ThE BiRd BooK:

An Ornithology Volunteer Preparation Guide

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2026

Burke MUSEUM
UNIVERSITY of WASHINGTON

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Land Acknowledgment

The Burke Museum stands on the lands of the Coast Salish peoples, whose ancestors have resided here since time immemorial. Many Indigenous peoples thrive in this place — alive and strong.

Tier & Program Introduction:

Welcome to the Burke Museum Ornithology Volunteer Program! This guidebook was designed collaboratively by Marnie Hill-Woodworth, Museology Graduate student class of 2026 with the help of committee members, Madison Mayfield, Ornithology Collections Manager, Alejandro Rico-Guevara, Curator of Ornithology, and Assistant Teaching Professor, Lane Eagles. The Bird Book provides volunteers with more robust experiences and moments to learn within the collections. New additions include a tiered system for volunteers to work through to help the department minimize specimen backlog. Each tier comes with opportunities to learn more preparation and collections skills based on your interest. The tiered system aims to give volunteers personal and professional goals to achieve during their time at the Burke all while having fun! Inside this guidebook you will find all the information needed to prepare specimens for the Burke's Ornithological collections.

Onboarding:

Before you begin working in the preparation lab to prepare specimens, you must complete all required onboarding. Please make sure that you have completed the following-

- Burke Volunteer Background Check
- Have a Burke Volgistics Account for volunteer scheduling
- Received your Burke badge
- Have been granted Husky card access to the museum (if you are a UW undergraduate or graduate student)
- Completed the 203 A Prep Lab Safety Orientation Checklist and all required trainings

Volunteer Expectations:

We want you to get the most out of your volunteer experience and are generally extremely flexible with our volunteer's schedules. However, we do ask that as a volunteer you are able to dedicate a few hours a week to volunteering on a regular basis so that the knowledge we pass on to you is put to good use and allows us to create consistent volunteer schedules. Volunteer schedules are set quarterly, following the UW academic calendar, and volunteers are required to log their hours in Volgistics.

Volunteer Hours:

Building access for volunteers is **8AM-5PM weekdays and weekends**. Volunteers' hours will be scheduled during those times.

Additional Expectations:

Our volunteers work in shared spaces that are visible to the public, oftentimes with other volunteers and Burke employees present. As such, we expect you to be courteous and kind to others and aware of your workspace. Always be sure to clean up after yourself, wiping down tables, cleaning your tray and tools, etc.

Photos of specimen are allowed, but we would like you to be mindful of the level of gore, especially when sharing photos online in association with the Burke's social media. Please do not include label information in photos. And please be mindful of other people in the photos you capture and be sure to always ask for consent before sharing!

Contact Info:

Below you will find the contact info for the Ornithology department and related members. In order to register for BIO 399 and BIO 499 you will need an add code that can be obtained from Madison Mayfield or Alejandro Rico-Guevara.

Curator of Ornithology, Assistant Professor, Department of Biology:

Alejandro Rico-Guevara, colibri@uw.edu

Collections Managers:

Kevin Epperly, kepperly@uw.edu

Madison Mayfield, madism2@uw.edu

Chris Wood, puffinus@uw.edu

Museology Graduate Student, Class of 2026:

Marnie Hill-Woodworth, marniehillwoodworth@gmail.com

Tier 1:

Open to all-

- **After preparing 20 birds, you can use your own preparator number.**
- Learning specimen prep and logging specimen under the ORN prep log.

CI Volunteers: CI Volunteers refers to Collections Interested volunteers who would like to be more involved in the collections management process.

  - Tag tying
  - Changing gentrol
  - Bone washing and numbering
  - Inventory

Tier 2:

- **Must have prepared 50 birds, or demonstrate equivalent skills**.
- **Able to register for BIO 399 credits after preparing 25 birds (contact Madison or Alejandro for add code).**
- **Possibility to join on collections trips and prepare birds in the field.**
- **Help train new volunteers with basic specimen prep.**
- Capable of correctly sexing birds 75% of the time (always check with supervisor for confirmation).

CI Volunteers:

- **4D Data Entry**
- Tag tying
- Changing gentrol
- Bone washing and numbering
- Inventory

Tier 3:

- **Must have prepared 100 birds, or demonstrate equivalent skills**.
- **Able to register for BIO 399 or BIO 499 credits (contact Madison or Alejandro for add code).**
- **Possibility to join on collections and research trips to prepare birds in the field**
- **Required to assist in teaching new volunteers (Assigned to Tier 1 or 2 to oversee)**
- Capable of correctly sexing your birds 90% of the time (always check with supervisor for confirmation).
- Basic understanding of bursa and skull ossification (even if observations need to be confirmed by a collections manager).

CI Volunteers:

- **Independent research using collections**
- **Can assist with packing specimen loans**
- 4D Data Entry
- Bone Washing and numbering
- Changing gentrol
- Tag tying
- Inventory

Tier 4:

- **Must have prepared over 150 birds, or demonstrate equivalent skills.**
- **Once you have prepared 200 birds, you have the ability to come in and prepare on your own time without collections manager supervision**
- Able to register for BIO 399 or BIO 499 credits (contact Madison Mayfield for add code).
- Possibility to join on collections and research trips to prepare birds in the field.
- Required to assist in teaching new volunteers (Assigned to Tier 1 or 2 to oversee)
- Capable of correctly sexing your birds 90% of the time (always check with supervisor for confirmation).
- Basic understanding of bursa and skull ossification (even if observations need to be confirmed by a collections manager).

