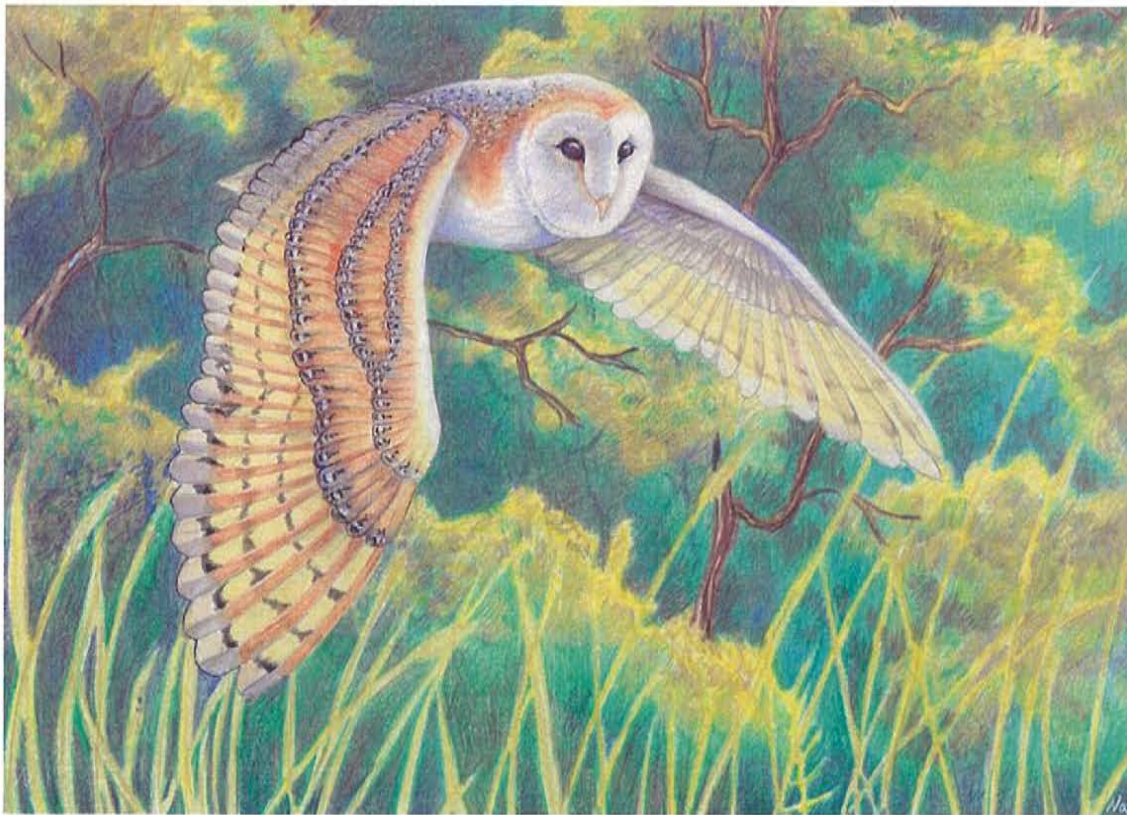


Build a Barn Owl Box

***Modeled after an Original Design by
Steve Simmons***



Natalia Daraselia, age 14, free-hand drawing from a published image.

Charles G. Wade, Lee Pauser, and David Altknecht

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Introduction

Barn Owls have been the subjects of wonder, wisdom, magical accoutrements, and folklore for ages. Their presence adds beauty and enchantment to the environment, and their significant rodent control skills comprise a very practical need for their presence. Habitat reduction has reduced their numbers over the last century, and an active program of owl box construction will help offset this.

An abundance of information exists^{1,2,3,4} about Barn Owls and Barn Owl boxes. A broad search of internet sources will reveal an extensive amount of information on Barn Owls, including box designs. However, a perusal of these internet sites will reveal many conflicting descriptions of the habits and preferences of Barn Owls. The conflicts arise in part because Barn Owls are nocturnal creatures not easily studied, and the number of observations made for any one article is often very small. Consequently, much of the internet information becomes anecdotal.

An excellent, scholarly reference on Barn Owls is the publication titled *Barn Owls: Predator-Prey Relationships and Conservation* by Iain Taylor.²

A very interesting and touching book by Stacey O'Brien⁴, *Wesley the Owl*, details her experiences raising a Barn Owl for a period of more than 15 years.

The Barn Owl box featured in this document is modeled on Simmons' proven design. The box is available commercially³ but is easy to construct.

Simmons' Barn Owl box has many advantages. It provides optimized protection from predators such as Great Horned Owls and raccoons. This is achieved by use of an ellipse-based entrance hole of unique shape and size and by an interior divider that separates the box into two compartments. The divider, visible via a transparent front in the drawing provides a safe living area away from the entrance. Should a predator gain access to the entrance hole, it is unlikely that it will fit completely through



the hole, and the divider further prevents the predator from reaching around the divider to access the occupants.

Additionally, the placement of the entrance hole is such that younger owlets who congregate near the hole waiting to be fed will not be pushed out of the box by older and larger siblings lunging for food from behind.

The design omits perches or platforms in front of the entrance hole which would enable predators to perch during their attempt to snatch the box's occupants. Owlets likewise cannot perch outside the box and thus be exposed to predation.

