers must be able to impart a clear understanding of the responsibilities involved in handling wild birds, provide bander candidates with experience in banding waterfowl, and to provide appropriate knowledge from this and other references.

### **5. BANDING PROGRAM GUIDELINES**

Because inferences derived from band-recovery information are only as good as the data used to derive them, the following guidelines are offered to promote collection of good banding data.

(1) Ensure that the banded sample is representative of the population of interest. For example, if the local breeding population is of interest, banding birds in staging areas during late September is likely to include birds from outside the local area. Subsequent analysis of those data will be confounded by these non-local birds, and inferences for the local population will be tenuous.

(2) Ensure a representative distribution of banding efforts within a region. Obtaining all bandings from one or two sites within a region can bias results, especially if harvest pressure near such sites is not representative of the region as a whole. By banding birds at many sites throughout a region biologists can ensure that resulting data are applicable to the regional waterfowl population.

(3) Ensure an accompanying sample of adults when banding large numbers of young. To estimate survival of young waterfowl, information is also needed on adult recovery rate. Although young birds are often more numerous and easier to capture, effort should be made to capture adult birds as well.

(4) Record all required information about each banded bird on banding schedules. Banding records that do not include age, sex, status, or location of the bird are of limited value.

(5) Use established banding periods. Waterfowl managers most often use recovery information from birds banded during the period immediately prior to the hunting season. However, valuable information is also obtained from birds banded at other times of year.

(6) The banding effort should be continued for an interval suitable to answer the questions posed. For monitoring and evaluation of population status, banding should be done annually over multiple years. Estimation of survival rate requires multiple years of continuous banding effort. Long-term banding programs are also necessary to monitor and evaluate harvest-rate changes that may result from changes in harvest regulations.

(7) Exceed banding goals whenever possible. Banding goals are often perceived as quotas, which imply that the bander should stop banding when the quota has been reached. However, the goals are usually minimum sample sizes needed to make the effort worthwhile. Exceeding the goals will greatly enhance the usefulness of the data by improving the precision of estimated survival and recovery rates.

### **6. TRAP-SITE SELECTION**

Site selection is an important part of a banding operation. The site is usually selected in an area

frequented by many birds. Often these sites can be found by scouting from vehicles or airplanes. It is better to locate a banding site where birds naturally congregate rather than trying to bait them to other sites.



An accumulation of duck feathers on the water during the peak of basic moult may reveal the presence of ducks and suggest a potential banding site.

For dabbling ducks, select secluded shoreline areas with gentle slopes and relatively firm bottoms. For more open-water diving-duck sites, select firm bottoms if possible to prevent undermining of the trap by feeding ducks; locate the site to provide some protection from prevailing winds. If necessary, clear heavy emergent vegetation from around trap sites. Make lanes to open-water areas to ensure the trap area is accessible to swimming ducks. Ideally, the banding site should have little human disturbance, shallow water, and a relatively hard bottom. Shoreline bait-traps for dabbling ducks may be placed partially on dry land or in water up to one foot (30 cm) in depth depending on the species targeted. Floating traps with attached bait platforms may be placed in much deeper water.

The site should be posted with a sign to inform the public of the purpose of the trap. The sign should include the bander's name and contact information.



## 7. BAITING THE SITE



Baiting a wetland concentrates duck use near the trap-site area and is probably the most important feature of successful bait trapping. The bait can be a variety of

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feed but it is typically corn, barley, or wheat. Grains of all types have been employed to catch waterfowl and those used are dictated somewhat by local availability, the species targeted, and those foods that the waterfowl are accustomed to feeding on in the trapping area. Such baits as corn, wheat, barley, rye, rice, millet, buckwheat, and milo have all been used to attract both dabblers and divers. Shelled yellow corn is probably the most universal bait, however ear corn and other floating baits such as oats, which are easily seen, are often helpful to attract the birds. Once baiting is started, ensure that bait is available until all trapping ceases. Missing a day of baiting may cause some of the ducks to vacate the site.

Many banders pre-bait sites up to three weeks before traps are deployed. Once deployed, the trap is usually left open (topless) or the funnel entrance is left open, until the birds have become accustomed to feeding in and around the trap. If there is heavy duck use, traps may be immediately assembled. The trap may be assembled in stages if the ducks appear to be "trap shy." Do not over bait in the water as bait not consumed may begin to rot. If rotting begins, open the trap. This allows the ducks to feed freely to reduce the volume of bait.

As part of the pre-baiting procedure, a much larger area than the trap is baited and gradually the bait is restricted to inside the trap and directly in the funnel entrance. Once the trap is closed the amount of bait in the funnel entrance must be reduced to induce the birds to enter. Some traps employ a floating or suspended tray of visible food to add to the attraction.

## 8. PRECAUTIONS TO REDUCE PREDATION

If there are likely to be predators at the banding site, precautions should be taken prior to the banding operation and BEFORE any ducks are killed. Live traps are one method of controlling predators, but be sure to check with the local provincial or state authorities before trapping. Electric fences of the type used for livestock control work well and provide protection twenty-four hours a day. They also have the added benefit that the bander does not have to deal with trapped animals. Duck-trap entrance doors that are operated by timers may also be used. The doors can be timed to open and shut at predetermined times, this will help prevent the capture of ducks when traps cannot be tended. In some locations banding traps may be checked twice a day, in the morning and just before dark, and this will help reduce predation.

Ducks do not like the presence of fish (alive or dead)

in the trap. Carp are attracted to grain and may cause much aggravation for duck trapping. Try to avoid areas with many carp. Remove dead fish when they are found and do not leave them nearby since they will attract scavengers and potential predators.



## 9. CAPTURE METHODS

Capture methods vary according to location, season, species, and objectives of the study. Bait traps are the most common means of capturing waterfowl, but other methods are also used.

### 9.1 Bait traps for Ducks

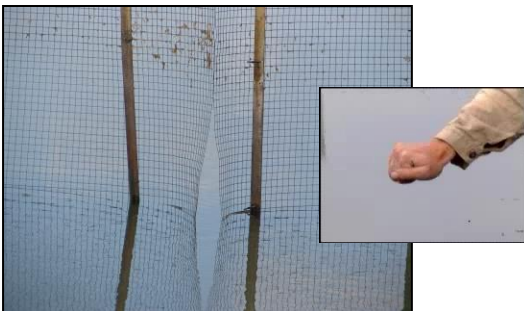
General bait-trap configuration can be of any size and should have a rectangular or circular main compartment made of wire and supported by rods or stakes driven in the soil or marsh bottom to maintain the desired outside dimensions. More elaborate permanent wood or metal framed traps can be used on permanent sites.

Welded wire is the most common material, although banders are experimenting with materials made from plastic. Plastic is easier to handle and will potentially reduce injuries to banders and waterfowl.



Bait traps may be topped with netting of various sizes of mesh or chicken wire with 1" (2.5 cm) openings.

A one-way funnel or confuser entrance extends from the bottom of the trap vertically up one side to 6"-12" (15-30 cm) above the water level, depending on the species to be trapped. The small end of the funnel extends into the main compartment which may have wire fingers made from the wire mesh or chicken wire protruding inward and acting as a very small opening to



prevent exit of the trapped ducks.

The funnel opening must be adjusted to be narrow enough that the ducks can just squeeze through while intent on getting to the bait placed inside the trap. To start, usually the entrance is somewhat wider until the ducks begin using the trap. The opening is then reduced to about the width of a clenched fist for species such as Mallards. This opening may have to be slightly reduced for smaller birds such as Blue-winged Teal.

Welded wire is easily cut using a metal cut-off wheel attached to a power tool. Plastic netting is easily cut using a variety of cutting tools including tin snips, scissors, or a knife.

The top of the trap may be covered with chicken wire, welded wire, plastic fencing, or fish netting. Plastic or fish netting is less likely to injure ducks when they try to escape. **Fine plastic garden type netting may entrap or tangle birds and should be avoided.**

Solid aluminium rod of half inch (1.75 cm) or larger diameter may be used to support the trap. Larger rods of greater than half inch (>1.75 cm) "T" bars are heavy to use but may be necessary if livestock are present.



Plastic cable ties are useful for joining materials together and are easier to use than tie wire. These plastic ties cause no injury to ducks or banders and they will not rip boots.





Ducks may undermine the wire and escape if the substrate is soft or there are many rocks or stumps. **Ducks may drown if they get trapped between the wire and the substrate.** This can be avoided by selecting a site with a firm bottom or by attaching a skirt of plastic to the bottom edge of the wire on the inside of the trap. This skirt should extend at least one foot (30 cm) into the trap.



A float or platform should be added to the trap so birds can rest, preen and dry off. These floats may be made of wood planks, natural stumps, rocks, or polystyrene covered with plywood. Also, the floats are useful for holding bait and exposing it to the ducks' view. Wooden pallets or similar structures should not be used as birds become trapped underwater in the spaces between the wooden slats.



Removing ducks from the trap.--When the trap has been successful, the ducks inside must be secured for banding. There are various methods for capturing the ducks from inside the trap. Often fish-landing-nets are used but this can be time consuming and cause the ducks to become wet or injured in the netting process. A good method is to use a catch box to confine the ducks. A catch box is usually easily removed from the trap, and provides a confined space that allows control and hand capture of the ducks. A catch box is attached directly to the trap or may be made detachable and carried to the trap when the trap is being tended. The front door to the catch box should slide up and down to open and close the door. A release mechanism attached

to the front door with string allows the bander to be on the opposite side of the trap, so that the ducks can be herded into the catch box. Compared to landing nets, catch boxes increase efficiency, reduce injuries to the ducks and provide a handy holding container while ducks are being processed.



Catch boxes can be built to any length but the width should be limited to the extent to which a bander can reach in to grasp a duck. This prevents the ducks from eluding hand capture. The box may be made of wood or wire but are best made of plastic with an aluminium frame. The latter are light in weight and reduce injuries to ducks and banders. Catch boxes that permit little light penetration tend to keep ducks calmer. There must be good air circulation in the box. If the catch box is intended to be used to catch many ducks at one time, then it should be compartmentalized so that the ducks may be separated. Do not let ducks pile up in the box, especially when they are wet. To remove ducks from the catch box, an access door made of rubber tubing may be used. Bicycle wheel inner tubes stretched over the opening work well. Alternatively, a solid door of wood or metal can be used to provide access to the ducks in the holding box.