CI Volunteers:

- **You now have access to all collections related activities!**
- Independent research using collections
- Can assist with packing specimen loans
- 4D Data Entry
- Bone Washing and numbering
- Changing gentrol
- Tag tying
- Inventory

Preparation Video:

Feel free to return to this video if you need a refresh, or if you are just getting started in prep and would like a visual guide!

https://drive.google.com/file/d/1Z4aGRu4Sd0P9uMj6u790o57O53UW5dSH/view?usp=drive_link

Getting Started With Bird Prep

Hazards:

Zoonotic disease: When working with any wildlife, there is always an underlying risk of zoonotic disease which can be minimized with the use of PPE. The main concerns when working with birds are avian influenza, psittacosis, and salmonella. These diseases are often transmitted through droppings, saliva, or dander. For this reason, hand washing before and after prep and avoiding touching your mouth, face, or nose during the process are the best way to prevent transmission. We do not currently test for avian influenza but are always monitoring the situation and will never ask you to prepare birds that are at high risk, such as waterfowl, unless you feel comfortable doing so.

Sharps: Bird prep involves working with scalpel blades, scissors and other sharp objects.

PPE: While we do not currently require the use of any PPE for bird prep, gloves, lab coats, and protective eyewear are always provided in the lab.

Prepping at the Burke:

At the Burke Museum, bird specimens are typically prepared as one of the following types:

Round skin (skin)
Skeleton (skel)
Round skin/skeleton (aka ROM after Royal Ontario Museum)
Flat skin/skeleton (flat)

Prepping cont: Each of these specimen types has associated with it a detached, extended wing. Most of the specimens also have associated with them a tissue sample (heart, liver, pectoral muscle). Tissue samples are frozen in an ultracold freezer (-80 ºC) or preserved in lysis buffer or alcohol and used for future research.

Specimens prepared one of these ways with detailed data on the tag provide significantly more information than traditional skins and skeletons and serve a greater variety of research projects. The initial steps for each of these preps, however, are the same.

Prep Tools:

Spare tools needed for specimen prep can be found in the prep lab. However, as you become a more advanced preparator, you may want your own tool kit. Below is a list of tools you can purchase to create your own specimen prep kit.

- Tweezers (needle-nose, curved, long, or short, whichever ones you prefer working with)
- Scalpel handle (#3 and/or #4)
- Scissors (ideally surgical scissors)
- Needle and thread
- Micron pens (005 or 01 are best)
- Diagonal wire cutters
- 6-inch plastic flexible ruler
- Loctite super glue
- Small plastic case like a pencil box to store tools in

Specimen Tags:

Every specimen and specimen part you produce in the prep lab must be identified so that others can connect the specimen to the data associated with it. The first step when starting to prepare a bird is to assign a prep number to it and write it down in your catalog.

The prep number for a specimen consists of the preparer's initials (3 letters) and the sequential number of the specimen you have prepared. Write the assigned prep number on the appropriate number of tags (one for each: skin, skeleton and detached wing). For skin/wing or skel/wing, put one tag on the bird's left tarsus. The other tag should be tied on the detached wing. Use a square knot (not a granny!) to attach the tags.

Pay close attention to getting all your parts labeled correctly, since keeping individual parts of a specimen together can be difficult on a crowded prep table. Example on how the tag should look like on both sides:

Prep Catalog:

We store the data from each specimen in three places: the prep catalog, the computer database, and the tag on the specimen. Of these three, the prep catalog functions as the primary data source, which is archived and referred to when the need arises. People will be looking at your catalog entries 100 years from now, so be diligent!

Prep Catalog cont: The data from the prep catalogs are entered into our electronic database. The fields are based on data standards which have been developed by informatics experts, and which help organize and disseminate the information to users outside the Museum. For some good bedtime reading: *http://tdwg.github.io/dwc/terms/index.htm#locationID*.

Use the UWBM lab prep sheets, as this will help organize the data and help you remember what data to take. There are two different sheets: Lab & Field. Field prep sheets have one locality per page and are used for preparing a series of specimens from one locality, like those from a collecting expedition. Lab prep sheets have one locality per specimen and are used when each specimen comes from a different locality.

Filing out your Prep Sheet:

Put your name and date (month/year) on the top of each page. Include all of your initials if you have a multi-hyphenate name!

Accession Number. This is a number given to any specimen or batch of specimens that comes into the Museum and is part of the process of the University taking possession of the specimens. For example, the specimens from an expedition would get one accession number; a batch of specimens salvaged from a research project would all get one accession number, etc.

Accession numbers will look like a year followed by a dash and another number, for example:

2025-01 or 2012-156

Locality. We stylize the locality from largest to smallest to minimize ambiguity and make it easy for users who are not familiar with the region. Here is an example of how to manage a locality of a salvaged specimen with a slip of paper in the bag saying, “Volunteer Park, 11/10/17”.

First record the locality: it is your job as a preparator to make this locality unambiguous for specimen users from a foreign country, who have no clue where “Volunteer Park” is. Do this by including the city, looking up the county, including the state, and list them from largest to smallest:

WASHINGTON: King Co; Seattle; Volunteer Park

This is a locality which anyone who can read the Roman alphabet can understand and find.

Lat/long. Use decimal degrees, not degrees and decimal minutes.

Date. Use DAY, MONTH (this MUST be in letters), YEAR. In the example above (from Volunteer Park), you would need to contact whoever salvaged the specimen to find out if it was found on 11 October or on 10 November. Then it goes into the field on the data sheet like this:

10 Nov 2017

Make sure that this is the date the specimen died, not the date it was received. If there is no date, then enter “no date” in the catalog.

Coll/Salv. This is who collected or found the specimen, and how it was killed. Collected birds are usually shot or netted; salvaged birds can come from a wide variety of sources: killed by cat, window-kill, roadkill, oil spill, dead on beach, etc. We do this because different methods of salvage or collection yield different kinds of samples. For example, shot birds are biased toward males, as they are more conspicuous; window-kills are more likely to be young birds, etc. It also gives information about likely DNA quality, and information about environmental causes of mortality in birds.

