

ACME Camera Image Classification Protocol

Data Organization

Raw camera trap images and all files produced during image processing should be organized in a standardized system and uploaded onto the ACME hard drives.

Create a parent folder with the Project Id (e.g. “Richardson” or “ChristinaLake”) and stratify based on Camera Site ID (e.g. “Rich01”, “CL12”). Within each camera site subfolder, further stratify based on deployment (e.g. “Deployment1”) for each round of checks.

Within the final subfolder, save all raw camera trap images as well as all .ddb, .tdb, and .csv files produced during the image tagging process in TimeLapse. If there are any additional notes you want to make for that site/deployment round, save a ReadMe.txt file with comments within the subfolder.

Station Covariates and Deployment Data

In addition to species detection data, we will also create and update “Station Covariate” and “Deployment Data” datasheets.

Station Covariates:

This datasheet will largely be built from the deployment notes collected during initial camera deployment.

Following each round of camera checks, this datasheet can be updated to reflect changes made to camera site locations or additional camera sites that have been deployed.

Deployment Data:

This datasheet will include information on when cameras were deployed and active, and denote any periods during which the camera was non-functional (e.g. compromised field of view, wrong date & time).

Before and during image classification in TimeLapse, please update the information for the site that you are working on, noting the start and end dates, as well as any notes on camera failures. If a camera becomes non-operational and then operational again (e.g. obscured by snow which later melts away), please insert additional rows for that camera site ID with the new start and end dates every time it becomes operational again.

As multiple people will be working on a project simultaneously, please input information into the Deployment Data google sheet in the parent directory for the project/array.

Working In TimeLapse

Overview:

Make sure you have **TimeLapse2** downloaded on your Windows computer (TimeLapse is not compatible with Mac).

All camera images to be processed using the ACME template
“**ACME_template_final.tdb**” in TimeLapse2 available on the ACME Google Drive.

Note: In the following document, anything in *italics* is its own category and column in the spreadsheet. Anything in “quotations” is an option within the category.

Event is defined as a sequence of photos captured when the camera is triggered by animal movement and may include photos without an animal directly present within the field of view. Images will be classified as the SAME event if they are triggered ***within one minute of each other***.

*** *With the exception of minimum group count and group demographics (Part 3)*, score images based on what is present in the **frame**, but use the **event** to determine information on species, sex, age, and partial ID (e.g. coat colour, antler count) of all individuals present within the frame.

What the Timelapse template looks like:

File	<input type="text"/>	Folder	<input type="text"/>	DateTime	<input type="text" value="01-Jan-1900 12:00:00"/>	<input type="button" value="▲"/> <input type="button" value="▼"/>	ImageQuality	<input type="text" value="Ok"/>	<input type="button" value="Delete?"/>	
Site	<input type="text"/>	Classifier	<input type="text"/>	Snow	<input type="text" value="0"/>	<input type="button" value="▲"/> <input type="button" value="▼"/>	Species	<input type="text" value="White-tailed deer"/>	<input type="button" value="Total"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="Male"/> <input type="button" value="▲"/> <input type="button" value="▼"/>
<input type="button" value="Female"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="UnknownSex"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="Adult"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="YLY"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="YOY"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="UnknownAge"/> <input type="button" value="▲"/> <input type="button" value="▼"/>					
<input type="button" value="Group Count"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="G_Male"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="G_Female"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="G_UnknownSex"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="G_Adult"/> <input type="button" value="▲"/> <input type="button" value="▼"/>						
<input type="button" value="G_YLY"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="G_YOY"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	<input type="button" value="G_UnknownAge"/> <input type="button" value="▲"/> <input type="button" value="▼"/>	Event Start/End	<input type="text" value="Start"/>	<input type="button" value="Empty?"/>					
CoatColour	<input type="text" value="Unknown"/>	RightAntler	<input type="text" value="Unkn"/>	LeftAntler	<input type="text" value="Unkn"/>	LCount	<input type="text" value="Total"/>	RCount	<input type="text" value="Total"/>	
Comments	<input type="text"/>	OtherSpecify	<input type="text"/>	Camera Malfunction	<input type="text" value="Functional"/>	<input type="button" value="Noteworthy"/>				

Part 1. File and Site Information

All categories in this section should be filled out for all sites.