### 9.1.1 Clover-leaf traps

One of the most common types of duck trap is the clover-leaf trap. This type of capture device is usually constructed of 1-inch by 1-inch (2.5 cm x 2.5 cm) welded wire. Sometimes 1-inch by 2-inch (2.5 cm x 5 cm) wire is used. We recommend wire no larger than 1" by 1" (2.5cm x 2.5cm) as small ducks may get a wing or a head stuck in the 2-inch (5 cm) wire. Clover-leaf traps can be of a variety of sizes. The number of ducks that one expects to capture at one time determines the size of the trap. About one square foot (~900 sq. cm) of area per duck is required. The traps are usually baited with grain. Generally, they have one to three funnel-type entrances at the end and sides of the trap. The entrances are most often in the water, but may be on land. Ideally the top of the traps are made from a soft material to allow give when birds try to fly up. The height of the trap varies but often traps are made of 5 ft. (1.5 m) wire to accommodate a person when it is necessary to enter a trap to make adjustments. Although 5 ft. (1.5 m) is common this height is not necessary. Higher traps are used when trapping in tidal areas where tops of the traps must be above high tide to prevent drowning. It is preferred that traps have a holding box that can be attached to the trap. Fishing-type landing nets may be used to remove ducks from the traps but these are more cumbersome and may make catching ducks difficult especially in deep and muddy water.



### 9.1.2 NBL (Benning trap) traps

NBL traps (see Appendix D) are also made of welded

wire. The main difference from the clover leaf trap and others is that NBL traps are collapsible and fold into a pile of wire. The size of the trap is generally 4 ft. (1.2 m) by 4 ft. (1.2 m) by 4 ft. (1.2m) and the top is generally made of the same wire as the rest of the trap. The wire top tends not to be a problem as the small size of the trap prevents captured ducks from hitting the top of the trap with any great speed while trying to escape. These traps have funnel type entrances extending above the water and are usually baited with grain. These traps generally have a smaller catch box that can be easily carried to each trap. Birds are then herded into the catch box and transported to shore for processing.

### 9.2 Mist nets

Mist nets have been used to capture ducks over open-water areas or on rivers where solitary breeding pairs of ducks may be netted. When used over open water such as on a wide river or lake, the net poles are erected on top of a float system to keep the net above the water, the floats are then anchored like a boat to keep the net taut. Nets placed across narrow rivers or streams can easily be anchored to the banks. Special care must be taken when using mist nets to ensure birds do not become tangled and drown when captured over the open water. Drowning may occur if the birds are caught in the lower panels of the mist net, this is especially true if the trapped bird is suspended above turbulent water or if several birds are caught in the net at the same time as it will make the net droop into the water. Ducks must be restrained quickly after capture to prevent injury to the duck and damage to the net. Removal of the duck from the net involves a great deal of manual dexterity. The proper use of mist nets must be taught to waterfowl banders in the field. Water safety gear (flotation gear) should be worn when operating nets in or over water due to the risk of the boat tipping.



### 9.3 Cannon or rocket nets

Waterfowl may be captured using cannon or rocket nets at natural feeding areas or at sites where birds have been attracted with bait. Extensive experience is



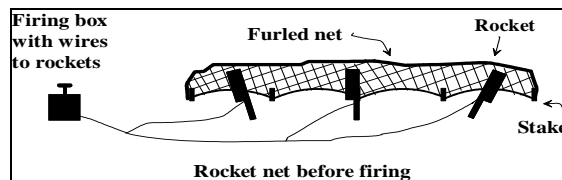
required to operate projectile nets, and is often conducted by a team of banders. Anyone interested in using these traps should seek formal training. The following paragraph is a brief summary based on information within the NABC Shorebird Manual.

The firing of the nets typically occurs during the early morning or evening but it may occur at any time of the day. Both rocket and cannon methods involve a net that is attached at one end, with projectiles attached to the other end. The net is furlled to the tethered end, and when the projectiles are fired, they carry the leading edge of the net over the birds. For cannon nets, cannons contain explosives, and projectiles attached to the leading edge of the net. The cannons are placed at an appropriate angle near the furlled net. When the cannons are fired, the projectiles shoot out to open the net. For rocket nets, the fuel is contained inside the rockets, which are themselves attached to the leading edge of the net and positioned at an appropriate angle. When the rockets are fired, the rockets carry the net over the flock of birds. Nets normally are equipped with three to five projectiles, which are wired together so that they fire simultaneously. Often they are attached to a battery operated firing box. The furlled net is usually disguised with a thin layer of vegetation.

This technique requires considerable training in safe use of explosives, use of the rockets/cannons and net. Anyone intending to use rocket or cannon nets should obtain practical experience in their use under different conditions with experienced users. Special permits are required to use the nets, and for transport of the explosives. Birds must not be on top of the furlled net, or in the air in front of the net, before the net is fired or they will be injured or killed. The net should not be fired into water, as birds may drown. Cannons or rockets must be set at appropriate angles to fire the net over the birds not through them. **The exact extent of the net must be known by placing sticks, stones or other such markers at the corners of the fired net,, so that it does not fire into water, or capture too large a flock of birds to handle safely. It is important not to capture more than can be removed quickly and processed immediately by available personnel.** Process birds quickly that may be piled on top of each other to prevent smothering. The banding crew should deal promptly with birds that are in a large group or ones that have their necks wrapped around the netting. Under appropriate circumstances (consistent daily patterns, trained and careful personnel), this is a very efficient and safe technique to quickly capture large number of birds. It has, however, the potential to kill or injure large numbers of birds very quickly if carried out

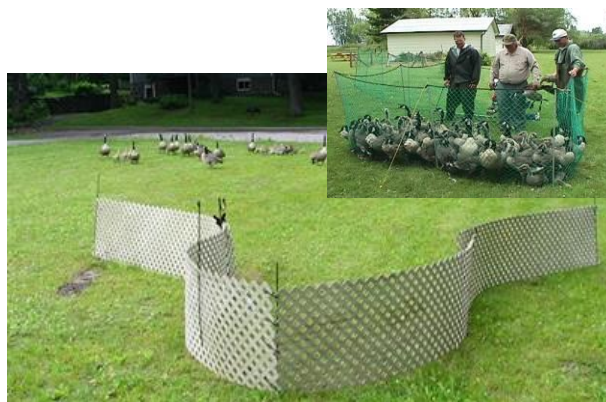
by inexperienced or careless banders.

Pneumatic nets operate in exactly the same way as cannon nets except that they are powered by compressed air instead of explosives.



#### 9.4 Drive Traps

These traps are used for flightless birds. Drive traps consist of a catch pod with two net leads extending from the pod on an angle to direct ducks or geese toward the catch pod. These nets vary in size depending on the target species. The height of the net depends on the type of bird to be trapped. For ducks the sides should be a minimum of half a metre (1.5 ft) and for geese one metre (3 ft). After the birds have been herded into the catch pod one lead is used for a door to close the entrance. The banders must ensure at this point that smaller birds such as ducklings or goslings are not trampled by larger birds such as adults. Another material to use for drive trap construction is 2.5 cm x 2.5 cm (1 in x 1 in) khaki coloured plastic privacy lattice (see North et al, 2011). This material reduces injuries to birds that may be caused by netting. Birds may be herded by a drive team of people on foot, in boats, or by helicopter.



### 9.5 Net Guns

Net guns can be used for capturing ducks and geese. These hand-held devices propel a net short distances from a modified rifle using blank cartridges. The nets travel various distances depending on the cartridge load, wind direction, and the angle at which the gun is held. These are specialized capture devices and should be used only by trained banders and researchers.



### 9.6 Night-Lighting



Night-lighting birds can be an economical and efficient way of capturing waterfowl, especially waterfowl species that are not prone to trapping, or when regulations prohibit the use of baiting. A combination of steady noise and bright light will startle and confuse roosting waterfowl, especially on dark nights. Night-lighting is usually performed with an airboat equipped with bright lights mounted onto the bow and a work deck for 1 to 2 crew members to

capture the waterfowl. Operations can begin once the sky is dark and waterfowl have settled into their roost for the night. Typically, once in the marsh the airboat captain will search out 20-100m ahead of the airboat for waterfowl with a very bright, concentrated beam, handheld spotlight. Once spotted, the captain will approach the waterfowl at a steady, consistent speed (generating consistent noise), and communicate to the crew that capture opportunity is imminent. Once the waterfowl is within very close range (<1.5m), a crew member will attempt to either net the duck using a dip net (5 or 6' handle with 18" diameter hoop with 2 or 3' deep fine mesh net bags) or grab the duck off the water surface with bare hands. Generally dip nets are the only way to capture diver duck species, while either method can be used for dabbling ducks. The bare hands method can be more effective than dip nets in very thick vegetation. Once waterfowl are captured and brought into the boat they will be placed into a temporary holding pen until banded. Care must be taken to ensure that waterfowl in your possession are well cared for. Large waterfowl species should be separated from smaller waterfowl species, holding pens should not become overcrowded and protection from heavy rains that can "waterlog" birds should be provided. There should be little reason to hold birds captive for more than 1-2 hours before banding.

Finding appropriate locations for night-light operations is an important detail to consider. Some sites that have large numbers of waterfowl during the day are not suitable roosting locations for waterfowl and will be empty at night. The best roost locations for night-lighting are typically vast marsh/wetland complexes that contain a diversity of submergent and emergent vegetation types. Floating logs, vegetation mats and isolated mud flats provide important roosting sites for dabbling duck species. Generally waterfowl don't like to roost on hard shorelines that can provide access for land predators (i.e. raccoons, mink, fox, etc) or under overhanging trees and/or dead standing timber that may harbour owl predators. Stumps, rocks, fences, low overhead bridges and wires are potential navigational hazards to be considered at new sites. Human conflicts (ie. nearby cottagers) should also be considered before attempting new sites. Another consideration is whether you will be banding on the boat or from shore, shore banding potentially increases the noise in the area of homes. Airboat night-lighting is loud and can cause tension with nearby residents trying to sleep. Consider sparsely populated locations or ceasing operations early in the night at more populated locations. Public and

police notification beforehand and community involvement can go a long way to mitigating complaints. Night-lighting operations will temporarily flatten standing aquatic emergent vegetation which may be unsightly for some people. Consideration should also be given before operating in areas where wild rice may be harvested as airboat operation will knock the grains off the rice plants, precluding harvest afterward.