Prep #. When you first begin prep, you will prepare under our generic Ornithology prep number, ORN. Always check with a collections manager to confirm which ORN specimen # you are on. While prepping under ORN, always be sure to write “prepared by [your full name]” in the Notes field. Once you have prepared 20 birds, a collections manager will assign you a personal prep number consisting of your initials.

Species. Latin name: you can get this from the field guide in the lab.

Prep Type. Round, round/wing, skel, skel/wing, tissue only, wing only, etc.

Before Cutting into the Specimen:

Weight. Use grams and make sure you put the month/year you weighed it, as specimens can lose significant weight in the freezer (which should be weighed upon donation). Make sure the month/year you weigh the specimen in is written right next to the weight, so it is not confused with the collection date.

Wingspan. Measure from wingtip to wingtip with both wings fully extended. Use millimeters.

Taking Tissue Samples:

Tissue. We take 3 kinds of tissue from each prepared bird: heart, liver, and muscle. For every tissue vial you fill, you must indicate what kind of tissue is in the vial and how many vials were filled from that individual. To indicate tissue type, use a capital letter for each kind of tissue in the vial: H for heart, L for liver, M for muscle. On your prep sheet, indicate both what kind of tissue and how many vials.

For example:

1HLM means one vial with some heart, liver and muscle in it

1H 1M means two vials, one filled with heart, one filled with muscle

1 of 3M means that you took three vials of muscle

When filling a tissue vial, fill it with as much tissue as possible but always leave about 5% empty to avoid the screw top popping off when tissues freeze and expand.

1. **Label tissue vial.** This will almost always be a screw-top cryovial, which can withstand shipping and deep freezing.

Use a Diversified Biotech solvent-resistant pen, *NOT* a sharpie, technical pen or ballpoint pen: the ink from most other pens comes off completely when exposed to alcohol, something that happens frequently when tissues are sub-sampled for loans. Write the following information sideways across the vial, on the white label area:

Prep number
Genus species
Tissue type and number of vials (i.e. 1 of 2; NOT 1/2 or 1-2)
Prep number (yes, same as above, this is in case some writing is smeared or illegible)

For example:

MEM 271
Pipilo maculatus
HLM 1 of 1
MEM 271

2. **Don’t contaminate the sample.** Make sure your tools are cleaned and dried between each specimen by scrubbing with detergent and water.

3. **Preserve the tissue sample in one of three ways:**

In the Lab:

a. **Minus 80°C Freezer.** Cut a piece of pectoral muscle, heart and liver and put into a cryovial. Fill the vial ca. 95% full if the bird is big enough (leaving a tiny amount of space helps with expansion during freezing). Place the tissue vial in a square white tissue box marked with your initials or the generic ORN box. Fill boxes systematically, moving from front to back and left to right, keeping vials in numerical order.

In the Field:

a. **Liquid Nitrogen:** (strongly preferred). Cut a piece of pectoral muscle, heart and liver and put it into the vial. Do NOT use snap-cap centrifuge vials; these explode when removed from the nitrogen. The vial should be ca. 95% full, leaving the top 5% empty so that expansion during freezing does not break the vial. Cryovials floating in LN2 tanks are not indestructible; violent shaking of the tank (donkey, boat, hand-carried, etc.) can break vials.

b. **Ethanol:** Use as close to 100% concentration as possible; less than 70% is inadequate. Put a slip of paper with the tissue number IN PENCIL into the cryovial. Mince small pieces (about the size of a pencil eraser or pea in 1.8 ml vials) and place them into a vial filled with alcohol. The tissue / alcohol ratio in the vial SHOULD NOT EXCEED 1/10, that is 1 part tissue and 9 parts alcohol. Exceeding this ratio will result in rotten samples. At the end of the day, pour off alcohol and refill with fresh alcohol.

c. **Buffer:** Cut small pieces (no more than the size of a small pencil eraser or pea in 1.8 ml vials) and place them into a vial filled with buffer. The tissue / buffer ratio in the vial SHOULD NOT EXCEED 1/10, that is 1 part tissue and 9 parts buffer. It is very important to mince the tissue to ensure exposure to the buffer. Many buffers have more specific protocols.

Molt

Look for growing or missing feathers in the wing and tail before you start skinning. Check for body molt later, when the skin is inside-out, looking for pigmented follicles that indicate molt.

<u>Evaluate molt at two stages of specimen prep:</u>

First, describe the wing and tail molt before starting to skin the bird. Refer to primaries as Px, where x is the number of the series of remiges starting from the secondaries and going toward the primaries. Refer to secondaries as Sx, where x is the number of the series of remiges starting from the wrist and going toward the body. Refer to rectrices as Rx, where x is the number of the series of rectrices starting from the center and moving to the outside.