1. *File* - Timelapse will autofill this with the photo file name
2. *Folder* - Timelapse will autofill this with the folder on your computer containing the template and image files (e.g. BH01)
3. *DateTime* - Timelapse will autofill this with the date and time that the photo was taken
 - Always double check that the date/time stamp on the image (top left corner) matches the autofill date/time
 - Make sure the data/time are correct (i.e. set correctly on the camera)
4. *ImageQuality* - Timelapse will autofill this with image quality information, with the options being: "Ok", "Dark", "Corrupted", or "Missing".
5. *Site*
 - Follow naming scheme (e.g. "Rich01" or "CL12")
 - If the user label on the camera was set up correctly, the site name you input should match the user label in the bottom left corner of the image, AND it should match the site name displayed on the slate (held by a staff member at the beginning and end of a folder)

- Make a note if any site names are incorrectly labeled
- **Copy across to all images in folder** (right click and a drop-down menu will appear with the option to **“Copy to all”** photos)

Use the following prefixes:

Richardson - Rich
Christina Lake - CL
Bighorn- BH
Castle - CA

6. *Classifier*

Enter your 2 or 3 letter initials; copy across to all images in folder

7. *Snow*

Classify snow cover on each image (including daily time lapse images) in one of 5 percentage categories: “0”, “<50”, “>50”, “100”, or “Deep”.

- It can be helpful to copy across to all images in folder (e.g. copy “0” to all images if images start in the summer), and then adjust as you work through the images
- You can right click and select **“Copy forward to end”** to make adjustments as snow cover changes without overriding previous values

The “Deep” category refers to snowcover of a significant depth (≥ 1 meter), whereas the “100” percent cover category is to be assigned to snow cover that covers the whole ground, but has not built up high. Assigning this will require some subjectivity and judgment; it may be helpful to scroll through the photos at a site to see how snow cover changes throughout the winter and what it looks like at its peak. It may also be helpful to ask yourself: “would I wear snowshoes to walk through this?”. The aim is to denote if the snow is deep enough to hinder animal movement.

Part 2. Species, Total, and Demographic Information

8. *Species*

Select the species’ common name from the drop down menu.

If “Unknown”, please specify additional information in *Comments*.

Additional options include “Unknown ungulate”, “Unknown canid”, “Unknown mustelid”, “Unknown Deer”.

If species is not in list, select “OtherSpecify” and input common name into “OtherSpecify” comments box.

9. *Total*

Total number of individuals present in frame.

*****Note: This number should equal the sum specified across Female/Male/UnknownSex as well as Adult/YLY/YOY/UnknownAge (if these categories are being filled out)**

*****Note: Demographic information (sex and age) only needs to be filled out for species of interest (i.e. all ungulates except cows, wolf, bear, cougar). As a rule, we will specify sex and age (including UnknownSex/Age) for all species larger than a coyote. For smaller species (i.e. mustelids, hare, mesocarnivores), unless there is evidence to distinguish sex/age (e.g. an adult female with young in tow), demographic information can be left blank.**

10. *Male/Female/UnknownSex*

Input the total number of individuals in each sex class.

If sex is distinguishable, please count under *Male* or *Female*. If not, count under UnknownSex.

11. *Adult/YLY/YOY/UnknownAge*

Input the number of individuals in each age class.

Classify individuals as *Adult* unless clearly a sub-adult (i.e. young of the year or yearlings). If the image does not allow you to distinguish whether it is an adult or not, select *UnknownAge*.

Moose, caribou, and deer typically produce young in May-June. Classify all individuals born within the last 12 months as Young of the Year (YOY). In the summer and fall, classify any sub-adults as yearlings (YLY) if they are clearly older than 1 (born in the previous year's spring, approximately 1.5 years of age). We will consider ungulate species as *Adult* by January of their second year (~1.5 years of age).