Night-lighting is most effective on the darkest nights (Buchanan et al., 2014). Moon brightness or urban light pollution can make the horizon more visible for waterfowl to take evasive flight from an approaching boat. Early setting or late rising moon times and moon phase schedule should be considered when planning night-lighting operations to maximize efficiency. Cloud cover on otherwise bright nights can mitigate moon brightness, but is unpredictable for work planning.

Some of the inherent safety risks of night-lighting will include: working at night, working in remote locations, working on water, working with dangerous machinery, and operating in potentially inclement weather. Safety precautions must be given top priority before undertaking a night-lighting operation. Airboat captains must receive appropriate specific training for operating an airboat, crew members should also task specific training before undertaking operations, and program specific standard operating procedures should be developed and adhered to.

### 9.7 Dogs for Capturing

Birds that are too young to fly or moulting birds can be caught by soft-mouthed dogs. Banding waterfowl caught by dogs can be selective and efficient. Dogs must be very well trained for this work.

### 9.8 Gill Nets/Submerged Mist Nets



Gill nets can be used to capture waterfowl that are too young to fly, moulting adults, or flight-capable birds that escape by diving away. The technique is appropriate for birds that can be herded or for birds found at locations such as at nest sites. Gill nets made of monofilament have a weighted bottom and floats on the top. The mesh size and overall dimensions are determined by the species of waterfowl to be captured and by the location.

Once the species and location have been determined,

the net is set. Birds are herded towards the nets with watercraft. About 4 ft (1.2 m) before the birds reach the net, they are startled and made to dive toward the net, where they become entangled. It is very important that the birds not be left unattended once they have been caught in the net or they will drown. Nets should be closely monitored at all times when deployed. If only a few birds are in the net, they can be taken out while the net is left in the water. With large numbers of birds in the net one must pull the net into the boat and then untangle each bird from the net. This is a specialized capture method that should only be used by someone trained with this type of technique. (Breault and Cheng 1989, Ferguson 1980, and Lensink, 1957.)

### 9.9 Floating Duck Trap



A floating trap design can be useful in areas, such as those that experience higher than average water levels, sites subject to wave or tidal action or sites with mucky bottoms/substrates. Traditionally, traps modified with plywood bottoms were used in these situations and placed on concrete blocks. The main advantages over the plywood bottomed traps are stable “in trap” water levels, highly visible and accessible bait, and weight reduction.

Any free standing funnel trap design can be converted into a floating trap. The main modifications include the addition of PVC pontoons, welded wire



bottom, fiberglass rods, plastic feed sacks, and a “cokeser tray.”

Bottom: Begin with cable tying welded wire to the bottom of the trap. Any size will work (2x3 in.). Welded wire provides greater strength as plastics generally only have reinforcements along the outer edges. An additional 2.5 X 2.5 cm (1x1 in.) plastic mesh was added to limit duck feet from going through the larger wire openings. Additionally, cable tie two plastic feed sacks on top



of the wire, inside the trap. Cable tie the sacks along the outer edges and centers as these will hold the bait inside the trap.

#### Cokeser Tray:

This tray (16x28 in.) extends out from the funnel and helps to orient the ducks to the trap and funnel. Attach a wooden or similar strength material to the underside of your trap frame. Self-tapping screws work well for this application. Framing in the tray will help keep the bait in place. Inside the trap, place bait on the feed sacks and additionally on a piece of polystyrene to increase bait visibility.



PVC Pontoons: Pontoons are constructed with 10 ft. sections of 4in. diameter PVC. Generally, extend the PVC 12 inches past the trap frame. Depending on the weight of the trap, added floatation may be needed. This is easily accomplished by placing “kid’s pool noodles” inside the PVC. Noodles are inexpensive and readily available. Once pontoons are tied in place, dry fit end caps and float



test the trap. Ideally the welded wire bottom and feed sacks should be submerged 2-3 inches. Once desired floatation is achieved, glue end caps in place.

Fiberglass Rods: Fiberglass rods can be used for added support. Weave the rod through the welded wire, overlapping the trap frame.

**Tips:** Most importantly, don’t forget to stake or tether the trap in place. Depending on the depths of your sites, it might be easier to float the trap to a nearby shore to remove ducks.

### 9.10 Lift Nets

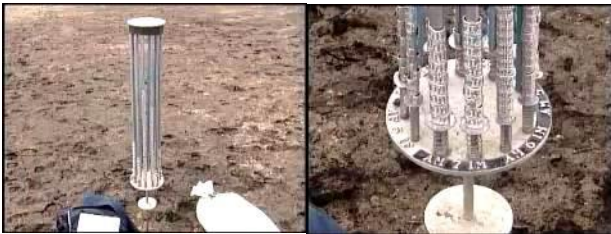
Lift nets have been used very successfully around Lake Ontario in both harbours and around docking areas for catching diving ducks such as Long-tailed Ducks. The idea is to submerge a 40 foot, 100mm heavy duty mist net horizontally (flat) under water with the end loops of the net attached to 10’ metal poles. There are ropes that attach to railings on the far side of the harbour or the next docking area, they then go out over the water to the pole on the end of the net, the ropes are attached to the pole and then run along the sides of the nets (effectively the top and bottom of a normal mist net) and then attach again to the next pole and then come back to the near dock and are attached to a car. The weight of the poles submerge the net when the ropes are relaxed, you then wait for the target ducks to swim over it, and you then lift it out of the water by quickly reversing the car a few (2-3) feet to raise the net out of the water, as soon as the net starts to rise through the water, the birds swimming over the submerged net see the ropes moving and dive to escape it and get caught in the rising net, once the net is out of and suspended above the water a boat with the extraction crew arrives and they extract the birds. When the net is raised above the water it should be about 4-5 foot above the water to keep the suspended bird(s) out of the water and it enables the extraction crew in the boat to go under it to get birds on the far side of the net out. If the birds do escape or after they have been safely extracted you simply drive forward a little bit (2-3 feet) to re-submerge the net again, it is then ready for the next bird. This is an ideal method for selectively catching only a certain age or sex of ducks, e.g. only adult females, as you only lift the net when the desired species, age or sex goes over it. It is best to work with an experienced crew first before doing it on your own.

## 10. HANDLING WATERFOWL



Care must be taken to ensure that birds are not injured due to improper handling or banding techniques. The bander should strive to keep the ducks as dry as possible during capture both for the welfare of the bird and for easier ageing identification. Immediately after ageing, sexing, and in some operations measured, the duck should be banded and released promptly.

Bands can be organized, pre-opened and placed on a carousel or on a piece of wood or metal doweling. Metal is best in damp conditions as it will not swell. Organizing bands in this manner may not be necessary, if you are planning to band only small numbers of ducks.

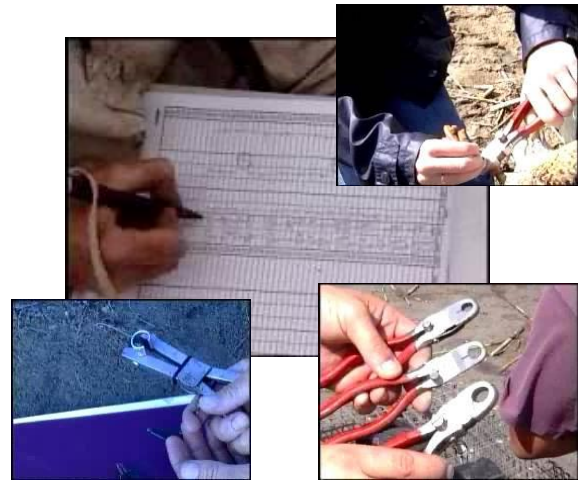


Pre-opened bands greatly reduce processing time if the station typically captures large numbers of birds. Bands are placed on waterfowl by using a variety of pliers but generally the best pliers to use are ones made specifically for banding.

Spreader pliers, such as external snap ring pliers, are required to open bands and to correct over-lapped bands. Waterproof note books are useful when waterfowl banding. When recording data electronically it is imperative that data collected that way are “backed-up” often to avoid loss of information.

It is essential that the bander strives to reduce death and injury during handling and collects precise data,

and it should be the goal of every bander to improve the techniques used at each banding site. At an established banding site, a new bander should spend time learning from the experienced banders. This is best accomplished by the new bander assisting the experienced bander in the field. Ensuring all banders keep detailed reports on individual trap sites enables the smooth transfer of information to new banders.



### 10.1 Ducks

Ducks vary greatly in size from green-winged teal (*Anas crecca*) weighing 300-400 grams to larger species such as mallards that may weigh up to 1800 grams. The techniques for handling are similar except more care must be used for smaller species. If a brood of ducks is caught, the ducklings should be released at the same time as the female. The young should be released first, quickly followed by the brood hen.

Generally, the best way to control ducks is to hold the two wings firmly against the body of the duck using two hands. The grip must be firm enough to keep the wings from flapping and causing injury to the duck.

It is usually unnecessary to control a duck's head because ducks tend not to bite. Some species of ducks, for example, wood ducks (*Aix sponsa*), may have sharp toe nails and these may cause some injury to the bander's hands, particularly if the hands are wet.







## 10.2 Geese



Geese are captured during various times of the year while flighted or flightless. The stage of a goose's development often determines how best to handle the bird. Radio-controlled model boats have been successfully used to encourage flightless geese to leave the water to emerge on the shoreline, whereby they can be captured for banding.

Adult fully-feathered geese are best held by firmly holding the body of the bird using the hands and arms. The wings of flapping geese can cause injury to the bander and the bird, therefore the wings must be controlled. Techniques for holding a goose for banding may vary depending on the size of the person controlling the goose. Geese can be controlled by grasping the wings with one hand near the body of the bird, but the person doing this must have relatively



strong hands. Geese can also be grasped by both wings using two hands; the goose is then turned upside down and held by the bander's legs and knees for ageing, sexing, and banding. The techniques for holding geese should be taught in a workshop or field session.