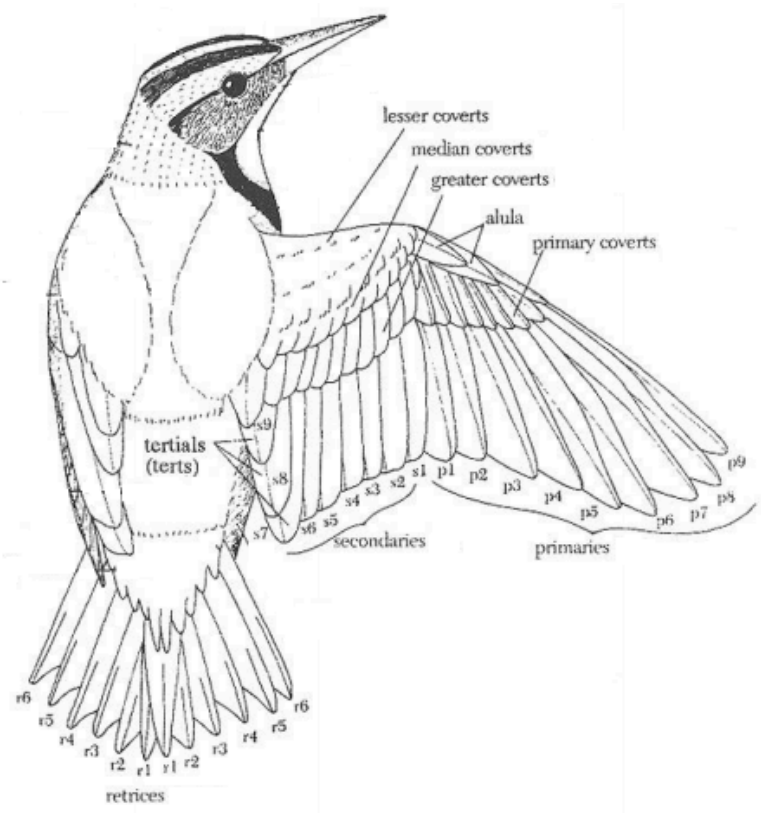

Photo from Juniata College Bird Lab

The amount of growth is written as a decimal fraction of the feather's eventual length.

For example:

Molt: left P1=.3, P2=missing, P3-P10=old, S1=.1, S2-S10=old; right and left R1=.2, other rectrices old.

This example means that on the left wing, the first primary has grown to 30% of its eventual length, the second primary is missing (the new feather hasn't started to grow yet), and the rest of the primaries are old; the first secondary has grown 10% of its eventual size, and the rest of the secondaries are old; the central rectrices have grown 20% of their eventual size, and the other rectrices are old. Second, describe body molt when the skin is inside out. Look for pigmented follicles, which indicate that the feather in that follicle is growing; note where on the body the molt is occurring, and how heavy the molt is.

For example:

Molt: heavy on head and neck, light on breast

Bursa of Fabricius

This is a fleshy sac off the dorsal side of the intestine of young birds, found where the intestine meets the cloaca. It functions as part of the development of birds' immune system, but for our purposes, it functions as an aging character: young birds have them and then lose them as their gonads mature. Measure the length and width of the bursa. Describe its condition by one of the following terms:

Fleshy - inside of wall is thick, spongy, glandular

Thin - walled, not membranous - a sheet of tissue with little or no glandular (spongy)
tissue; similar to the intestine

Membranous - see-through, glassine; cannot be dissected without extreme care

Tiny pit - a tiny blind sac or "neck"; often visible only through opening in cloaca

No bursa

Bursa cont: When you are still learning prep, always ask a collections manager or advanced preparator to check your bursa observations and note in your prep catalog who confirmed your findings.

Skull

Percentage of skull pneumatization. Not all birds have pneumatized skulls, so leave it blank for most non-passerines.

When they hatch, the crania of most birds are made of a single layer of thin bone. In many passerines, during the first months of their lives, the bone thickens, becomes harder, and fills with air; this process we call “pneumatization.” We use this as an independent aging character for the species whose skulls pneumatize. This pneumatization looks like tiny dots on the skull, or tiny pillars between two layers of the skull. Estimate the percentage of the cranium that has pneumatized.

Note that many birds have skulls which never pneumatize. The crania of woodpeckers, for example, thicken and harden as young birds age, but they never pneumatize. Therefore it is important to distinguish between skulls thickening/hardening, and skulls that actually pneumatize.

Fat

How fat? Birds regulate how much fat they store depending on what is going on in their life at the time. A couple of examples: the hummingbirds in your yard put on fat throughout the day during the winter months so that they can make it through the night. Birds just leaving for a long migratory flight store a great deal of fat to fuel the effort, and land at the other end of the flight completely depleted of fat reserves. Describe how fat your specimen is by one of the following terms, modified from the McCabe (1943) scale, sometimes used by biologists evaluating fat on live birds (continue to next page):

Emaciated - pectoral muscles partly resorbed; no fat anywhere

No fat - hardly more than a trace in dorsal tract

Trace fat - small quantities of fat in feather tracts of furcula

Little fat - depth of 1 mm in dorsal tract, some fat in furcula

Moderate fat - quite heavy in feather tracts, furcula well-filled

Very fat - heavy in tracts, considerable solid fat inside body cavity

Extremely fat - deep sheets everywhere, intestines hidden by blocks of fat; preparator wants to change careers

Sex

Gonads in birds are located on the back, at the top of the synsacrum, at the anterior end of the kidneys. A good landmark for hard-to-see gonads are the adrenal glands, which are light-colored triangles in the same location. Detailed gonad information can reveal where in the breeding cycle the bird was when it died: breeding, pre- or post-breeding. We can sometimes infer clutch sizes and laying dates and can make inferences about a bird's general condition.

Males. Measure length x width of the testes on each side (the bird's left and right). Look for enlarged seminal vesicles, which birds use to store sperm. Both the testes and seminal vesicles hypertrophy in the breeding season, and atrophy to almost nothing after breeding. In many passerines, they are found in the cloaca (making the cloacal protuberance) - you can peel them out of the cloaca when cleaning up that area during skinning. In some birds they are inside the body cavity. Measure length x width of both left and right.

Females. Ovaries. Females usually develop only one ovary, the left. Raptors and tube-nosed seabirds (Procellariiformes) are often exceptions to this and can have two developed ovaries. Like testes, the ovary hypertrophies (enlarges) during the breeding season, and atrophies (shrinks) after laying. Laying birds grow the ova (singular "ovum") they are going to lay, which can be easily seen and measured as small spheres of various sizes in a mature ovary. When the follicles (thin membrane that holds each ovum) ovulate, they leave behind a collapsed follicle which can be seen and measured for a couple of days after laying.