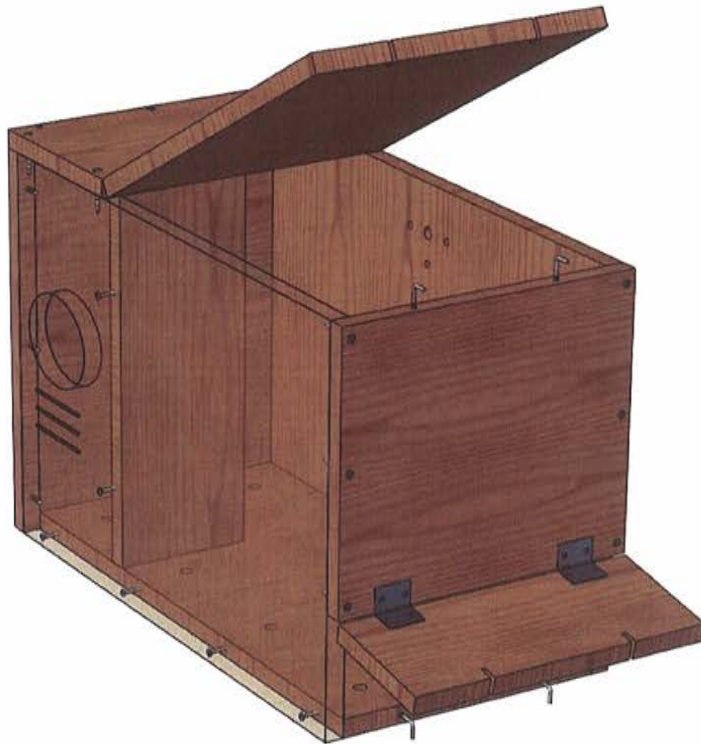
Grooves (grip grooves) below the entrance hole assist adults entering the box.

The design includes two doors—an end clean out door and a top door which provides access to the interior during clean out and monitoring activities.

The box weighs about 23 lbs, much less than most other owl boxes in the literature. This provides for easier mounting.

An important attribute about this box is that the design has been tested in use by thousands of owls, an extremely unique situation. This provides comfort that the solutions presented here are not anecdotal but are applicable to a high percentage of Barn Owls.

For all of the above reasons, we have adapted this design for boxes at the IBM Almaden Research Center site in San Jose, CA.



Tool Requirements

For making a few boxes, the following list of tools and materials is usually sufficient:

- Safety goggles or safety glasses
- Hand saw, electric circular saw, or power saw (table, radial or miter)
- Scroll Saw or keyhole saw (to cut out entrance hole)
- Router with 3/8" straight bit to rout grip grooves (optional)*
- Tape measure
- Pliers (for turning the L screws)
- Carpenter square or tri-square
- Hand screwdriver or a battery powered portable drill
- Hand drill, battery powered portable drill/driver or screw driver
- Drill bits
 - 3/32" for screw pilot holes[†]
 - 5/32" for screw clearance
 - 5/16" for mounting holes
 - 1/2" for scroll saw starter, drain, and hanger holes
- Air nailer (optional)

* Alternatively, the grooves can be cut with a sharp chisel.

[†] Bit assemblies which include a countersink, a clearance section, and a pilot hole for screws are available commercially and are useful as the screw heads can then be set below the surface.

Materials

For parts having the dimensions in this design, exterior plywood and exterior siding which come in 4' x 8' sheets are the most practical materials. Plywood should be exterior grade, usually identified by "exterior" stamped on the surface or by the use of an X in a three digit designation such as "CDX" where C and D indicate the quality of the two surfaces and the X designates exterior use. Siding is designed for exterior use, but it is usually more expensive than plywood.

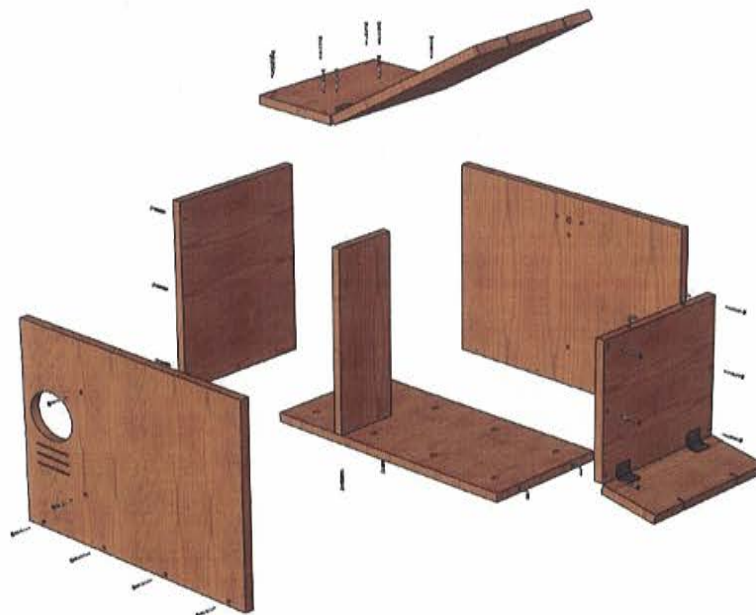
The dimensions assume a sheet material of labeled as $\frac{3}{4}$ " plywood. Today's industrial standards require that the product listed as $\frac{3}{4}$ " plywood have an actual width stamped on the wood. Usually this is $\frac{23}{32}$ " but variations of $\pm\frac{1}{32}$ " are allowed (and typically found) in any sheet. These differences have little impact in the actual construction of the box but should be accounted for in the width of the top.