Bears are born in winter, during hibernation. They usually leave their mother in their second summer. We will classify sub-adults as YOY in their first year, and YLY in their second year (whether or not they are still following their mother).

For all other species (e.g. canids, felines, mustelids, etc), classify any sub-adults as YOY.

Part 3. Group Count Information and Demographics

*****Note: For all group-related information, input information based on what is observed across the entire detection sequence (and not just what is present within the individual frame).**

A **sequence/event** is defined as a set of photos triggered by the same individual or a group of individuals (members of the group may come in and out of the frame throughout the sequence). We are classifying images as pertaining to a single event if they occurred within 1 minute of the previously triggered image. *****If more than 1 minute elapses between images, even if it is clearly the same individual or group, classify this as a new event*****

Episode Function:

*****Tip:** TimeLapse2 can help you keep track of events with the “**Episode**” feature; in the top left corner of the image, all single images will display “SINGLE”, while events (photos triggered within 1 minute of each other) will show the number of images in the event and which image you are currently on (e.g. “2/9”). Remember to select Event Start/End values for the first and last image in a sequence.

Go to: *Options* → *Adjust episode time threshold* → set the time threshold to **1:00 minute** and press Ok

Options → *Show episode information*

****Note:** Do not rely on this feature alone to demarcate event start/end but more as a guide to help you keep track.

***** Values input into Points 12 - 14 should stay the same for the duration of the entire sequence.**

- E.g. If a pack of 5 wolves travels in front of the camera, *GroupCount* = 5 across the entire sequence, even if no more than 1-2 individuals are seen in front of the camera at a time. Likewise, input all information on group demographics based on the sequence, and keep it the SAME across the duration of the event (e.g. *G_Adult* = 5 and *G_UnknownSex* = 5).

As with Part 2, demographic information (group age and sex info) does not need to be recorded for all species; only needs to be filled out for species of interest. As a rule, we will only specify sex and age (including UnknownSex/Age) for all species larger than a coyote. For smaller species (e.g. mustelids, hare), unless there is evidence to distinguish sex/age (e.g. an adult female with young in tow), demographic group information can be left blank.

12. *GroupCount*

Specify the minimum number of individuals observed to be traveling together during the event. Input 1 if the sequence only included a single individual.

13. *G_Male, G_Female, G_UnknownSex*

Specify the total number of males, females, and unknown sex class traveling together (should always sum to whatever value was input under *GroupCount*).

14. *G_Adult, G_YLY, G_YOY, G_UnknownAge*

Specify the total number of adult, yearling, young of year, and unknown age class traveling together

(Should always sum to whatever value was input under *GroupCount*).

15. *Event Start/End*

Use this to denote the start and end of an event sequence; select “Start” on the first photo of an event, and “End” on the last photo of an event; leave blank in between.

- There does not have to be an animal in the frame at the start or end of sequence, it is just based on the timing of the first image triggered and the last image triggered (Start/End images can be empty).

*****Note: Please classify a new event if >1 minute has elapsed with NO images containing any individual(s) in the frame, even if it is the same individual that returns in the next event.**

16. *Empty? (flag)*

**** OPTIONAL ****

If you come across a long sequence of images during which an animal repeatedly enters and leaves the frame, you have two options:

- i) Manually re-enter information about the detection across all relevant categories each time an animal exits and re-enters the frame

ii) Copy previous values into the image (use the “**Copy previous values**” function, or just press “**C**”) even if there is no animal in the frame (i.e. it is empty) *** but select the *Empty?* flag so that we know that this image does not actually contain the animal ***
(This lets us know that this is an image within a sequence during which an animal is present in the area but not actually in front of the field of view of the camera)

For timelapse images (the photos taken every day at noon, or whatever the camera’s timelapse is set to), you can simply select the *Empty?* flag.

Part 4. Information on Partial Identity (for density estimation models)

17. *Coat Colour*

***Only for daytime photos of wolf, black bear, fox, and feral horses. Leave blank for other species.**

Wolf: Select “Black”, “Grey”, “White” or “Brown”

Black Bear: Select “Black”, “Blonde”, “Brown” or “Cinnamon”

Fox: Select “Red” or “Cross-Phase”

Feral Horses: Select “Black”, “Brown”, “Grey”

Select “Unknown” for all night shots (i.e. black and white photos) or photos where coat colour is unclear.