Females cont: By counting enlarged ova and collapsed follicles, we can deduce clutch sizes and laying dates. Young birds have an ovary that is smooth, sometimes transparent, and poorly differentiated (i.e., individual ova cannot be seen). Although adult (post-breeding) ovaries atrophy to almost the size of an immature ovary, they look and are described as "granular" (differentiated), not smooth like undifferentiated young ovaries.

Oviduct

The oviduct starts out in young birds as a straight, tiny, thread-like tube, that drastically enlarges and thickens during laying, then atrophies again afterward. Although the oviduct gets tiny after laying, it remains convoluted, and so is useful as an aging character.

What to measure and describe in females. Measure the length and width of the ovary, note whether it is granular or smooth, and note the diameter of the largest ova. If a few ova are yolky (yellow) and much more enlarged than the rest (these are the eggs she's likely to lay), measure their diameter, note that they are yolky, and then measure the largest of the remaining ova (those which she is unlikely to lay). Also note whether there is an egg in the oviduct, and whether it has albumen (transparent, jelly-like "white" of the egg) or a shell. If there are collapsed follicles, measure their diameters. They look like squashed grape skins and start to be resorbed as soon as the egg is laid, so they get smaller with time. The most recently ovulated follicle will be bigger than one that ovulated a few days prior. Measure the width of the oviduct at its widest point. Look at atrophied oviducts with the dissecting scope to see if they are straight or convoluted.

Brood Patch

Birds that incubate eggs develop ventral bare patches. On most birds, it is a huge bare patch on the breast and belly with NO down, but some birds can have more than one smaller patches (two in gulls and shorebirds, three in galliform birds, for example). In species where only the female incubates, males don't develop brood patches.

Brood Patch cont: Brood patches go through different stages. Before laying, the patch is bare and dry (not edematous). When the bird starts incubating, the patch becomes fluid-filled (edematous), or sometimes very vascularized. When incubation is finished, the edema and vascularization subside, leaving the skin somewhat scaly. If you've had poison oak, perhaps you remember the edematous blisters at the height of the rash, and then the scaly dry skin after the rash subsided.

Note the presence or absence of a brood patch, and its condition: no brood patch, brood patch bare and dry, brood patch edematous, brood patch dry and scaly.

When you are still learning prep, always ask a collections manager or advanced preparator to check your gonad (sex gland) observations and note in your prep catalog who confirmed your findings.

Additional Notes

Stomach contents. You do not always need to document stomach contents in all birds, but it is important in larger birds or birds of prey, and still useful to look in other birds. Note what was found in the stomach upon dissection.

Notes. Any other notes about the specimen.

Remarks. Any other notes about the specimen.

See back. If you don't have room for any of the above fields, you can use the back of the data sheet.

Preparing Spread Wings:

Remember to weigh and measure wingspan before removing the wing!

Select the wing with feathers most intact (if both are intact, take the left wing); break the humerus (if making a skeleton, disarticulate humerus at elbow rather than breaking the bone). To find the place to cut, twist the body while holding onto the wing; the inner secondary feathers should separate from the scapulars; secondaries stay with the wing, scapulars stay on the body.

Begin the cut at the leading edge of the wing skin, near its attachment to the torso and distal to the scapulars, which should remain with the skin. Cut through the humerus (skins) or disarticulate at the elbow (skels). The more perpendicular the cut is made to the bone, the smaller the resulting wing hole in the skin will be. This will later facilitate securing the button-stick in the skin.

Remove the humerus and muscles or fat near the cut. If there is little meat between the ulna and radius (most small birds), then the wing is ready to pin out. In larger birds, the muscles should be removed. Do not strip the secondaries from the ulna in order to remove the muscles! Rather, remove the muscles through an incision made on the underside of the wing between the ulna and the radius. Use plenty of sawdust. Sew up the incision.

Tie your prepared tag through the patagium. With a needle, thread one string of the tag through the patagium just proximal to the wrist. Tie the knot on the underside of the wing, and leave a loop, so that the string does not cinch up the skin.

Pin the wing out. Wings should be fully extended to show all flight feathers as well as primary slotting (if present). This extension can be accomplished with four main pins, although the final position of the wing is more important than using as few pins as possible. Drier wings require more pins to get the spacing right (as seen in this magpie wing below).

Spread Wings cont: Lay the wing dorsal side up on the pinning board. Insert the first pin in the leading edge of the wing, at the corner of the skin where the wing was initially cut. Stretch the leading edge of the wing and insert the second pin through the skin just proximal to the wrist. Place the third pin through the skin at the "elbow," angling the pin down to hold the secondaries down. Do not flatten secondaries if the wing has camber. With the fourth pin, extend the outermost primary forward until the wing is fully extended and the primaries, including the slots, are displayed. In general, this is accomplished when a) the outermost primary forms a straight line with the rest of the wing; or b) blades of the primaries begin to separate from adjacent blades or the trailing edge becomes distorted.

Spread wings cont: If necessary, use more pins to evenly space out the primaries and secondaries. This may only be necessary only on birds that are desiccated from being frozen for too long. The secondaries should be lined up perpendicular to the length of the wing.

For badly desiccated wings, inject hot water (half or full syringe) into the wrist and hand (muscles and tissues surrounding the wing bones). This helps relax the wing enough to be pinned.

Leave wings pinned out until there is no flexibility in the wrist; this may take weeks in large birds. If a wing is unpinned too soon, the patagium will shrink, causing the leading edge of the wing to wrinkle and the primaries to fold in.

Preparing Round Skins:

1. **Prepare specimen tags and tissue vial.**
2. **Weigh specimen and measure wingspan.**
3. **Stuff mouth with clean cotton.**
4. **Prepare a spread wing.**
5. **Carefully break the humerus of the remaining wing.**
6. **Make an incision.** Make a mid-ventral incision with your scalpel from the posterior edge of the sternum down to the cloacal wall. Try to make a cut just through the skin and not into the body cavity with your scalpel.