An included *Cutlist* shows how to cut two boxes from one 4' x 8' sheet of plywood, and it takes into account in the dimensions a slight top overhang and the saw kerf (width of saw blade).

Materials List

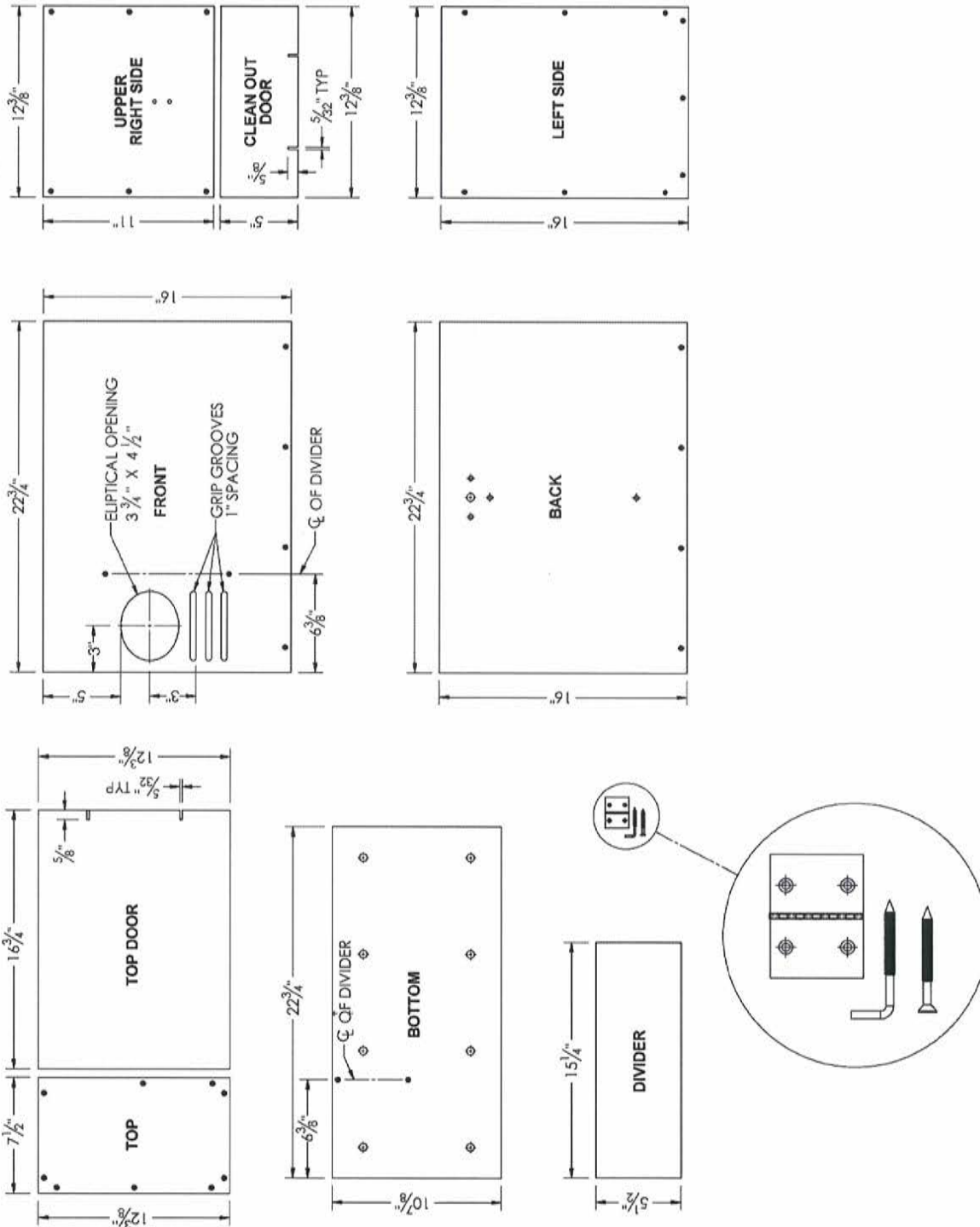
The following materials are required to assemble **two** boxes:

- 1 sheet $\frac{3}{4}$ " x 4' x 8' exterior plywood or siding
- 68 each 1 $\frac{5}{8}$ " #8 Deck Screws
- 8 each 1 $\frac{3}{4}$ " long L-Screws (sometimes called right angle screws or square bend screw hooks)
- 4 pair 1.5" x 1.5" nickel plated, non-removable pin hinges with screws
- Exterior grade (waterproof) glue such as Titebond II or Titebond III. These are non-toxic, yellow woodworking glues which are water soluble before curing.
- 2 each $\frac{1}{2}$ " wide metal glue brushes (typically sold as flux brushes).



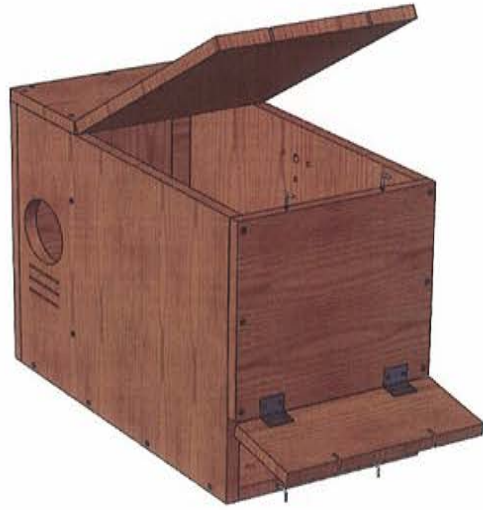
Details of Dimensional Drawings

Notes: The metal parts are scaled 4X the size of the wooden parts. The holes in middle of the back are illustrative.