Select “OtherSpecify” if options do not match. Input more information into the *OtherSpecify* comments box.

18. *LeftAntler* and *RightAntler*

Count the number of antler points for all ungulates classified as *Male*, but only if the photo was captured within the date ranges detailed below (otherwise leave blank). Leave blank for *Females* and *UnknownSex*.

If antler is not fully in view, count the minimum number of points visible.

“Missing” - if the antler has dropped off or is missing (e.g. a male with one large left antler but nothing on the right)

“Unknown” - if presence of antlers cannot be confirmed

“None” - if clearly no antler is present

**** If pedicles or small antler stubs are visible, put a value of 1 to denote the presence of an antler.

Dates for Scoring Antlers:

White-tailed and Mule Deer - August through end December

Moose - September through end November

Caribou - August through end October (also count antler points on females)

19. *LCount* and *RCount*

Select “Total” if there is a clear and unambiguous view of the complete antler for you to count all points.

Select “Minimum” if the antler was partially obscured or you don’t feel certain that you were able to count all points.

Scoring Moose, Caribou and Deer Antlers:

Deer - count the number of visible points on the antler, keeping a careful eye out for any brow tines. Count all visible points, even abnormal ones.

Moose - More ambiguous, as moose antler points can be a bit blobby. As a rule, I count everything that looks like it could be a point.

Caribou - Again, I count everything that looks like it could be a point. This can be challenging on the brow palms as they can be a bit blobby.

Do not score horns (e.g. Bighorn sheep and Mountain goats)

Part 5. Additional Information

20. *Comments*

Any relevant comments regarding the image or event.

21. OtherSpecify

Additional comments box to populate anytime “OtherSpecify” is selected from the drop-down menu of another category.

22. CameraMalfunction

If something goes wrong with the camera that compromises its ability to detect wildlife (e.g. obscured by snow, re-angled, blurry, obstructed, etc.) or somehow otherwise compromised (e.g. wrong date and time stamp), select from the drop-down menu.

- If the camera batteries die before servicing, tag the last photo with “Battery dead”

Leave blank if no camera malfunction or other issues.

23. Noteworthy (flag)

Flag any images that are particularly exciting that lab personnel may want to use in the future for presentations, etc.

Also, PLEASE save/export any noteworthy or even semi-decent camera trap images into a “BestOf” folder on the ACME Google Drive (predation events, wildlife selfies, awkward moose pictures, and even rainbows are all fair game)

Click File → Export (copy) the current image or file

(Field crew photos are ok but please practice discretion when it comes to images of the public)

Other Notes

i) Partial Identity For Multiple Individuals in an Image or Sequence

How to capture all information on partial identity (i.e. coat colour) across individuals, and also how to attach information on partialID to that individual’s demographic status when multiple individuals in frame (e.g. a blonde black bear sow with two black cubs).

If you come across a sequence of photos with multiple individuals for which information on partial identity is available (coat colour, antler points):

1. If the number of individuals in the sequence is less than or equal to the number of captured photos in the sequence, try to attach info on partialID to each individual at least once
2. If there are more individuals than there are images, then input information on additional individuals in “Comments”
3. Specify what partial identity is attached to which demographic members in the group in “Comments”, if there is the possibility of any confusion (In my black bear example above, I would include under *Comments* “AdultFemale CoatColour = Blonde; YOY1 Coat Color = Black; YOY2 Coat Colour = Black”)

ii) Behaviour

*** Only for Richardson ****

Tag the behavior exhibited by an individual on a per image basis.

Foraging = clearly eating, head down for multiple images/chewing.