7. **Clean both legs.** Carefully push the skin at the anterior end of the cut to the side and expose the knee. Break the tibio-tarsus and push the end through the muscles until the leg is completely inside-out. Peel the muscles away from the tibio-tarsus and cut them off at the ankle, rubbing sawdust around the tarsi to clean them off. For big birds or birds with fleshy pads on toes, make an incision on the sole and pull out the tendons. For large birds, ream the marrow out of the tibio-tarsus with cotton on a stick.

8. **Check, measure, and write in the catalog.** Bursa (both sexes) and Oviduct (females) data.

> Small birds: cut into lower abdominal cavity and look for a sac-like structure behind the intestine at the cloaca into which the bursa opens.
>
> Big birds: look for a “hole” in the uroproctodeal fold of the cloaca to indicate the presence of a bursa and then double check for its presence as in small birds.

If present, measure and describe it. Otherwise, record “no bursa.” If the specimen is too decomposed to evaluate this feature, note this in your catalog.

9. **Stuff a small piece of cotton into the abdominal cavity after bursa check.**

10. **Cut through the vertebral column between the pygostyle and the synsacrum.** Peel the skin away from the body wall in the region just above the tail. Cut through the muscles and into the body cavity, cut through the small intestine and carefully through the vertebral column. Be careful not to cut through the skin of the back. Cut with scissors that have one rounded tip. Push the skin with the rounded tip when cutting.

11. **Skin out bird, neck and head.** Start at the tail and moving toward the head, push (*don't pull*) the skin away from the body. When you get to the remaining wing, cut or pinch through the humeral muscles. Continue up the neck to the head. Use lots of sawdust to absorb grease, blood and other body fluids to keep the feathers clean. Skin all the way forward to the base of the head. At the head, gently pull out the skin lining the ear and very carefully cut through the transparent membrane between the eyelid and eyeball on each side.

12. **Cut through the skull to remove the body and clean out the skull.** Remove eyeballs. Near the jaws on each side of the skull, make lateral cuts (vertically orient one point of the scissors poking through the floor of the mandible inside the skull, orient the other point outside the head behind the jaw and cut). Connect these lateral cuts with a third cut across the back of the skull leaving the cap of the skull intact (refer to 26:28 in preparation video for visuals). Then pull back the tongue and cotton stuffed in the throat and cut directly through the roof of the mouth between the orbits with the points of the scissors. Detach the body from the skull by pulling out the brain and tongue. Clean out the remaining muscle and brain tissue and cut off extra tissue around the eyelid so that cotton eyes will stay clean when you insert them later.

For passerines, estimate the percentage of the skull that is pneumatized and record it in your catalog.

13. **Take a tube of tissue and freeze it immediately in −80°C freezer.**

14. **Scrape fat and remove uropygial (preen) gland.** It is important to take time to remove most of the fat on the skin, as the remaining grease can ooze out of the skin and damage the specimen.

15. **Evaluate skin molt, fat condition, seminal vesicles (in male passerines) and write these data in the catalog.** Seminal vesicles are found in the cloacal wall of breeding male passerines. Carefully dissect them to measure and describe them.

16. **Clean and tie wing to button-stick.** Strip secondaries from the ulna. Cut the radius and muscles at the wrist. Pull the radial muscles toward the body. Cut the ulna just below the joint with the humerus, removing the humerus, elbow and attached radius and muscles. With a short piece of STRONG thread, tie one end through the wrist and the other end to a stick. The stick should be long enough to keep from slipping back through the wing hole but short enough to remain hidden by scapulars and flank feathers.

The distance between the ulna and the button-stick should be slightly shorter than the ulna for small birds (up to say jay or quail size) or slightly longer for large birds. This distance should be short enough to hold the wing up tight to the specimen's back. Reinsert the free end of the ulna into the pocket of skin (pocket for elbow) that it came from. Before stuffing the bird, you will button the tied stick through the hole left by the detached wing; you can also tie the button-stick prior to inserting the ulna into its pocket.

17. **Turn skin right side out (i.e. feed skull back through neck skin).** Before turning skin right side out, thoroughly moisten the skin either with spit or water, and then dust the moist skin with sawdust.

18. **Wash skin if necessary.** Wash off blood and dirt using a mild detergent and lots of water. Rinse in mineral spirits for very fat birds. Dry with sawdust and compressed air. Record treatment in your catalog, e.g., "skin washed with mild detergent and mineral spirit." If your hands are greasy, wash them before continuing.

19. **Sex bird, measure gonads and write this information in the catalog.** Until you have prepared a substantial number of specimens (50-100), you should have an experienced preparator confirm sex and bursa data. Write in the catalog who confirmed the data.

20. **Wrap tarsi and insert eyes.** Wrap the tarsi with a small piece of cotton to fill in for the removed muscle and to cover the abrasive ends of the bones.

Make eyes by folding over the edges of small pieces of cotton to form spheres. Grasp the eye with forceps and feed up through the neck skin of the bird, into the head and out through the eyelids. Eyes should be well secured by the eye-ring to prevent them from falling back inside the skull.

21. **Insert the button-stick and a body support stick.** Button the stick tied to the skin's wing through the hole of the detached wing and make sure that the ulna is still in the wing pocket.

For a body support stick, use a wooden applicator (small birds) or dowel (big birds). Form a cotton "brain" at one end of the stick to hold it in place inside the specimen. With a scalpel, make nicks at one end of the stick or wet the end of the stick. Feed thin pieces of cotton onto the stick while turning it to form a tight cotton ball that will just fill the skull cavity. Insert the stick, cotton end first, through the neck and into the skull. In large birds with narrow necks, instead of a cotton "brain", whittle a point at the end of a dowel to lodge into the maxilla and wrap a layer of cotton around the dowel to partially fill in the neck.