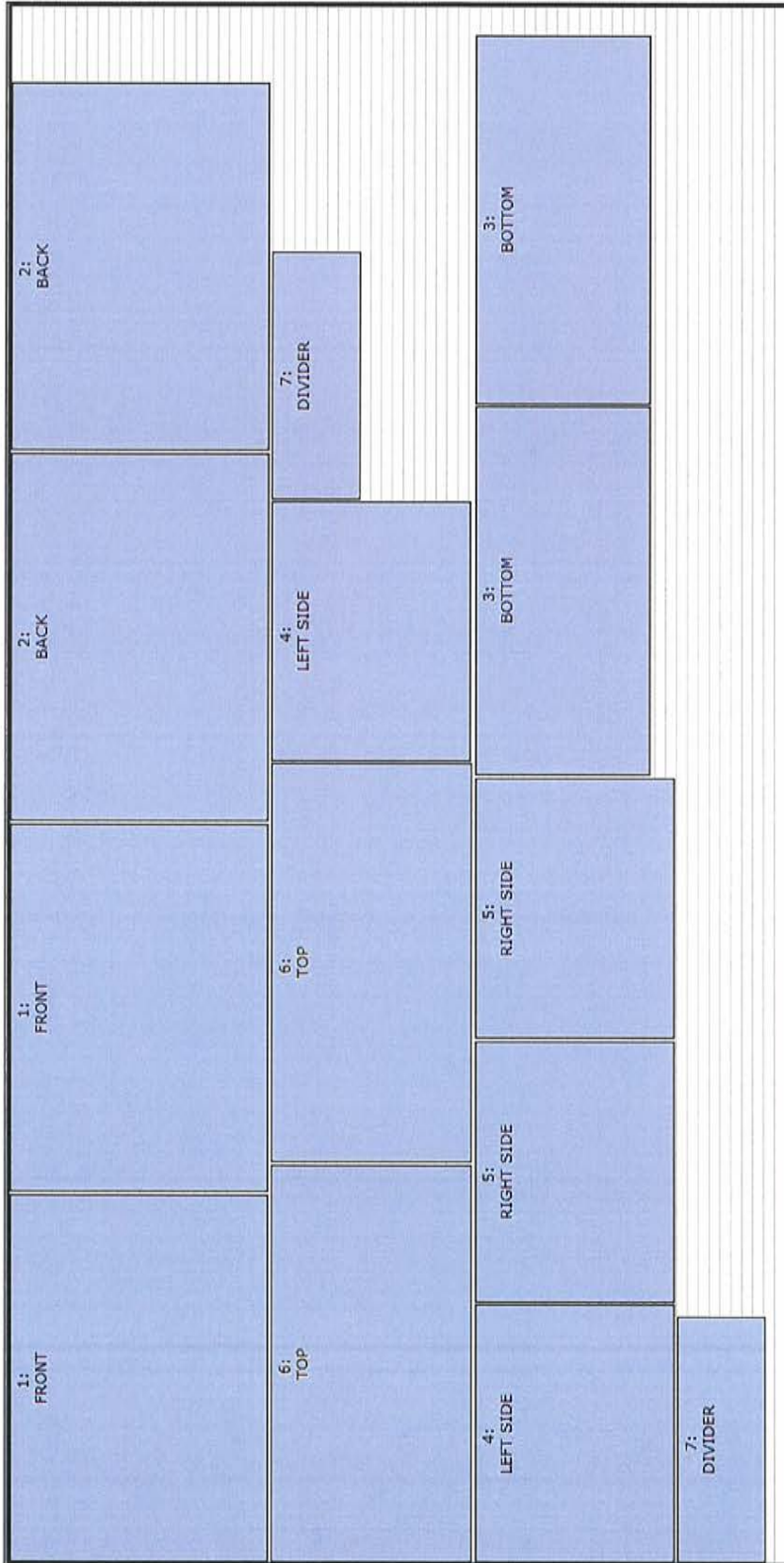
Cutlist

The cutlist on the next page shows a layout for cutting two boxes from a 4' x 8' sheet of plywood. In this drawing, the saw kerf is assumed to be 1/8", and the material loss due to the kerf is accounted for. Note that the TOP and the RIGHT SIDE are cut sufficiently long that they can each be sawn into two separate parts—the TOP and TOP DOOR, and UPPER RIGHT SIDE and CLEAN OUT DOOR. Once cut, keep the parts paired to insure a snug fitting assembly with minimal water entry.



The below parts list provides additional details.

Part #	Description	Copies	Width	Length	Note
1	FRONT	2	16"	22 3/4"	
2	BACK	2	16"	22 3/4"	
3	BOTTOM	2	10 7/8"	22 3/4"	
4	LEFT SIDE	2	12 3/8"	16"	
5	RIGHT SIDE	2	12 3/8"	16 1/8"	Cut into 11" high UPPER RIGHT SIDE and 5" high CLEAN OUT DOOR
6	TOP	2	12 3/8"	24 3/8"	Cut into 7 1/2" long TOP and 16 3/4" long TOP DOOR
7	DIVIDER	2	5 1/2"	15 1/4"	



Cutlist for two Barn Owl boxes from a 23/32" thick, 4' x 8' panel. Each TOP and RIGHT SIDE are to be cut into two parts each, so the total length in this table includes the 1/8" saw kerf.