Traveling = moving through

Vigilant = alert, listening, watching

Inspecting = going up to/smelling/mouthing camera

OtherSpecify = input comment into *OtherSpecify* box

For human images, please specify behaviour, e.g. hiking/hunting/mountain biking/horsebackriding/quad/motorbike/truck/car/Unknown/vehicle/snowmobile

iii) Delete

Mostly just to flag any inappropriate photos for deletion

QuickPaste

The **QuickPaste** function lets you create custom paste entries for pasting in certain values into multiple fields via a single mouse click - it is a very handy shortcut for entering commonly occurring data patterns (e.g. female white-tailed deer). You can create and save multiple preset paste entries that can be applied to multiple photos at once.

Go to: *Edit* → *Show QuickPaste Window*

The QuickPaste Window will pop up → select *New QuickPaste...*

QuickPaste Editor

What: The checked items below form a quickpaste entry. You will be able to paste these values into the corresponding data controls with a single button click.

Result: A new quick paste button will be added to the QuickPaste window

Hint:

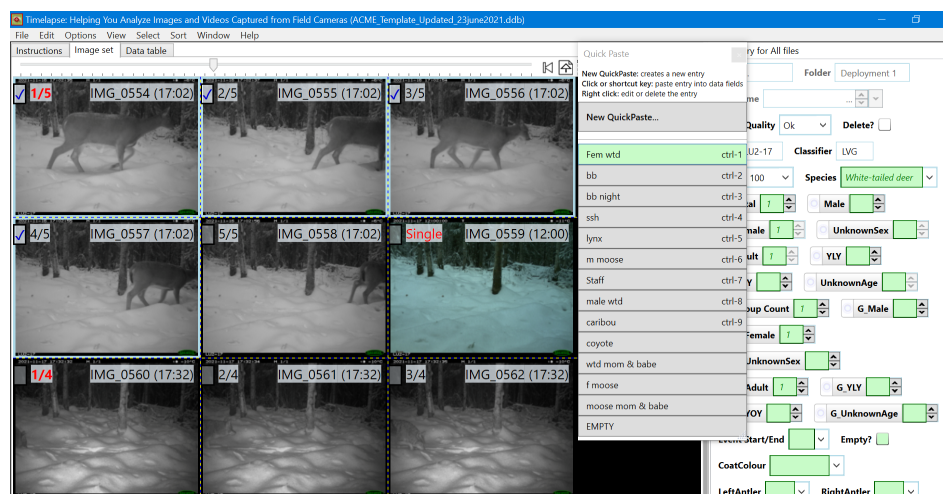
- create a meaningful title
- check 'Use' to select items to be quick-pasted into data controls
- if desired, use the buttons to select or clear all 'Use' checkboxes

Title:

Use	Label	Value
<input type="checkbox"/>	Site	<input type="text" value="LU2-17"/>
<input type="checkbox"/>	Classifier	<input type="text" value="LVG"/>
<input type="checkbox"/>	Snow	<input type="text" value="0"/>
<input checked="" type="checkbox"/>	Species	<input type="text" value="Grey wolf"/>
<input checked="" type="checkbox"/>	Total	<input type="text" value="1"/>
<input type="checkbox"/>	Male	<input type="text"/>
<input type="checkbox"/>	Female	<input type="text"/>
<input checked="" type="checkbox"/>	UnknownSex	<input type="text" value="1"/>
<input checked="" type="checkbox"/>	Adult	<input type="text" value="1"/>
<input type="checkbox"/>	YLY	<input type="text"/>
<input type="checkbox"/>	YOY	<input type="text"/>

all Use checkboxes

- Give your QuickPaste a shorthand, descriptive title
- Clear all checkboxes. This way you can go through and only select the checkboxes you want copied to all the photos.
 - E.g. it is helpful to make sure *Site*, *Classifier*, and *Snow* are all unchecked so those values do not get overridden
- Fill in all appropriate categories and press okay
- This QuickPaste entry will be saved and can be applied to any photo



You can also **import** your QuickPaste window from a previous file of tagged photos, so you do not have to recreate a new QuickPaste window every time you start tagging a new set of photos.

Go to: *Edit → Import QuickPaste Items from .ddb file...*

Simply select the ACME tagging template in a file that has a previous QuickPaste window of choice. You can then keep adding to your QuickPaste list as you work through multiple folders of photos.