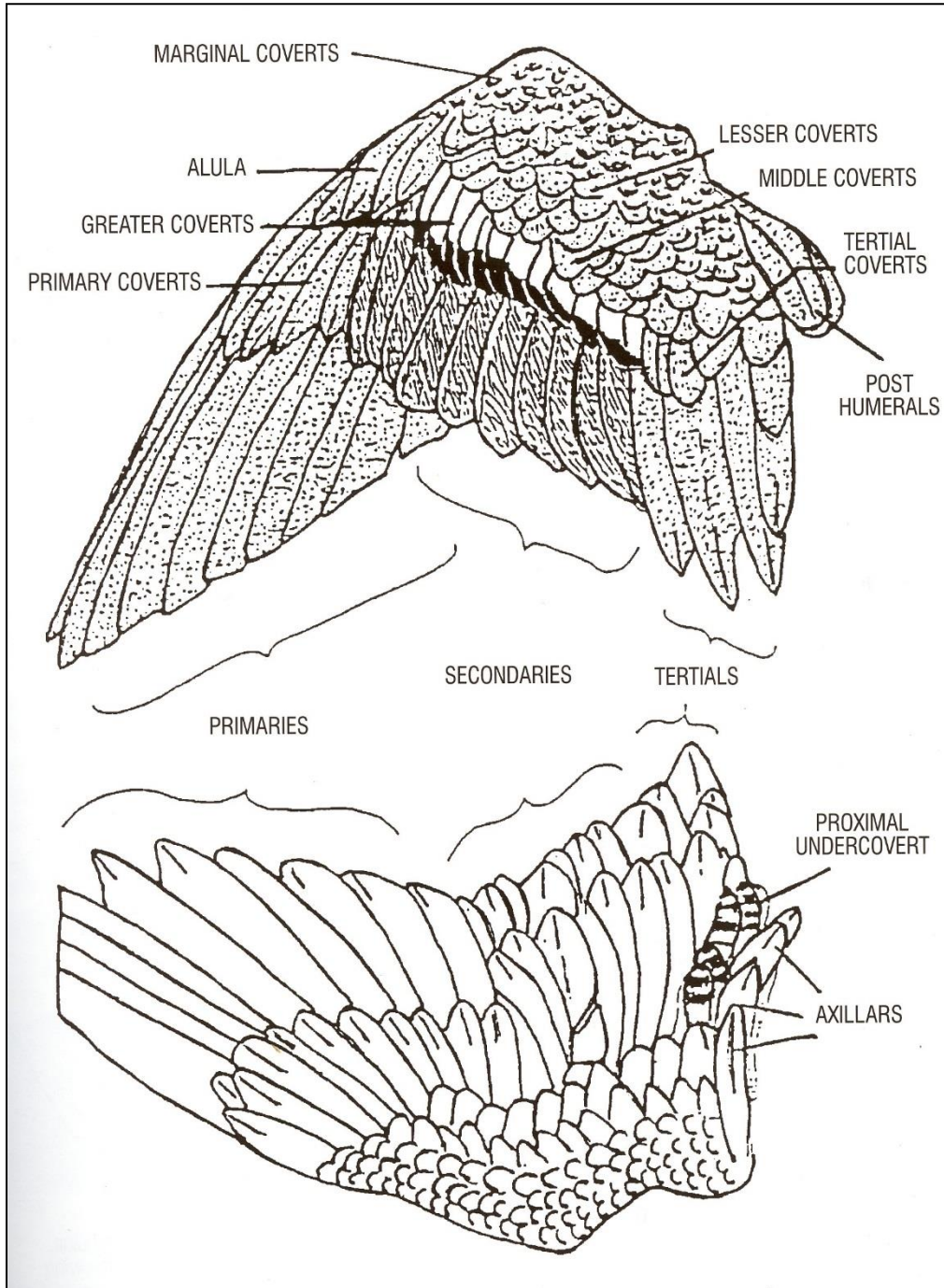
Geese will bite, thus the head must be controlled to prevent human injuries. To accomplish this, the neck is held firmly near the base of the head. This method allows control of the bill and will keep the goose from biting the handler or other people standing nearby.

## 10.3 Swans

Handling swans is similar to handling geese; Care must be taken by those working with the birds to ensure injury is not caused to either the bird or other people by making sure the bird is properly secured. A swan's flapping wings can cause painful injuries. The head may have to be controlled on some swans because they too can bite? Grasping the neck at the base of the swan's head helps to control unwanted head movement.



**Duck Wing.**



**Figure 2. Duck Wing (see Appendix D)**

Source: Samuel Carney

*Species, Age and Sex Identification Using Wing Plumage*



## 11. AGEING AND SEXING WATERFOWL

Ageing and sexing techniques explained here are primarily criteria used for pre-hunting season duck banding. This period is typically July, August, and September. In order to fully comprehend the variability



in age and sex characteristics for various waterfowl species, it is imperative that potential new banders get training in the field with experienced banders.

For the purpose of this manual, it will be generally assumed that the reader knows the species of waterfowl that will be encountered at the banding site. **If there is any doubt about the species of a captured bird, the bird must be released unbanded.**

All ages of birds are considered AFTER HATCHING YEAR (AHY) if the banding date is after December 31 and before that year's ducklings fledge. Just as with passerines, some duck species can be aged beyond the first year as a result of moult limits and with full knowledge of plumage variation and molt limits, some ducks may be designated after December 31 as Second Year (SY) or After Second Year (ASY). To age

ducks after the preseason period, the bander must have good knowledge of wing plumage characteristics.

Birds are LOCAL (L) or HATCH YEAR (HY) only if they are banded in the same calendar year as they were hatched. "Local" birds are young birds that are incapable of sustained flight. HY birds have notched tail feathers until these feathers are moulted. Early nesting species of puddle ducks may have young that have moulted their tail feathers before the banding season ends.

To identify Locals look at the base of the primaries, four or more primaries will not have fully grown out and part of the primary and its shaft will be sheathed.

If you are in doubt if the bird is capable of sustained flight, you can perform a flight test over water. Simply release the dry bird over water, if it doesn't fly away it's an L; if it does then it's a HY.

The age and sex of all waterfowl can be determined by cloacal examination. The cloaca of each bird must be examined to confirm the age and sex before banding.



Determining the age and sex of birds that mature in one year is straight forward using cloacal examination, AHY male have a sheathed penis

Young males have a small penis (do not confuse with cloacal worms which are usually yellowish in colour.)

Distinguishing AHY females from HY females can be difficult after tail feathers are moulted. To assist with this differentiation, plumage characteristics are described below.

Second-Year birds (SY) are often easy to differentiate from HY and After-Second-Year (ASY) birds when that species does not mature until two or more years of age.

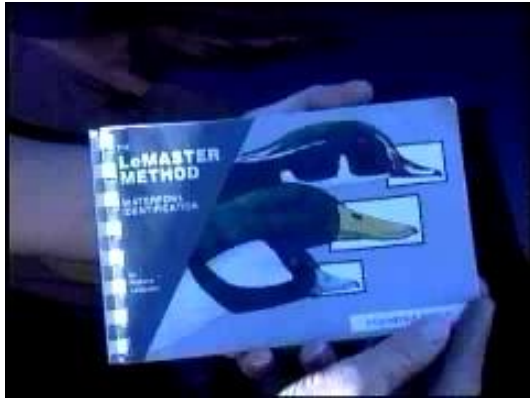
### 11.1 External Characteristics to Assist Age and Sex Determination

All waterfowl should be aged and sexed using cloacal examination when possible. To assist with the determination of age class and sex of each bird, the



following information is included here.

Additional information can be found in Carney (1992), LeMaster (1986), Pyle (2008), and the duck banding video. (Duck Banding, Environment Canada, 1997. ISBN: 0-662-75258-9)



### 11.2 Dabbling Ducks (Anatinae)

The relative size of the spots on a female's bill often reveals the age of the duck. Adult females of most species of North American puddle ducks typically have large spots or blotches. Immature female spots are small, few in number or sometimes only one spot may be present. This technique does not work for mallards. Males usually have no spots.



The tertials and tertial coverts may be used to age a bird and these are particularly helpful later in the banding season. Adults usually have larger, broader, and less worn feathers. Immature feathers are narrower and are more worn. (Appendix E) Mastering wing-feather wear requires experience. If you will be banding birds late in the season, start examining wing feathers early, and acquire a good wing key.

Adult birds have rectrices with no notches. If the bird has notched rectrices; the bird is either a Hatching Year or a Local.

Many immature birds moult their rectrices by late



August and may have a combination of adult and young feathers or all adult type rectrices. Puddle ducks moult their rectrices from the edges toward the centre. The banders should check carefully in the centre of the tail for immature type feathers.

Wing feathers will help to determine the age of a female. Adult birds that have unmoulted wings have very worn tertial and primary feathers. Some birds may be in full moult.



HY

AHY



HY

AHY



Many of the adult males and some of the adult females have brighter and more colourful feet and legs compared to immatures of their species.



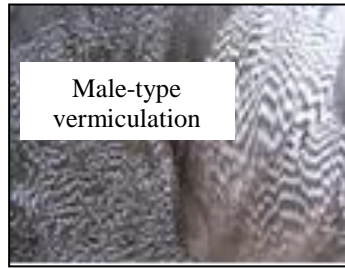
Male dabbling ducks often have vermiculations, complex white markings, on their body feathers. These may occur on both immature and adult males.



### 11.3 Diving Ducks (Aythyinae)

Most methods used to determine age and sex of diving ducks are similar to puddle ducks.

Male diving ducks often have white vermiculations on their body feathers and wings with some having just flecking, whereas females have flecks of white. If you observe vermiculations it is likely a male bird.



Some immature diving ducks retain their notched tail feathers even after the month of December. Therefore, tail feathers on diving ducks can sometimes be used to age both sexes into the new year.

### 11.4 Geese (Anserinae)

Young geese have notched tail feathers until the notched feathers are replaced by adult-like tail feathers with no notches. Most young geese have notched feathers into early autumn. For some geese especially temperate breeding “giant” Canada Geese this may occur in early September.

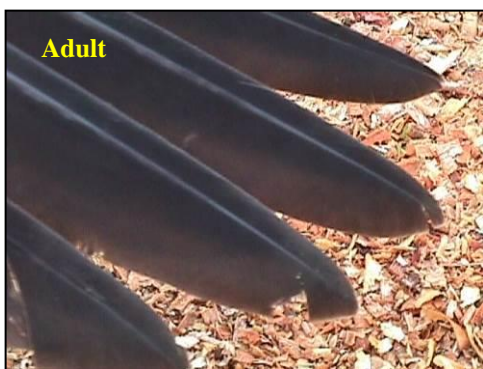
#### 11.4.1 Canada Goose (*Branta canadensis*)

Sexes are similar in plumage, but birds can be sexed cloacally. Young males have a small unsheathed penis. The adult male penis is large and sheathed. Young geese may be identified by remnant down protruding from feathers particularly in the head and neck area. Young geese also tend to have a “squeaky” voice and the adults honk and hiss when captured.