Drilling Parts before Assembly

The use of 'drawings' below refers to those in the section titled *Details of Dimensional Drawings*.

It is advantageous to drill many of the parts and cut the entrance hole before beginning assembly.

The Barn Owl box is put together with screws (# 8 deck screws) and exterior glue. It is helpful to drill 5/32" clearance holes for the screws 3/8" from the edge of the TOP, FRONT, SIDES, and BACK at the spots indicated in the drawings.

Eight 1/2" drain holes are drilled in the bottom approximately as shown.

The entrance hole is an ellipse with axes 3 3/4" and 4 1/2". A template in the next section can be used to trace the exact dimensions of the hole and guide the location of it on the FRONT. Cut it with either a scroll saw or a keyhole saw, then sand the edges smooth.



Barn Owl pair
Photo by Lee Pauser

Entrance Hole and Grip Groove Dimensions

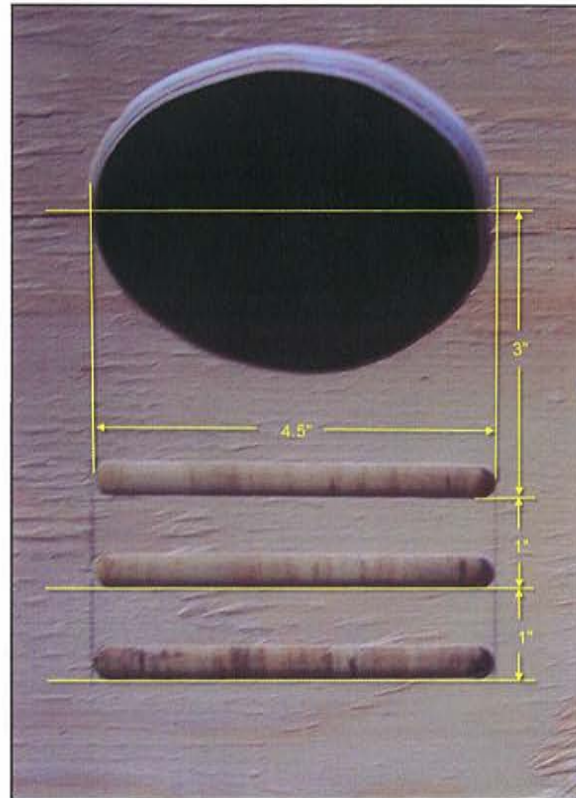
The entrance hole was developed just large enough to allow the barn owls to fit through it while keeping the larger predators out. The horizontal axis of the ellipse is 4 ½" and the vertical axis is 3 ¾". (See previous section).

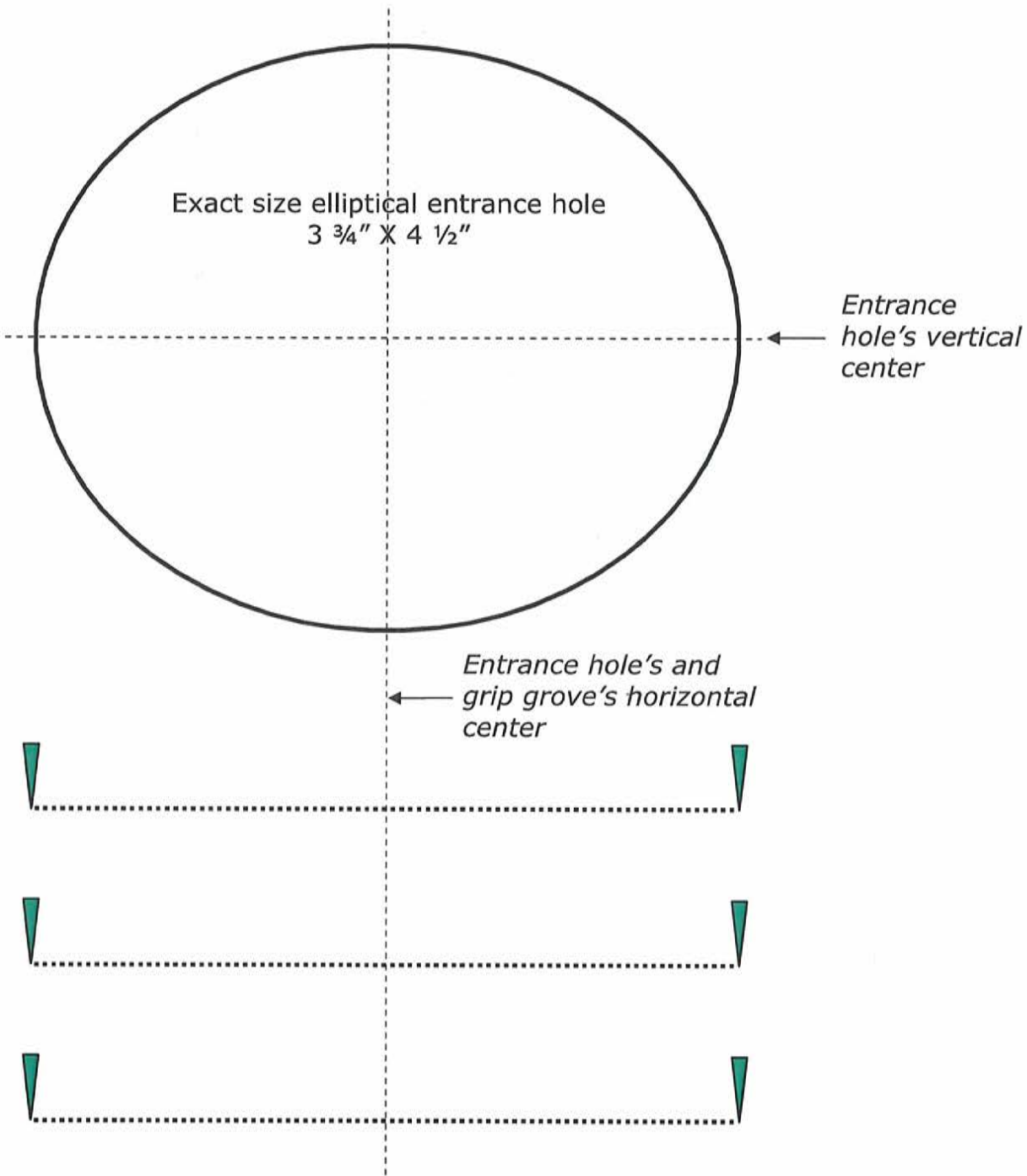
Three grip grooves below the entrance hole aid the owls when entering the box. They can be cut with a router using a 3/8" straight bit set to cut 1/8" deep. Alternatively, shallow grooves 1/8" deep can be cut with a sharp chisel. Whatever the method, the grooves should not reach completely through the wall.