22. **Stuff the skin with a cotton body.** Form a cotton body by rolling a flat rectangular piece of cotton into a cylinder about the diameter of the bird's body. Twist one end between the moistened palms of your hands to form a narrow neck. Grasp the neck with forceps to feed it up through the neck of the bird and out through the mouth.

With large birds, place a flat piece of cotton beneath the stick to fill out the back of the bird before inserting the body.

For big birds, you can do a 3-piece body. First place a flat piece of cotton beneath the stick to fill out the back of the bird. Roll up 2 pieces of cotton into cylinders of the same size as the body of the bird. Insert the cylinders into each side of the bird. This should fill up the body cavity. Make a triangular piece of cotton and place it on top of the cylinders, feeding the tip of the cotton through the mouth. To avoid getting a furrow in the middle of the skin where the incision is made, roll up another small cylinder of cotton and place it where the incision is.

Hold the skin at the anterior end of the mid-ventral incision with the fingers of one hand and tuck at the anterior part of the cotton body up and under the skin alternating on left and right sides, and then the middle. Do it with the forceps held in the other hand. DO NOT PULL THE SKIN OVER THE COTTON BODY. Grasp the mouth cotton with one hand and pull it a little forward holding the head by the sides with the other hand. Arrange skin feathers by holding the skin with the fingers of one hand along the mid-ventral incision and pushing the cotton body with the forceps in the other hand inside the skin. Start at the anterior end of the incision pushing the cotton body toward the neck and gradually move down while pushing the cotton body sideways, alternating the sides.

23. **Arrange feathers.** Hold the prep by the cotton in the mouth and pull the wing and button-stick down along the back to arrange feathers and the shape of the body. Break off any stick extending beyond the cloacal pocket. Break off extra body cotton at the tail end by placing your thumb in the middle and pulling from the center. Tuck the remaining lateral wings of cotton into the leg pockets.

24. **Sew up incision.** Start at the anterior end and ending in the cloacal wall and make fairly widely spaced stitches, alternating sides along the very edges of the ventral cut. Keep stitches out of the feather tracts. The thread can be pulled all at once after all the stitches have been made. Stitches do not have to be pulled completely tight. Preen feathers again with forceps.

25. **Tie tarsi together (left over right, unless left tibia is broken).** Use moistened thick thread. Circle thread over legs lengthwise and tie half of a square knot. Then circle thread crosswise and tie over a full square knot.

26. **Adjust the head length and the bill together.** Hold “neck" cotton in the mouth and pull the feathers at the side of the head until they are continuous and smooth and there is no gap between the body and head. Adjust the position of the head so that the bill is pointed in line about 30° with the body line rather than forward. The tip of the bill should never be higher than the body. Cut off extra neck cotton with scissors. Tie the bill together with thread laced through the nostrils. In species with conical beaks, it may be necessary to pin the bill together.

27. **Arrange feathers and pin out the bird to dry.** Make sure the primaries and secondaries are lined up properly, the wing is up and under the bird and that the flank feathers are pulled out on the sides and over the wing. Place the bird carefully on its back on the pinning board. Insert one pin through the belly just in front of the vent to hold the bird in place. Other pins, single or paired, should hold the wing in place, bill straight and at the desired angle above the horizontal, legs and toes symmetrical, and errant feathers from sticking out at odd angles. Spread the tail and use pins, cotton or a paper strip if necessary to keep it symmetrical and spread out.

Preparing Skeletons:

1. **Prepare tags and tissue vial.**

2. **Weigh specimen, and measure wingspan.**

3. **Detach and prepare spread wing** (See pg. 21).

4. **Take the skin off the wings, tail, and body.** Pull primaries toward the body, to break them off the hand; pull secondaries away from the body, to break them off the ulna. Snip the leading edge of the patagium and pull the patagium off the wing. To remove rectrices, hold the pygostyle with fingers, and pull feathers straight out. Care should be taken to avoid removing the outer phalanges of the wing and the pygostyle when the feathers are removed.

Pull the skin off the body without worrying about tearing. This can be done by holding the wing tip and the base of the tail between the thumb and forefinger when pulling out the outer remiges and the rectrices, respectively. The eyes, hyoid (tongue bones) and trachea should be left with the skeleton.

Removing the skin from the feet, including the toes, greatly accelerates the cleaning process, especially on larger birds. Make cuts into the pads of the toes of large birds.

5. **Molt, fat.** Check for body molt and fat as you pull off the skin. (See pg. 14-15).

6. **Take a tissue sample** (See pg. 11-13).

7. **Bursa of Fabricius and Sex**. Now is the time to check for the bursa and sex the bird. (See pg 14-16 & 17-18).

8. **Tie up the carcass with thread or string.** Make sure the limbs, head and neck do not stick out. The tag, tied to one of the feet, must be outside and easy to read. Now the skeleton is ready to be dried on the rack just above the sink.

ROM (SKIN-WING-SKEL) PREP

The preparation of a ROM (after Royal Ontario Museum) combines the methods of the preparation of both round skin and skeleton. However, saving both skin and skeleton modifies the preparation techniques. When saving a skeleton, you must disarticulate bones rather than break them. Also, you must not cut the vertebral column, leaving the pygostyle with the skin. The entire skull (including the bill), one leg and all the bones from the wing that remain with the skin are preserved with the skeleton.

1. **Stuff mouth with clean cotton.** Tie preparator tags on both legs.

2. **Prepare a spread wing.** Choose the wing to be kept with the skeleton. If bones are broken, keep an intact wing with the skeleton. Remember, do not break the humerus. Disarticulate at the elbow.