The tertial coverts of adult geese tend to be broader and more rounded and young geese have narrower and frayed coverts.

Since all coverts are replaced over a period of time, young geese may have a combination of young and adult coverts. Immature geese may have adult-type feathers but adult geese never have young feathers.

The tip of the last two primaries (9th and 10th) of young geese is pointed whereas that of adults is more rounded.



## 12. HEALTH OF BANDERS

Waterfowl are prone to a number of diseases, some of which may affect humans.

There are three zoonotic diseases of primary consideration when working with waterfowl in banding situations: Salmonellosis, Chlamydiosis and Highly Pathogenic Avian Influenza (HPAI). Understanding their causes, symptoms, diagnosis, and appropriate field precautions will protect bird and human welfare.

### 12.1 Salmonellosis

Transmission is by direct contact with infected birds or feces, contaminated food or water. Clinical signs in humans include diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. Illness usually lasts 4 to 7 days.

Risk of human exposure can be minimized by following these precautions:

1. Exposed or contaminated skin should be washed with soap and water. Alcohol-based hand sanitizers and hand wipes may also be used where soap and clean water are not available.

2. Avoid rubbing face or eyes with hands while handling birds.
3. Do not eat, drink or smoke while working with birds or use cell phones.
4. Clean all trapping equipment with disinfectants daily (i.e. wash down with soapy water, 10% bleach solution, Lysol, or Virkon).

### 12.2 Chlamydiosis

Transmission occurs when a person inhales the organism, which has been aerosolized from respiratory secretions or from dried feces of infected birds; other means of exposure include bird bites, mouth-to-beak contact, and the handling of infected birds' plumage and tissues. In humans there is an incubation period of 5 to 14 days. Severity of disease varies from asymptomatic illness to systemic illness with severe pneumonia or flu-like symptoms with a nonproductive cough.

Risk of human exposure can be minimized by following these precautions:

1. Avoid working with large numbers of birds in dusty, closely confined areas (e.g. Confined Animal Feeding Operations and chicken coops).
2. Use disinfectants to wet down dry dusty areas that are contaminated with bird droppings.
3. Clean all trapping equipment with disinfectants daily (i.e. wash down with soapy water, 10% bleach solution, Lysol, or Virkon).

### 12.3 Highly Pathogenic Avian Influenza

The following guidelines regarding HPAI are provided by the DOI Office of Emergency Management <http://www.doi.gov/emergency/employeeemergency/updated-employee-health-and-safety-for-avian-influenza.cfm> (July, 2014).

HPAI is caused by a herpes virus, and was confirmed in the US in December, 2014. Although HPAI is highly infectious and pathogenic to domestic poultry, observable signs of illness have not been described for wild birds. The virus can be found year round in wild birds but highest occurrence of infection occurs in the late summer months in juvenile waterfowl when they assemble for their first southward migration. Diagnosis can be made by cloacal swabs at surveillance testing by USDA personnel or by carcass submission to a wildlife disease diagnostic laboratory.

Transmission to humans occurs by direct contact with infected birds or contact with surfaces contaminated with feces or oral or nasal discharge from infected birds. The route of infection is all mucous membranes including oral, respiratory and ocular as



well as open skin wounds. The virus has not yet been confirmed to be transmitted to humans in the North America, but HPAI (H5N1) has caused disease and high human mortality in other countries. Risk is considered low for the general public but increased for those handling infected birds. Clinical signs in humans include fever, sore throat, cough, muscle aches, eye infections and pneumonia and severe respiratory infections

Risk of human exposure can be minimized by following these precautions:

1. Exposed or contaminated skin should be washed with soap and water. Alcohol-based hand sanitizers and wipes may also be used where soap and clean water are not available.

2. Avoid rubbing face or eyes with hands while handling birds.

3. Do not eat, drink, smoke or use cell phones while working with birds.

4. "Follow all PPE (personal protective equipment) and standard work practices recommended for normal operations at your station."

5. Consult regional health and safety expertise regarding zoonotic disease risks in your area, National Wildlife Health Coordinator, Dr. Samantha Gibbs, at [Samantha\\_Gibbs@fws.gov](mailto:Samantha_Gibbs@fws.gov) or 571-216-5776 (cell). In Canada, contact the Canadian Wildlife Health Cooperative (CWHC) at [national@cwbc-rcsf.ca](mailto:national@cwbc-rcsf.ca) or 306-966-5099 or visit CWHC website, [http://www.cwhc-rcsf.ca/report\\_submit.php](http://www.cwhc-rcsf.ca/report_submit.php)

6. Follow Work Practices outlined above and:

- a. Wash hands often and thoroughly for at least 30 seconds (using soap/water or alcohol-based hand sanitizer) before eating, smoking, using cell phone and touching face, hair or exposed skin.

- b. Indoors, work in well-ventilated areas. Outdoors, work upwind of animals to decrease risk of inhaling airborne particulate matter such as dust, feathers, or dander.

- c. Gloves, aprons, goggles, face shields, rubber boots and coveralls that can be easily disinfected may also be worn to prevent skin and mucous membrane contact with biological materials and prevent movement of biological materials to other sites.

- d. Clean all trapping equipment with disinfectants daily (i.e. wash down with soapy water, 10% bleach solution, Lysol, or Virkon).

7. Personnel should have a regular seasonal influenza vaccination.

8. Development of fever, respiratory or conjunctivitis symptoms within 10 days of potential exposure requires professional medical care.

#### **12.4 Other common zoonotic diseases- briefly**

Avian botulism is a paralytic, often fatal disease of birds. It results from ingestion of a toxin produced by a bacterium (*Clostridium botulinum*). Humans are considered fairly resistant to botulism that occurs in birds (Locke and Friend 1987).

Avian cholera is a highly infectious disease caused by the bacterium (*Pasteurella multocida*). It often results in the death of the infected bird. Avian cholera is not considered a high risk disease for humans (Friend 1987).

West Nile virus belongs to a group of disease-causing viruses known as flaviviruses. These are spread by insects, usually mosquitoes. This virus was first isolated in Uganda in 1937, and is most commonly found in Africa, West Asia, Europe, and the Middle East. It was first reported in the United States in New York State in the summer of 1999. West Nile virus is closely related to St. Louis encephalitis, a naturally occurring virus in the U.S. and in Canada.

West Nile virus is new in North America and there is still much to be learned. Over one hundred species of birds have been found to carry the virus, with members of the family Corvidae (crows (*Corvus* spp.), blue jays (*Cyanocitta cristata*), ravens (*Corvus corax*)) showing the greatest mortality from the virus. To date, specimens of the following game birds have been reported positive for West Nile virus: sandhill cranes (*Grus canadensis*), mourning doves (*Zenaidura macroura*), mallards, wood ducks, Canada geese, ruffed grouse (*Bonasa umbellus*), wild turkeys (*Meleagris gallopavo*), and ring-necked pheasants (*Phasianus colchicus*).

When a mosquito bites a bird infected with the virus, the mosquito becomes infected and can transmit the virus to humans, horses, dogs, or other birds that it bites. Of the forty species of mosquitoes that transmit the virus, three species (*Culex pipiens*, *C. restuans*, and *C. salinarius*) have been implicated as the most common vectors. Larvae of these species are most commonly found in urban settings where mosquitoes lay eggs in the stagnant water of bird-baths, tin cans, old tires, and plastic bottles.

Despite increased media attention, there is no cause

for panic about West Nile Virus but neither is there room for denial. Banders should follow the usual precautions when handling wild animals and if you expect to encounter mosquitoes in the field, wear long pants, long-sleeves, and mosquito repellent. Here are recommended precautions that should minimize any possible risk:

- Do not handle sick birds.
- When handling live or dead birds, use gloves in order to prevent blood-to-blood contact
- Wash hands thoroughly after handling birds

Most people (around 80 percent) who are infected by West Nile virus show no recognizable symptoms. Of the 20 percent who do show recognizable illness, the symptoms are typically mild, including "flu-like" symptoms, nausea, a mild rash, or fatigue. The most severely affected patients may develop the potentially fatal conditions of West Nile encephalitis, West Nile meningitis or West Nile meningoencephalitis. Encephalitis refers to an inflammation of the brain, meningitis is an inflammation of the membrane around the brain and spinal cord, and meningoencephalitis refers to inflammation of the brain and the membrane surrounding it. Severe symptoms include shaking or tilted head and impaired motor skills.

### **13. BIRD SAFETY**

All those handling and banding wild birds need to consider the potential for injury that may occur as a result of capture, handling and banding activity. They need to be ready to deal with the unexpected and follow their training to prevent stress and injury. Emergency equipment, protocols and training should be reviewed and refreshed with each banding crew and season. All personnel should be well trained in the tasks they are to perform and all equipment should be thoroughly inspected and repaired or replaced as needed. Preparation promotes good data collection.

Birds can be injured directly and obviously during capture. Rarely they can be struck by nets or injured while struggling in nets. Drowning can occur when netted over water or in water traps. Predators can injure or kill birds or cause them to pile up on one another. Banders should be alert for signs of predators at the banding location and take preventative measures. Electric fences can effectively limit raccoons and other terrestrial predators. Removing excess food between banding events can lower predator attraction to the site.

#### **13.1 Bird capture, management and handling**

Efficient removal of birds from nets and traps, and adequate numbers of safe transport crates can minimize contact injuries. Well trained staff and smooth banding operations reduce holding and handling times, further reducing injury and stress. Watch for birds piling up under the nets and remove them quickly to prevent trampling injuries. Waterfowl rely on the integrity of their feathers for thermoregulation and buoyancy. Crowded ducks that become excessively wetted or soiled may drown in traps or succumb to hypothermia during prolonged holding or when released.

Excessive struggling or improper handling of birds can damage muscles, joints and feathers. Some of these injuries may not be immediately apparent or obvious but will impact the bird's ability to feed or evade predators. Extreme heat or cold conditions combined with lack of shade or feather integrity may cause birds to become hypothermic or to overheat. Over-heated birds may gape at the mouth. Even under ideal conditions and handling, banding activity will have a negative impact on birds. Good operators strive to minimize this impact at all times.