The following page contains a template that can be used to easily position the entrance hole and grip grooves on the box's FRONT.

To use the template:

- 1) If you haven't already done so, print the template, and ensure that it printed correctly (see the *Important Note*).
- 2) Cut out the template's entrance hole.
- 3) Lay the template on the box's FRONT positioning it so the hole's horizontal center line is 6 7/8" from the FRONT's top edge, and the hole's vertical center line is 3" from the FRONT's left edge. The template's left edge should align with the FRONT's left edge.
- 4) Use a sharp tool, punch, or pencil to mark the pointed end of each of the template's six arrows.
- 5) Using a sharp pencil, trace the hole's shape (cutout) on the FRONT.
- 6) Remove the template.
- 7) Cut the entrance hole into the FRONT.
- 8) Draw horizontal lines between each of the three grip groove's left and right marked points. These lines represent the length of and **bottom edge** of each of the 3/8" wide grip grooves.
- 9) Cut the grip grooves.





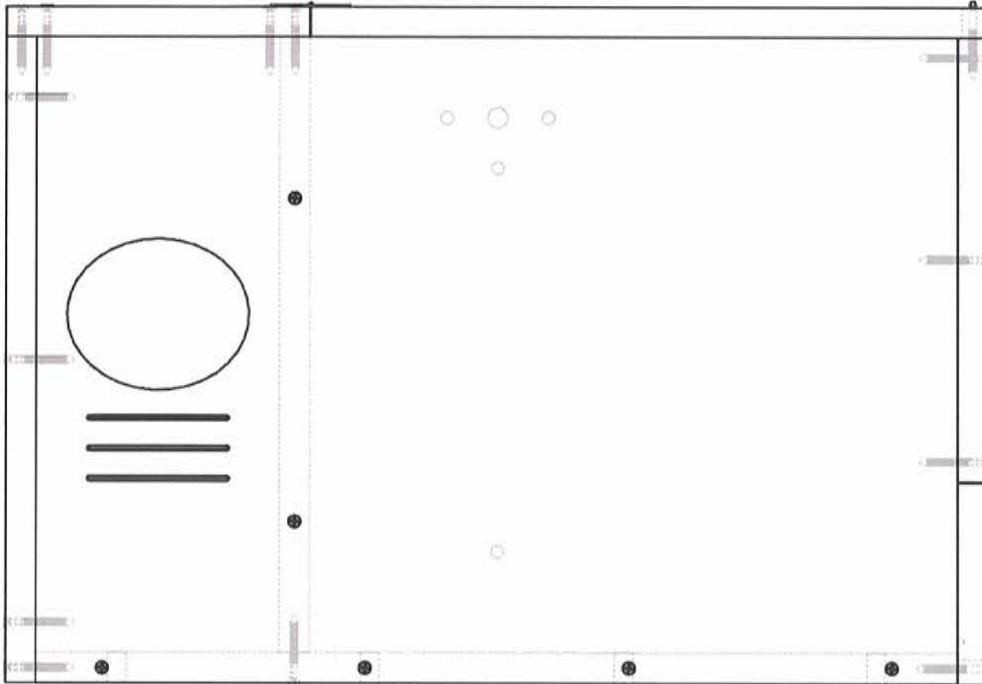
Important Note: Before using this template, you should ensure that it printed correctly. This can be done by verifying that the entrance hole's dimensions as printed are 4.5" in width and 3.75" in height. A possible reason for the dimensions being incorrect originates in your printer's page setup options. This page should be printed with the *Page Scaling* option set to *none* or the *Page Sizing* option set to *Actual Size*.