Copying values to multiple photos

Besides using the “C” function to copy values from the previous photo, you can also select multiple photos to copy values to when using QuickPaste.

- Zoom out of the photo (will display multiple photos on the screen), select all the photos you wish to copy the same values to (by holding down the “**shift**” key), and select your QuickPaste entry
- That QuickPaste will be copied to ALL selected photos. Remember to fill out Event Start/End values for the first and last image if it is in a sequence, or making any changes to the values if individuals move in and out of the frame

Part 6. Post-Processing

Please backup and upload data files onto the ACME net drive as you work your way through image folders.

*****Important:** Whenever you complete an image folder, please scroll through the image data csv file and confirm there are no obvious discrepancies (e.g. an ungulate detection for which no demographic information on age and sex has been specified). Please filter and check that all species detections have a corresponding total and other required information, and *vice versa*. The most common error is missing Event Start/End information.

****** Note:** Should you notice any errors or discrepancies, please do not correct the csv file but instead, re-open the folder in TimeLapse to directly correct the mistake at its root and save a new Image Data csv file with the updated image information.

Part 7. Information on Identifying and Classifying Species

*****Please be conservative.** If you aren't sure, consult others via the Photo_Id_Help Slack Channel or put "Unknown".

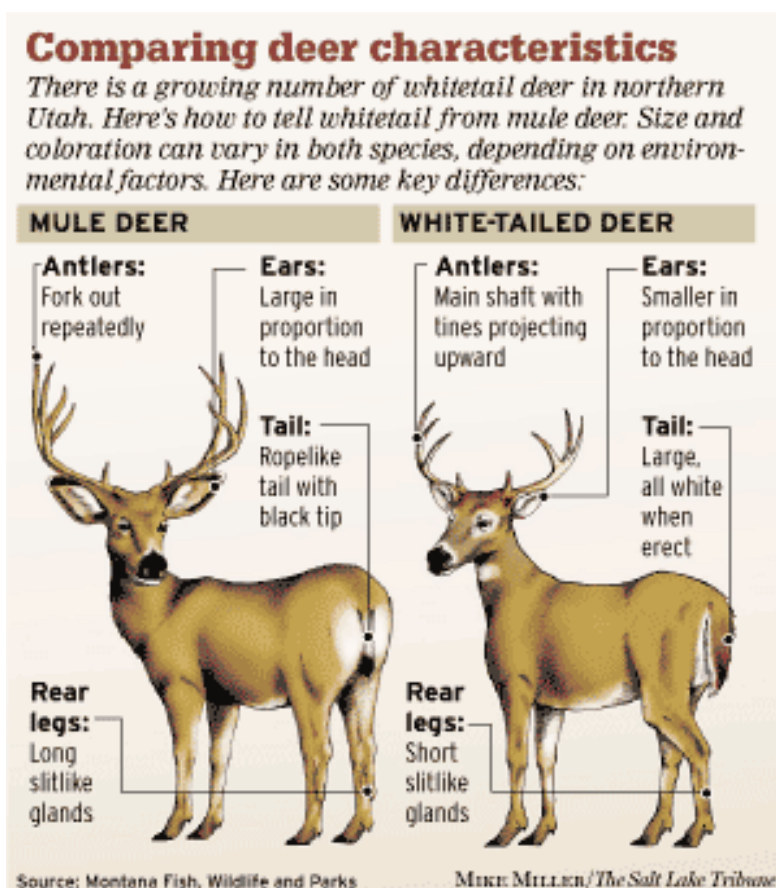
1. Mule Deer versus White-tailed Deer

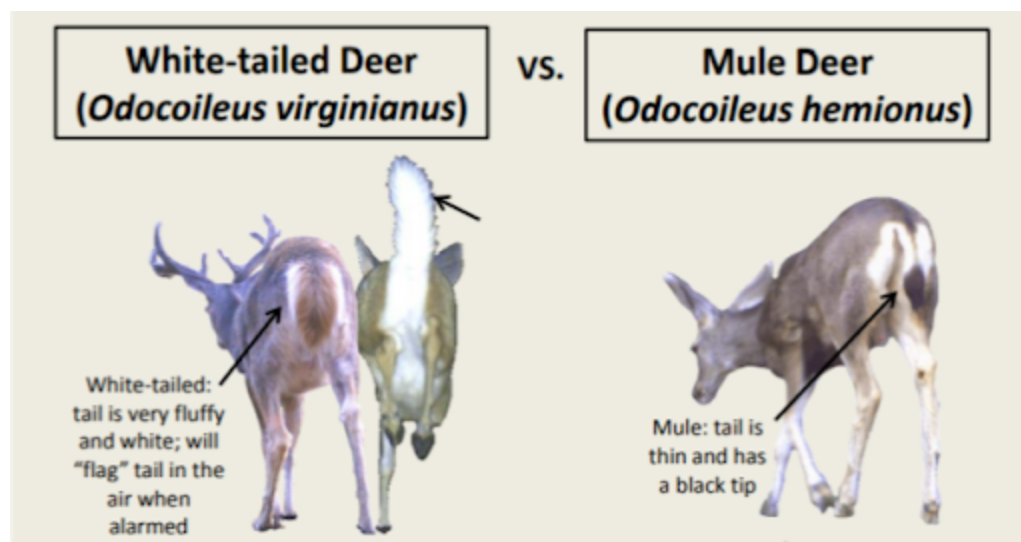
Easiest to distinguish by tail and antlers. Do not rely solely on the ears (unless they are obviously massive and mule-like) or coat colour to distinguish between the two.

Select "UnknownDeer" if uncertain.

Helpful guides:

<https://coloradooutdoorsmag.com/2015/03/18/a-quick-guide-to-differentiate-mule-deer-from-white-tailed-deer/>





2. Black Bear versus Grizzly

<http://www.bearsmart.com/about-bears/know-the-difference/>