Gentle respectful handling of captured waterfowl is imperative. Restrain birds using both hands. Control wing movement, keeping wings gently tucked along their bodies and bodies supported. Never carry birds by their necks or legs. Grasping by wings alone, in rare cases, may be the most reasonable method for removing a bird from a situation. This should be accomplished gently, efficiently and for the shortest period of time possible. A well-trained staff and well-managed banding station will ensure the least risk to captured birds.

When color markers or tags are to be applied, the researcher should know all possible effects of those markers. The markers should be carefully researched and appropriately selected for species, environment and purpose. Functions that can be impacted by color markers include the ability to attract a mate, evade predators, or avoid nest predation and may lower reproductive success. Color markers may increase the harvest rate of hunted species. Some markers may be prone to icing when repeatedly exposed to freezing air temperatures, impairing feeding or flight. Others have been reported to become entangled in submerged vegetation. The banding offices require banders seek their approval before deploying auxiliary markers.

#### **13.2 First Aid**

Releasing banded birds in as healthy and comfortable a condition as possible is part of best

banding practices. If minor injuries have occurred treat them with simple supplies you have on hand in a prepared first aid kit. Make sure every team member knows this is available and how to use the contents.

A simple first aid kit can be assembled from supplies available at a local pharmacy and kept in a watertight plastic container. Contents should include a nail clipper or small scissors to trim broken toenails and styptic powder or gel to apply if bleeding persists. Broken feathers can be trimmed or pulled with forceps or needle nose pliers. Minor skin lacerations can be cleaned with sterile saline, dried with sterile gauze and antibiotic ointment applied. If needed, skin glue can be applied to dried skin edges and held momentarily until edges are adhered.

Be alert for signs of stress in birds in nets or crates. Symptoms include closed eyes, the appearance of sleepiness, weakness or unresponsiveness and open mouth breathing (gaping). Remove these birds to a quiet location and allow to rest in a dry prepared "hospital box". This can be any easily cleaned towel lined, dark but well ventilated container placed in a cool, quiet location. More severely affected birds may be dramatically helped by giving rehydration/energy fluids by mouth. Wrap the bird in a towel or stockinet to minimize struggle if needed. A 10 to 20 cc syringe may be used to administer fluid (Pedialyte, cranberry juice, etc). Do not tip the bird's head back or force fluids as this may result in aspiration.

All injuries should be recorded and these records should be reviewed after the banding event. Steps should be taken to ensure preventable injuries do not occur at future banding events.

#### **14. EUTHANASIA**

Major injuries due to capture or banding of wild waterfowl, fortunately, are rare. When they do occur they warrant an immediate and thorough review of techniques or equipment being used. Remedy the situation as quickly as possible.

Occasionally a bird with severe injuries may enter a trap or be accidentally netted. When birds with injuries that are certainly not compatible with survival are encountered, it is the bander's responsibility to end the bird's life as humanely as possible. Releasing such birds to a long, slow, certain death is not ethical. Some advance preparation for applying humane euthanasia will aid banders in taking this step when it becomes necessary.

The euthanasia method used must be approved in the

most recent edition of the AVMA (American Veterinary Medical Association) Euthanasia Guidelines. Information presented here is from the 2013 edition. Any technique considered must minimize pain and distress and result in rapid loss of consciousness followed by death. In most field situations, cervical dislocation will be the most practical method to use with waterfowl. Properly applied, cervical dislocation is nearly instantaneous in causing unconsciousness and death. This technique must be taught by someone experienced in its use and practiced in advance. Arranging with waterfowl hunters to use their bagged birds is an excellent way to gain practice in this technique. A description of cervical dislocation can be found in NWHC Field Manual of Wildlife Disease, Chapter 5, Euthanasia, [http://www.nwhc.usgs.gov/publications/field\\_manual/](http://www.nwhc.usgs.gov/publications/field_manual/).

Although previously approved, thoracic compression is no longer considered humane. This method must never be used. Other methods unacceptable under any condition include air embolism, blow to the head, burning, decompression, drowning, exsanguination, hypothermia, and smothering.

#### **15. DATA MANAGEMENT**

The importance of having specific questions in mind when planning research has already been noted. This will allow identification of which species to concentrate on, what sample sizes are necessary, what types of trapping and marking techniques to use, what measurements to take, and so on. There are numerous types of data forms: depending on the site conditions, data may be collected directly into a computer, directly onto datasheets, or into a field book and then (as soon as possible) onto datasheets or a computer. Data are entered for each bird: band number, species, age, sex (if known), date, time, location (and nest site if applicable), ensure your data is legible and can be read by people other than yourself. The computer program "Bandit" (available from the U.S. and Canadian banding offices) can be used to enter these data. Banding information must be reported to the banding offices promptly.

##### **15.1 Four Letter Alpha Codes Explained:**

Always consult the codes that are given by the BBL and do not guess or assume the bird's code (see Appendix H).

The normal rule of thumb is -

- Species with a single name (e.g. Bufflehead) use the first four letters of the birds name (BUFF).
- Species with two names (e.g. Lesser Scaup) use the first two letters of each name (LESC).
- Species with three names (e.g. White-winged Scoter) use the first letter of each of the first and second names and the first two letters of the last name (WWSC).
- Species with four names (e.g. American Green-winged Teal) use the first letter of each name (AGWT).

However there are some exceptions:

The four letter codes for Waterfowl with two word names are usually the first two letters of each of the two names. There are three exceptions to this rule as listed below, these species would have “potential codes” that would or at some point did, conflict with another species.

\* Northern Shoveler “should be” NOSH:- however the other confusing species for this code is Northern Shrike (NOSH), so the BBL has changed the codes for both, Northern Shoveler becomes NSHO and Northern Shrike becomes NSHR (both species here start with the word “Northern” so the first letter of the first name and the first three letters of the second name are used Northern Shoveler = NSHO.

\* Common Pochard “should be” COPO:- however the other confusing species for this code is Common Poorwill (COPO), so Common Pochard becomes CPOC and Common Poorwill becomes COPO (both species here start with the word “Common” so the first letter of the first name is used and the second name of both species starts with “Po” so the BBL retained COPO for the Common Poorwill and just changed the code name for Common Pochard (CPOC).

\* Harlequin Duck “should be” HADU:- however there does not now appear to be any other confusing code, (it was probably used for a species that no longer exists, e.g. it has now been lumped with another species) and the BBL has kept this changed code, Harlequin Duck became HARD.

The four letter codes for Waterfowl with three word names are usually the first letters of each of the first two names and the first two letters of the last name

There are three exceptions to this rule also, as listed below, these species would have “potential codes” that would or at some point did, conflict with another species.

\* White-cheeked Pintail “should be” WCPI:- however the other confusing species for this code is

White-crowned Pigeon (WCPI), so White-cheeked Pintail becomes WHIP and White-crowned Pigeon remained (WCPI) (both species here start with the word White and the first letter of the second name starts with C and the third name starts with a Pi) so the BBL retained WCPI for the White-crowned Pigeon and just changed the code name for White-cheeked Pintail (WHIP).

\* Taiga Bean-Goose “should be” TBGO:- however there does not now appear to be any other confusing code, (it was probably used for a species that no longer exists, e.g. it has now been lumped with another species) and the BBL has kept this changed code for this species = Taiga Bean-Goose became TABG.

\* Fulvous Whistling-Duck “should be” FWDU:- however there does not now appear to be any other confusing code, (it was probably used for a species that no longer exists, e.g. it has now been lumped with another species) and the BBL has kept this changed code for this species = Fulvous Whistling-Duck became FUWD.

The definitions for the four letter codes of hybrids vary depending on the degree of hybridization (see Appendix H).

## 16. EQUIPMENT SOURCES

Check

<http://www.pwrc.usgs.gov/bbl/resources/supply.htm> for a current list of bander supplies.

## 17. LITERATURE CITED

Bellrose, F. C. 1978. Ducks, geese & swans of North America. Stackpole Books, Harrisburg, Pennsylvania. 543 pp

Breault, A., and K. Cheng. 1989. Use of submerged mist nets to capture diving birds. *Journal of Field Ornithology* 61:328-330. Quantifying Moonlight and Wind Effects on Quantifying Moonlight and Wind Effects on Flighted Waterfowl Capture Success During Night-Lighting. Buchanan, T., R.W. Brook, M.P. Purvis and J.C. Davies. 2014. *Wildlife Society Bulletin*; DOI: 10.1002/wsb.514

Carney, S. M. 1992. Species age and sex identification of ducks using wing plumage. U.S. Department of the Interior, U.S. Fish and Wildlife Service Washington, D.C. 144pp

Ferguson, R. S. 1980. A technique for live-trapping nesting Horned Grebes. *Journal of Field Ornithology* 51:179-180.

Friend, M. 1987. Avian cholera. Pages 69-82 in M. Friend and C. J. Laitman, eds. Field guide to wildlife diseases. Vol. 1. General field procedures and diseases of migratory birds. U.S. Fish and Wildlife Service Resource Publication 167.

Gill, J. S., R. Webby, M. J. R. Gilchrist, and G. C. Gray. 2006. Avian influenza among waterfowl hunters and wildlife professionals. Emerging Infectious Diseases [serial on the Internet]. Available from <http://www.cdc.gov/ncidod/EID/vol12no08/06-0492.htm>

Gustafson, M. E., J. Hildenbrand, and L. Metras. 1997. The North American bird banding manual (Electronic Version). Version 1.0.

Hyslop, C. 1981. Bird banding in Canada. Canadian Wildlife Service, Environment Canada. Ottawa, Ontario.

Hyslop, C. 1990. Bird banding in Canada, Canadian Wildlife Service. Hinterland Who's Who, Environment Canada, Hull, Quebec.

LeMaster, R. 1986. LeMaster method: Waterfowl identification guide. Stackpole Books, Mechanicsburg, Pennsylvania.

Lensink, C. J. 1957. Use of a gill net in trapping waterfowl. Journal of Wildlife Management 21:103-104.

Locke, L. N., and M. Friend. 1987. Avian botulism. Pages 83-93 in M. Friend and C. J. Laitman, eds. Field Guide to Wildlife Diseases. Vol. 1. General Field Procedures and Diseases of Migratory Birds. U.S. Fish and Wildlife Service Resource Publication 167.