Assembling the Box

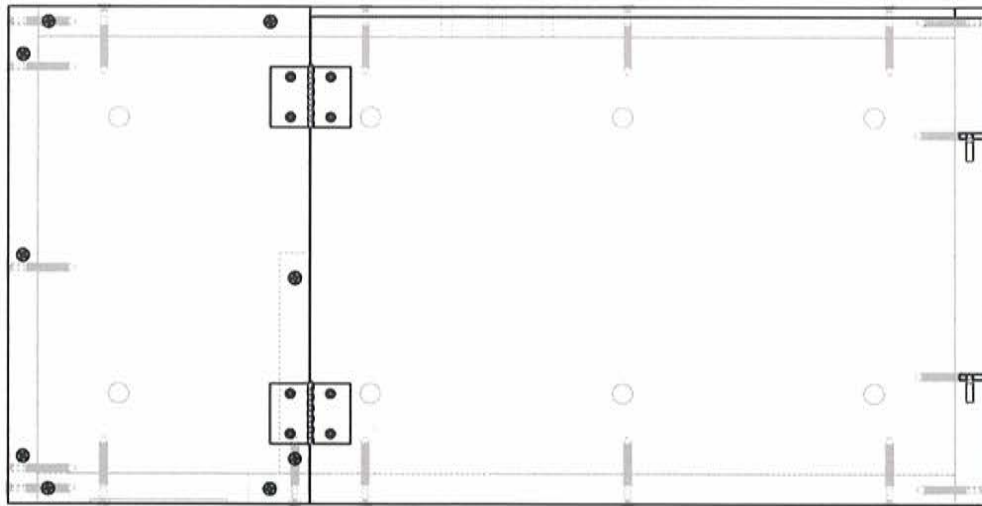
The box is assembled using deck screws (#8, 1 5/8" long) and exterior glue. Deck screws are preferred since they are more weather resistant than other screws. Any surface on this box held together with screws should also be glued. Using the small metal brush, coat both surfaces before assembly. To avoid splitting the plywood, it is helpful to drill pilot holes for the screws in the wood below the outer sheets. For this a 3/32" bit is used to make a hole 7/8" deep. If an air nailer is available, it can be used to tack the parts together initially. Then the pilot holes can be drilled through the clearance holes, and the screws can be driven into place. If no nailer is available, apply the glue then use just a few screws to hold the box together initially. At this point the pilot holes can be drilled through the remaining clearance holes, after which the screws can be driven into place. The steps to assemble a box are as follows.

1. Attach the BACK (2) to LEFT SIDE (4)
2. Attach BOTTOM (3)
3. Attach FRONT (1)
4. Attach DIVIDER (7)
5. Attach UPPER RIGHT SIDE (part of 2)
6. Attach TOP (part of 6)
7. Attach CLEAN OUT DOOR (part of 5) using hinges
8. Insert CLEAN OUT DOOR L-screws (use 3/32" pilot bit)
9. Attach TOP DOOR (part of 6) using hinges
10. Insert TOP DOOR L-screws (use 3/32" pilot bit)

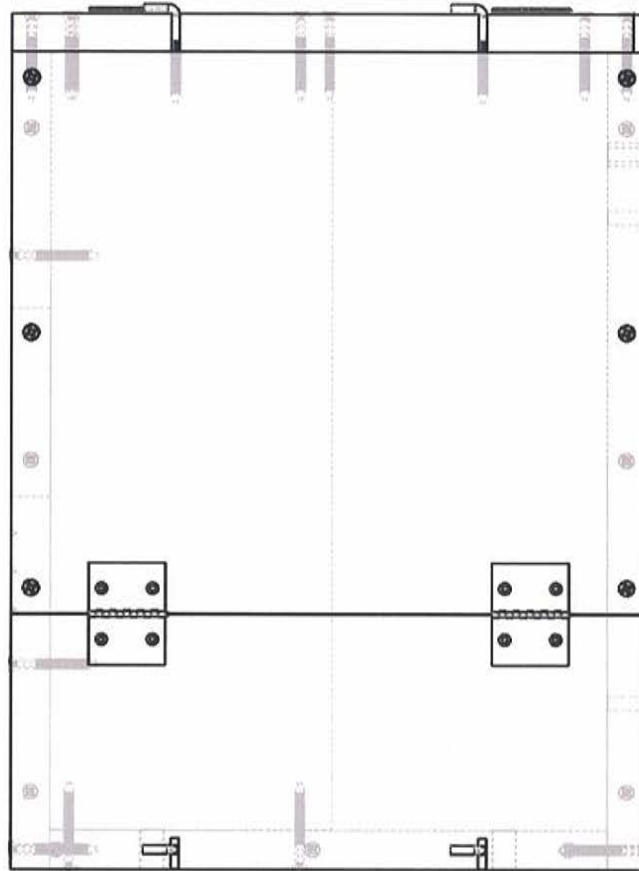
Tighten the L-screws until they are snug. These screws are widely used in nest box trails of smaller bird species such bluebirds. Use of L screws has the practical advantage compared to a traditional screw in that a trail monitor need merely twist the L screws about ¼ turn with a pair of pliers to release the door. An additional advantage of L screws over conventional screws is that L screws are never lost in the field since they are not removed from the box.



Assembled Front View



Assembled Top View. This one shows an offset, narrower top which might be needed if the box were mounted on a wall or tree. See the section titled ***Preparations to Accommodate Mounting Methods.***



Assembled right end with clean out door.