Select "UnknownBear" if uncertain.

3. Wolf versus Coyote

<http://westernwildlife.org/gray-wolf-outreach-project/library-2/>

How to recognize a gray wolf

GRAY WOLF

Color: light gray to black

Dimensions: 2.5 feet tall, 5-6 feet long

Broad snout

Round ears



80-120 pounds

Paw size: 4" x 5"



COYOTE

Color: light gray/brown

Dimensions: 1.5 feet tall, 4 feet long

Tall pointed ears



Narrow snout

20-50 pounds

Paw size: 2" x 2.5"



Wolves are protected by federal law under the Endangered Species Act.

Source: U.S. Fish and Wildlife Service

The Salt Lake Tribune



Select "UnknownCanid" if unsure whether it is a wolf/coyote/fox.

4. Marten versus Fisher

Identification of Fisher and Marten in Washington

Pelage Colors

Fisher – dark brown with lighter shading on head, back of the neck and back.
Marten – light brown to brown (cinnamon, russet), with creamy brown/ beige face and occasionally chest with darker brown legs, feet and end of tail.

FISHER





Photo by Paul Bannick

MARTEN



WDFW Staff

Fishers are protected under both federal and state law and may not be trapped or killed. **Be sure of identification if you are trapping marten or mink.**

Ear Shape

Fishers – rounded "teddy-bear" shaped ears
Marten – more pointed ears

Size

Fishers are bigger, darker and have noticeably longer and fuller tails than marten. Fishers tails average 14-15 inches in length and Marten tails average 6.5-7.5 inches in length.

Trapping Information

Use cubby boxes, with a closed front and 2.5 inch entrance hole, to avoid catching fishers.

Elevation

Fishers and marten overlap in elevation. Therefore, elevation should not be used as an indicator of species presence.

*** Also note that other mustelids may be present in the area, including wolverine, mink, and weasel spp.***

Select "UnknownMustelid" if uncertain.

5. Bighorn Sheep

Note that both males and females have horns, and form sexually segregated groups with rams hanging out together while ewes and young grouping together. Exercise judgment when classifying sheep as Male/Female/Young.

<https://www.canadiangeographic.ca/article/animal-facts-bighorn-sheep>

<https://www.hww.ca/en/wildlife/mammals/mountain-sheep.html>