North, N. R., Alice North, Carol Buyers, and Gary Buyers. 2012. NorthBuyers Goose Drive Trap. Goose Specialist Group, Goose Bulletin issue 14., Pgs.62 and 63.

Pyle, P., 2008. Identification guide to North American birds, Part 2. Slate Creek Press, Point Reyes Station, California.

Stutzenbaker, C. D. 1988. The Mottled Duck. Texas Parks and Recreation Department, Austin, Texas. 209 pp.

Wobeser, G. A. 1981. Diseases of wild waterfowl. Plenum Press, New York.

## 18. RELATED WEB PAGES

Waterfowl Banding and Workshop resources:  
<https://nctc.expertlearning.net/course/view.php?id=27>

Duck Wing Plumage

<http://digitalmedia.fws.gov/cdm/ref/collection/document/id/1407>

<http://digitalcollections.pugetsound.edu/cdm/search/collection/slaterwing>

Canadian Banding Office  
<http://www.ec.gc.ca/bbo/>

U.S. Banding Laboratory  
<http://www.pwrc.usgs.gov/bbl>

North American Bird Banding Manual - electronic  
<http://www.pwrc.usgs.gov/BBI/manual/>

Ducks Unlimited  
<http://www.ducks.ca>

Delta Waterfowl  
<http://www.deltawaterfowl.org/>

Reporting Recovered Bands  
<http://www.reportband.gov>

### Other Useful Publications:

Smith, C. M., Trimper, P. G., Bate, L. J., Brodeur, S., Hansen, W. K. and Robert, M. (2015), A mist-net method for capturing harlequin ducks on rivers. Wildl. Soc. Bull., 39: 373–377. doi:10.1002/wsb.530

Ware, L. L., Naumann, B. T., Wilson, P. L., Petrie, S. A. and Schummer, M. L. (2013), A lift-net method for capturing diving and sea ducks. Wildl. Soc. Bull., 37: 877–880. doi:10.1002/wsb.324

Ashley, P. E., N. R. North, S.A. Petrie, and R. C. Bailey. Age Determination of American Black Ducks in Winter and Spring. Wildlife Society Bulletin 34(5):1401-1410. 2006 doi:  
[http://dx.doi.org/10.2193/0091-7648\(2006\)34\[1401:ADOABD\]2.0.CO;2](http://dx.doi.org/10.2193/0091-7648(2006)34[1401:ADOABD]2.0.CO;2)



## **APPENDIX A: THE NORTH AMERICAN BANDING COUNCIL**

The mission of the North American Banding Council (NABC) is to promote sound and ethical principles and techniques of bird banding in North America. Skill levels of banders will be increased by the preparation and dissemination of standardized training and study materials and the establishment of standards of competence and ethics for banders and trainers.

The immediate objectives are:

- (1) to develop a certification and evaluation program by setting standards for experience, knowledge, and skills that must be attained at each level (Assistant, Bander, and Trainer);
- (2) to produce and update training materials such as manuals and perhaps videos;
- (3) to identify and certify an initial pool of trainers; and
- (4) to encourage cooperative efforts in the use of banding in the study and conservation of North American birds.

The NABC consists of 18 to 20 voting members, including one representative appointed by each of the following organizations:

American Ornithologists' Union, Association of Field Ornithologists, Cooper Ornithological Society, Waterbird Society, Eastern Bird Banding Association, Inland Bird Banding Association, Ontario Bird Banding Association, The Pacific Seabird Group, Raptor Research Foundation, Society of Canadian Ornithologists, Western Bird Banding Association, Western Hemisphere Shorebird Reserve Network, and Wilson Ornithological Society; and two representatives appointed by the Association of Fish and Wildlife Agencies (one from Canada and one from the United States).

Other groups have been invited to become affiliated. The NABC also designates from four to six additional members. The directors of the Canadian and U. S. Bird Banding Offices are non-voting members of the NABC. The NABC was incorporated as a non-profit, California corporation in 1998.

**APPENDIX B: AGE (YEAR CLASS) CODES**

NUMERIC CODE	ALPHA CODE	ALPHA TRANSLATION	
0	U	UNKNOWN	A bird that cannot be placed in any classes below. Except in cases where data were not recorded or have been lost during the nesting season, ONLY BIRDS BANDED AFTER THE BREEDING SEASON AND BEFORE JANUARY 1 CAN BE CORRECTLY CODED "U".
4	L	LOCAL	A young bird incapable of sustained flight. After a young bird achieves sustained flight it becomes an "HY" until December 31.
2	HY	HATCHING YEAR	A bird capable of sustained flight and known to have hatched during the calendar year in which it was banded. Example: Banded 1997 - Hatched 1997.
1	AHY	AFTER HATCHING YEAR	A bird known to have hatched before the calendar year of banding; year of hatch otherwise unknown. Example: Banded 1997 - Hatched before January 1, 1997. Birds that would have been coded "U" on December 31 "graduate" to class "AHY" on January 1.
5	SY	SECOND YEAR	A bird known to have hatched in the calendar year preceding the year of banding and in its second calendar year of life. Example: Banded 1997 - Hatched 1996.
6	ASY	AFTER SECOND YEAR	A bird known to have hatched earlier than the calendar year preceding the year of banding; year of hatch otherwise unknown. Example: Banded 1997 - Hatched 1995 or earlier.
7	TY	THIRD YEAR	A bird known to have hatched in the calendar year two years prior to the year of banding, now in its third calendar year of life. Example: Banded 1997 - Hatched 1995.
8	ATY	AFTER THIRD YEAR	A bird known to have hatched prior to two years prior to the year of banding, now in at least its fourth calendar year of life. Example: Banded 1997 - Hatched 1994 or earlier.

**APPENDIX C: FEATHER GROUPS OF THE  
DUCK WING**

Source: Samuel Carney  
*Species, Age and Sex Identification Using Wing Plumage*

**REMIGES:** (Flight feathers)

- Alula:** The feathered “thumb” of the bird wing
- Primaries:** Flight feathers attached to the hand (manus)
- Secondaries:** Flight feathers attached to the forearm (ulna)
- Tertials:** Incorrect (morphologically) but used here to designate the more proximal secondaries which are generally different in size, shape, and color from their more distal counterparts, are often sexually dimorphic, and usually molt with adjacent body feathers.
- Post humerals:** Feathers attached to the humerus. They lie between the tertials and scapulars, usually molting with adjacent body feathers.
- Scapulars:** Feathers of the humeral (upper arm) feather tract. These lie on either side of the back and may partially cover a folded wing. They usually molt with adjacent body feathers. (Not shown)
- Axillars:** Elongate feathers growing in the “armpit” region and closing the space between the spread wing and the body

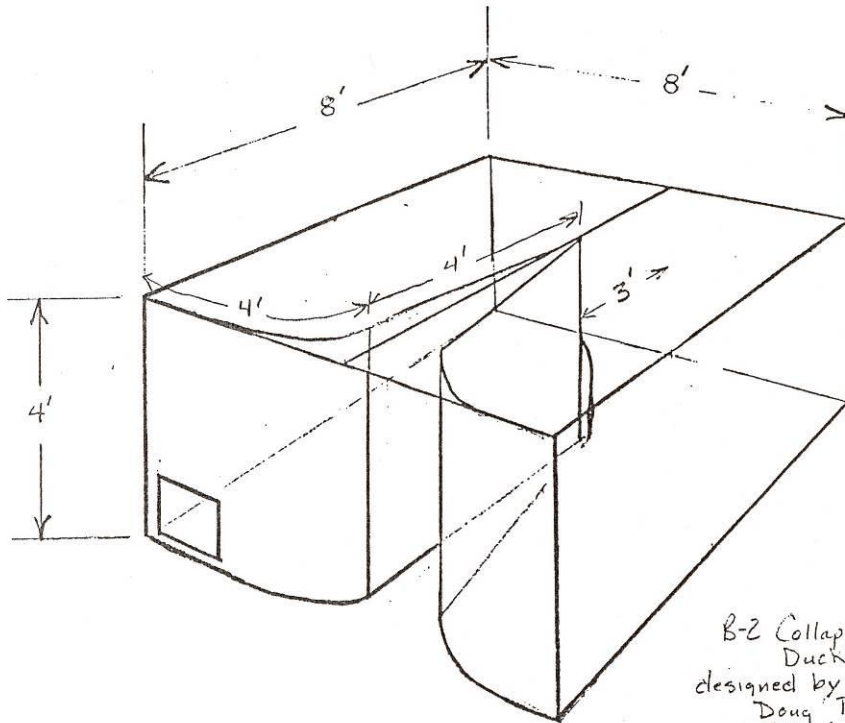
**WING COVERTS:** (Cover flight feathers)

- Greater coverts:** The first row of feathers overlying the flight feathers, identified by the particular feathers they cover as primary, secondary, or tertial coverts.
- Tertial coverts:** Those greater coverts that overlie the tertials. Designated separately here because they are sexually dimorphic in adults of several species and usually molt with the adjacent body feathers.
- Middle coverts:** The next row of coverts.
- Lesser coverts:** The next several rows of coverts.
- Marginal coverts:** An indefinite number of rows anterior to the lesser coverts

APPENDIX D: NBL TRAP DESIGN

With permission from D. Benning

5 - 4'x8' sections }  
 4 - 4'x4' sections } 2 - 100' rolls = 3 traps



B-2 Collapsible  
 Duck Trap  
 designed by  
 Doug Benning  
 FWS, Golden, CO

Welded wire Construction - 14 gage, 1" x 2" mesh, cross  
 stitched at joints with #1 hog rings (one per ≈10")

Catch Box Door Opening - 14" wide x 12" high (w/ 4" below  
 and 4" to left side to maintain section strength)

Catch Box Door - 18" wide x 14" high (for 2" overlap at  
 sides and bottom)

50# test strength  
 Tie-Wraps (7")<sub>n</sub> used to secure trap after setup and  
 to be down.

**APPENDIX E: TYPES OF WEAR ON WING FEATHERS**

With permission from Paul Ashley

**Primary Coverts**



Rounded with edging

**Juvenal Type**



Pointed



Rounded



**Adult Type**

Slight squaring no edging

Squared no edging

**Tertial Coverts**

**Juvenal Type**



Pointed



Bluntly Pointed

**Adult Type**



Rounded



Broadly rounded

## APPENDIX F: Waterfowl Banding First Aid Kit

Below is a list of suggested first aid kit contents and their use. The kit should be kept in a clear watertight container. Sterile items should be stored in their original sterile wrapping and replaced if they become damp or wet. Review and replenish first aid kit contents regularly.