3. **Make a mid-ventral incision with your scalpel from the posterior edge of the sternum to the cloacal wall.**

4. **Clean both legs.** Carefully push the skin at the anterior end of the cut to the side and expose the knee. Disarticulate the femurs from tibio-tarsi. Push the end of the tibio-tarsus through the muscle until the leg is completely inside-out. Peel the muscles away from the tibio-tarsi, rubbing sawdust around to clean them off. Choose the tarsus that stays with the skeleton. This is usually on the opposite side as the wing that is detached, unless it is broken. Cut the skin around the ankle of the foot that stays with the skeleton and pull it out.

5. **Check, measure, and write in the catalog: bursa (both sexes) and oviduct (females) data.**

Small birds: cut into lower abdominal cavity and look for a sac-like structure behind the intestine at the cloaca into which the bursa opens.

Big birds: look for a “hole” in the uroproctodeal fold of the cloaca to indicate the presence of a bursa and then double check for its presence as in small birds. If present, measure and describe it. If the specimen is too decomposed to evaluate this feature, do not enter any data about the bursa.

6. **Free the pygostyle.** Peel the skin away from the body wall in the region just above the tail. Cut into the body cavity and through the small intestine. Peel the skin away on the dorsal side of the synsacrum and along the vertebral column, then cut through the muscles and oil glands along the pygostyle. Make the cut as close to the pygostyle as possible. Muscles surrounding the pygostyle support the bases of the tail feathers. If you cut too close to the bases of tail feathers or through them, the feathers may fall out. Try not to cut through the skin of the back. Pull out the pygostyle with the fingers of one hand and hold the tail feathers with the other hand. Use plenty of sawdust.

7. **Skin out body, neck and head.** Starting at the tail and moving toward the head, push (don’t pull) the skin away from the body. When you get to the remaining wing, cut through the humeral muscles and disarticulate it at the elbow. Continue up the neck to the head. Use a lot of sawdust to keep the feathers clean. Skin all the way forward to the base of the beak. At the head, gently pull out the skin lining the ear and very carefully cut through the transparent membrane between the eyelid and eyeball on each side. Leave the eyeballs in the sockets.

8. **Cut the skin around the mouth lining.** Leaving some of the rhamphotheca with the skin is OK, but do not leave any plumage with the carcass. You do not need to make an extra cut to skin the heads of large-skulled birds such as waterfowl and some woodpeckers. Rather, skin the bird as far as possible and disarticulate the neck near the back of the head. Then, from the outside, cut the skin around the mouth. Skin the head from the mouth back toward the neck and remove the skull.

For billed ROM, skin the bird to expose part of the bill. Peel back the tongue. Measure the total length from the tip of the bill to the back of the skull. Write down the data in your catalog. Cut through the base of the bill.

If a passerine, estimate % skull pneumatized and write it into the catalog.

9. **Remove all the bones from the wing that stays with the skin.** Peel the skin and all secondaries, primaries and alula from the wing bones. Make sure you take out all the phalanges and do not break them. Tie a long piece of thick thread to the end of the wing.

10. **Take a tube of tissue and freeze in −80°C.**

11. **Scrape fat and remove oil glands.**

12. **Evaluate skin molt, fat, seminal vesicles (in male passerines) and write these data in the catalog.**

13. **Wash skin if necessary.**

14. **Turn skin right side out.**

15. **Sex bird, measure gonads and write this information in the catalog.**

16. **Sex bird, measure gonads and write this information in the catalog.**

17. **Tie the button stick.** Pull the long thread across the body and out of the hole where the wing had been removed. Stick a thin stick through the remaining wing and secure it into the end of the wing. Make a break on the stick where the first primary would have been. Make another break on the stick about the length of an ulna. Remove the remaining length of the stick. Insert the ulna stick into the pocket. Tie a button stick to the long thread.

18. **Wrap the remaining tarsus.**

19. **Insert a body support stick** For a body stick, use a wooden applicator (small birds) or dowel (big birds) long enough to extend beyond the mouth opening a short distance (the skin from the mandible and maxilla will be tacked together around the dowel on both sides) and beyond the cloaca far enough to attach the leg to it. Form a cotton skull a short distance from one end of the dowel by feeding long, thin layers of cotton successively onto the twisting dowel. The cotton skull should be small enough to feed up the neck of the specimen and will partially fill out the head skin. Wrap the rest of the dowel with a thin piece of cotton. Push the posterior end of the dowel through the cloaca, then feed the wrapped end up through the neck, lodging the cotton skull in the head. Insert eyes through the mouth.

20. **Stuff the head and torso.** Fill out the crown by stuffing a small piece of cotton through the mouth. If the specimen is big, fill out the sides of the head as well. Insert a flat piece of cotton under the towel to fill out the space between the dowel and the dorsal skin. If the removed wing is large, insert an extra piece of cotton along the back on the side of the missing wing. Make a cotton body as in a regular skin.

21. **Arrange feathers.**

22. **Adjust the head and neck length, sew up the ventral incision and mouth.** Sew the ventral incision. Using the protruding dowel as the bill substitute, tack the maxilla skin to the mandible skin on each side, respectively lining them up as they would orient around the actual beak were it there. Use as many separate stitches as necessary to do this properly.

23. **Tie the leg to the portion of the dowel that extends through the cloaca.**

24. **Pin out the bird to dry.**

25. **Take out internal organs from the carcass and cut off as much flesh as possible.**

26. **Tie up the carcass with thick thread.** Before you tie up, put all the loose bones (leg, wing, head) inside the body cavity. The preparator tag should be outside.

pREP TRACKING sHEET

Name:

Tier	Bird Tally
1 (20 Birds)	
2 (50 Birds)	
3 (100 Birds)	
4 (150–200 Birds)