Barn Owl hen with owlets a week-old and less
Photo by Lee Pauser

Preparations to Accommodate Mounting Methods

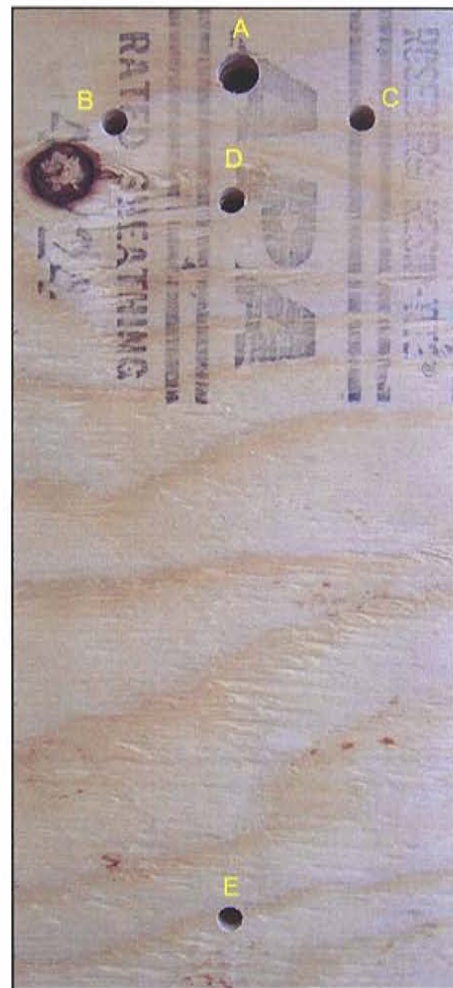
At this point the mounting method should be defined so that the relevant drillings can be done to enable the mounting. It is much easier to do this before the box is carried to the site. This section discusses common options.

In any case where threaded bolts are used, **insert the bolts from the inside of the box and out through the back of the box**. This prevents injury to the box's occupants from having encountered a bolt protruding into the box. The bottom of the box should be level when mounted to prevent eggs from rolling to one corner of the box.

Three common mountings are flat surfaces (buildings or rectangular wooden poles), large trees, or metal poles. As discussed below, metal poles have advantages in reducing predation.

If the box is to be mounted on a surface which will extend *above* the top of the Barn Owl box, such as a building, a power pole, or a tree, you need to ensure that the operation of the top door is unimpeded by friction with the surface. This can be done either by trimming $\frac{1}{4}$ " off the side of the Top Door (total width of that piece is then $12 \frac{1}{8}$ "") and or by using spacers or backing boards to increase the box's distance from the mounting surface. The use of spacers may also be necessary to level the box.

The photo on the right details the array of mounting holes as shown in the drawings, but only a few of these holes will be used in any one mounting method. The hole A, a $\frac{1}{2}$ " diameter hole, is often useful. It can be used initially to hang the box on a large nail or screw set into the mounting surface. Once the box is hung in place on the nail or screw, it is easy to proceed with other mounting operations. The smaller holes are $\frac{5}{16}$ " diameter to accommodate $\frac{5}{16}$ " lag bolts or threaded bolts which should be used with a fender washer to attach the box.



Some examples of other hole combinations are: D and E are drilled where the mounting surface is flat; B, C and E can be used where the wooden mounting surface is rounded, such as on a tree trunk.

Metal poles offer an advantage in predator control. Although raccoons can climb metal poles¹, their access can be minimized by using a piece of stove pipe as a predator guard. Use a 24" length of stove pipe with a diameter of 8". Place the stove pipe around the mounting pole, attach it loosely with wires to the bottom of the box. The bottom of the stove pipe is unconnected, and this wobbly structure restricts the upward mobility of raccoons.

When mounting on metal pipe, pipe clamps (pipe grip ties) can be used. In this case, the holes in the back of the box should match those of the clamps as shown in the photo at the right. The photo shows the use of a backing board between the clamps and the box.



If this technique is used, it is best to secure the clamps to the box in the following order:

1. Drill two mounting holes on one side of the pipe, and attach both clamps using 5/16" threaded bolts (inserted from the inside box to the outside).
2. Insert the pipe, and tighten the bolts.
3. Drill two mounting holes on the other side of the pipe, and attach both clamps using 5/16" threaded bolts.

This technique eliminates the problem of being unable to sufficiently tighten the clamps on the pipe. In the picture, a single hole is drilled through the lower clamp into the pipe to accommodate a sheet metal screw. This screw further prevents turning or slipping of the box on the pipe.

Another variation of mounting a box on a metal pole is shown on the right. This method involves the welding of a piece of angle iron (1/8" x 2" x 2" x 12") horizontally to the post at a spot where the box can rest. In this case, holes in the horizontal angle iron can be set to allow screws to be driven into the edge of the bottom or set to allow the use of 5/16" threaded bolts with a fender washer inside to hold the box. An iron plate (1/8" x 2" x 12") near the top of the pole provides a spot where the top of the box can be stabilized with bolts. All of the mounting holes in the metal pieces should be drilled before the box is mounted.



To Paint or Not to Paint

The box will provide many years of use without painting. If the decision is made to paint the box, apply either a white exterior latex based paint or a linseed oil finish. White is the most heat reflective color which reduces the heat buildup within the box, but lighter earth tone colors are acceptable. DO NOT use dark colors which absorb more of the sun's radiant heat, and contribute to the buildup of heat within the box.



3-4 week-old owlets
Photo by Lee Pauser

Apply the finish to the exterior of the box only.