Contents	Description/Use
Stockinet or towels	If needed wrap bird in towels or stockinet to prevent struggle. For small or medium ducks a large stretchy sock with ends cut off can be used.
Rehydration fluids	Bottled oral electrolyte and energy fluids (Pedialyte, Gatorade or fruit juice). Stressed or dehydrated birds may respond dramatically to these fluids administered slowly by mouth.
Medicine dropper or 10 to 20 cc syringe	Use to slowly administer oral fluids. Do not tip the bird's head back or force fluids or aspiration may occur.
Nail clipper and small scissors	May be used to trim broken toenails or feathers at the site of the break. Trim only broken portions, do not cut feathers at the base. Scissors are useful for removing string, fishing line etc.
Styptic gel or powder	Small amounts may be applied to a nail or feather shaft if bleeding persists.
Forceps or needle nosed pliers	To be used by experienced handler to pull bleeding blood feathers if needed, as a last resort. Also useful for removing foreign material or feathers from a wound.
Sterile saline	Use to flush wounds before applying antibiotic ointment or skin glue.
Antibiotic ointment	Over the counter triple antibiotic ointment works well. Apply small amounts to clean wound.
Q-tips, sterile gauze	May be used to clean or dry wounds, apply pressure to bleeding toenail or broken feather and to apply ointment.
Skin glue	DermaBond is available over the counter. The wound should be cleaned, treated and skin edges dried with sterile gauze. The skin edges are apposed then a thin film of glue is applied over the skin edges to form a "bridge". Do not apply to muscle or subcutaneous tissues. The glue will provide adhesion after a moment of drying.
Hospital box	Stressed birds often respond very well to rehydration fluids and recovery in a hospital box. An opaque plastic, easily disinfected tote box with securely closing lid works well. Smooth edged ventilation holes should be added, keeping hole diameters smaller than the birds' bills. The box should be lined with soft washable towels or mats. When in use, the box should be placed in a quiet shaded location.

**APPENDIX G: Wildlife Mortality Response**

Below are lists of suggested items to include in a refuge or station wildlife disease response kit and suggested items to include in a vehicle or boat kit. These forms should be completed by each station and updated regularly with current quantities and sources of included items.

**Wildlife Mortality Response Kit**

Items needed to investigate a suspected disease outbreak. Complete the table below with your refuge/district specific information.

Wildlife Mortality Response Kit	
Contents	Source
<b>Personal Protective Equipment (PPE)</b>	
Coveralls/Tyvek suits: ____ (S), ____ (M), ____ (L), ____ (XL)	
Nitrile gloves, Box of 100: ____ (S), ____ (M), ____ (L), ____ (XL)	
____ Goggles	
____ Respirator/masks, disposable N95 or better	
____ Hip/rubber boots, Sizes: _____	
<b>Instructions/Information</b>	
____ Current printed NWHC Instructions for Collection and Shipment of Avian and Mammalian Carcasses,	
____ Current printed NWHC Specimen Submission Form (See below)	
____ Current Printed copy of NWR Disease Response Plan	
<b>Carcass Handling Supplies</b>	
____ Open plastic bin, adequate for equipment cleaning and disinfection	
____ Scrub brush	
____ Household bleach, 1 gal. jug	
____ 5-gallon water jugs for tap water	
____ 21” pin flags, bundles of 50	
____ Sample Labels, (leg tags)	
____ Bag or package labels	
____ Sharpies, ____ pens	
Heavy duty plastic bags, various sizes and types: ____ 1 qt Ziploc, ____ 1 gal Ziploc, ____ 2 gal Ziploc ____ Large (4-5 gal), ____ other	
____ Large trash bags for contaminated gear containment	
____ Blue ice packs (16 oz or larger) for field use and shipping (keep 1 dozen or more frozen)	
Coolers of various sizes include; the 16 qt size will ship of 5-10 avian carcasses ____ 16 qt. cooler ____ 28 qt. cooler ____ 54 qt. cooler ____ 70 qt. cooler	
____ Shipping tape	
____ Hand washing solution or hand sanitizer	
____ Sanitizing wipes, container	

Inspected and stocked on: (mm/dd/yyyy), by: (responsible person)

**Vehicle Incidental Mortality Kit**

Items to carry in all vehicles/boats; store in watertight cooler. Complete the table below with your refuge/district specific information.

<b>Vehicle Incidental Mortality Kit Contents</b>
___ Nitrile gloves, M, L and XL, 6pr each size in Ziploc bags
___ Container of sanitizing wipes
___ Hand sanitizer, 8 oz bottle
___ Sharpies, ___ pens
___ Sample Labels (leg tags)
___ Current printed NWHC Reporting and Shipping Form
___ Current printed NWHC Instructions for Collection and Shipment of Avian and Mammalian Carcasses (See below)
___ Heavy duty Ziploc plastic bags, various sizes and types
___ Heavy duty trash bag

**The following forms should be downloaded, printed and included in the disease response kits. Update forms with current versions as they become available.**

Links to the most current documents can be found at: <https://www.nwhc.usgs.gov/services/>

- USGS NWHC Instructions for Collection and Shipment of Specimens
- USGS NWHC Wildlife Mortality Reporting and Diagnostic Services Request Form
- USGS NWHC Diagnostic Case Submission Guidelines

**Always call the National Wildlife Health Center or your responsible state/provincial agency to report a disease event before collecting or submitting specimens.**

- Contact FWS Wildlife Health office: Sam Gibbs: 571-216-5776, or email [samantha\\_gibbs@fws.gov](mailto:samantha_gibbs@fws.gov)
- Contact USGS National Wildlife Health Center Field Epidemiology Team: 608-270-2480, or email [NWHC-epi@usgs.gov](mailto:NWHC-epi@usgs.gov)
- Contact your responsible State Agency or disease specialist. In Wisconsin: Wisconsin Veterinary Diagnostics Laboratory <http://www.wvdl.wisc.edu/>

**In Canada, contact the Canadian Wildlife Health Cooperative (CWHC)**

- CWHC email, [national@cwbc-rcsf.ca](mailto:national@cwbc-rcsf.ca) or phone, 306-966-5099
- Visit CWHC website, [http://www.cwhc-rcsf.ca/report\\_submit.php](http://www.cwhc-rcsf.ca/report_submit.php) for sample submission information, disease updates and useful links



## APPENDIX H: AOU CODES AND BAND SIZES

The band sizes given are for both males and females of the species unless otherwise noted, and the band sizes are given in the order that they are normally used on the species. The band sizes and species codes for any species or hybrids not listed here can be looked up on the BBL website. <https://www.pwrc.usgs.gov/BBL/MANUAL/specplist.cfm>

1290	COME	Common Merganser	7A, 7
1300	RBME	Red-breasted Merganser	6, 5A
1310	HOME	Hooded Merganser	5, 5A, 6
1320	MALL	Mallard	7A, 7
1326	MBDH	Mallard X American Black Duck Hybrid	7A
1330	ABDU	American Black Duck	7A
1331	MEDU	Mexican Duck	7A
1340	MODU	Mottled Duck	7A
1350	GADW	Gadwall	6
1360	EUWI	Eurasian Wigeon	6
1370	AMWI	American Wigeon	6
1371	FATE	Falcated Teal	4A
1390	AGWT	American Green-winged Teal	4, 4A
1400	BWTE	Blue-winged Teal	5, 4A
1401	UNTE	Unidentified Teal	5, 4A
1410	CITE	Cinnamon Teal	5, 4A
1420	NSHO	Northern Shoveler	5, 6, 5A
1430	NOPI	Northern Pintail	6
1440	WODU	Wood Duck	M: 5A, 6, 5 F: 5A, 5, 6
1460	REDH	Redhead	6, 7A
1470	CANV	Canvasback	7A
1480	GRSC	Greater Scaup	6, 5A, 5
1490	LESC	Lesser Scaup	6, 5A, 5
1500	RNDU	Ring-necked Duck	6, 5A
1510	COGO	Common Goldeneye	6, 7A
1520	BAGO	Barrow's Goldeneye	7A, 6
1530	BUFF	Buffhead	5, 5A
1540	LTDU	Long-tailed Duck	6, 5A, 5
1550	HARD	Harlequin Duck	5, 5A
1570	STEI	Steller's Eider	7A, 6
1580	SPEI	Spectacled Eider	7A, 6

1590	COEI	Common Eider	M: 7B, 7, 7A F: 7A, 7, 7B
1620	KIEI	King Eider	7A, 6, 7, 7B
1620	BLSC	Black Scoter	7A
1650	WWSC	White-winged Scoter	7A, 7
1660	SUSC	Surf Scoter	7A
1670	RUDU	Ruddy Duck	M: 7A, 6 F: 6, 7A
1690	LSGO	Lesser Snow Goose	7B
1691	BLGO	Blue Goose	7B
1695	SBGI	Snow X Blue Goose Intergrade	7B
1698	BGSG	Blue Greater Snow Goose	7B
1699	GSGO	Greater Snow Goose	7B
1700	ROGO	Ross's Goose	7B
1703	SRGH	Snow X Ross's Goose Hybrid	7B
1710	GWFG	Greater White-fronted Goose	7B, 8
1716	OHGO	Other Hybrid Goose	8, 7B
1719	TWFG	Tule White-fronted Goose	8
1720	CAGO	Canada Goose	8
1721	ACGO	Aleutian Canada Goose	7B, 7
1722	CACG	Cackling Goose	7A, 7, 7B
1723	LCGO	Large Canada Goose	8
1729	SCGO	Small Canada Goose	7B, 7
1730	ATBR	Atlantic Brant	7B, 7
1740	BLBR	Black Brant	7A, 7, 7B
1750	BRNG	Barnacle Goose	7B
1760	EMGO	Emperor Goose	7B
1770	BBWD	Black-bellied Whistling-Duck	7A, 7
1780	FUWD	Fulvous Whistling-Duck	7A, 7
1782	MUSW	Mute Swan	9C
1790	WHOS	Whooper Swan	9
1801	BESW	Bewick's Swan	9
1804	TUSW	Tundra Swan	9
1810	TRUS	Trumpeter Swan	9C, 9