

*Pulley System to Raise  
and  
Lower Large Nest Boxes*



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*Last Updated:  
December 7, 2018*

## Introduction

Accessing large nest boxes is a problem of varying magnitude. Merely getting to the box with a ladder and servicing supplies can be difficult unless they can be carried on a vehicle. Due to habitat restrictions, some of my large nest boxes require carrying the ladder and supplies to the box by hand. This is usually done once a year when the box is serviced after the end of the nesting season. Additional access may be required for the purposes of banding or to intervene in a problem.

This begs the question "is there an easier way to access the nest box"?

To address the question, I developed a pulley system to easily access a nest box mounted on a 2" ID galvanized metal pipe. (Hereafter this metal pipe will be referred to as a "pole".) Specifically, the system enables the raising and lowering of a large pole-mounted nest box from the ground thereby negating the need to port a ladder to the box. A lock secures the box in its raised position. The pulley system is most beneficial when used with boxes that are remote and accessible only by foot.

This document provides details on how to assemble and install the pulley system for use with pole-mounted large nest boxes such as Kestrel or Barn Owl nest boxes. The nest box pictured below is a Barn Owl nest box modeled on Merced, California's Steve Simmons' design that weighs in the 25-30 pound range. Simmons recommends, the pole be 12' in length and cemented into a 3' deep hole. This leaves 9' of the pole exposed. A longer pole may be used if the habitat is such that there are concerns about human activities, vandalism, etc.

Using the pulley system as documented with a larger and heavier box may require the system to be made sturdier by the use of larger ABS parts and pole or by the use of metal parts instead of ABS parts.

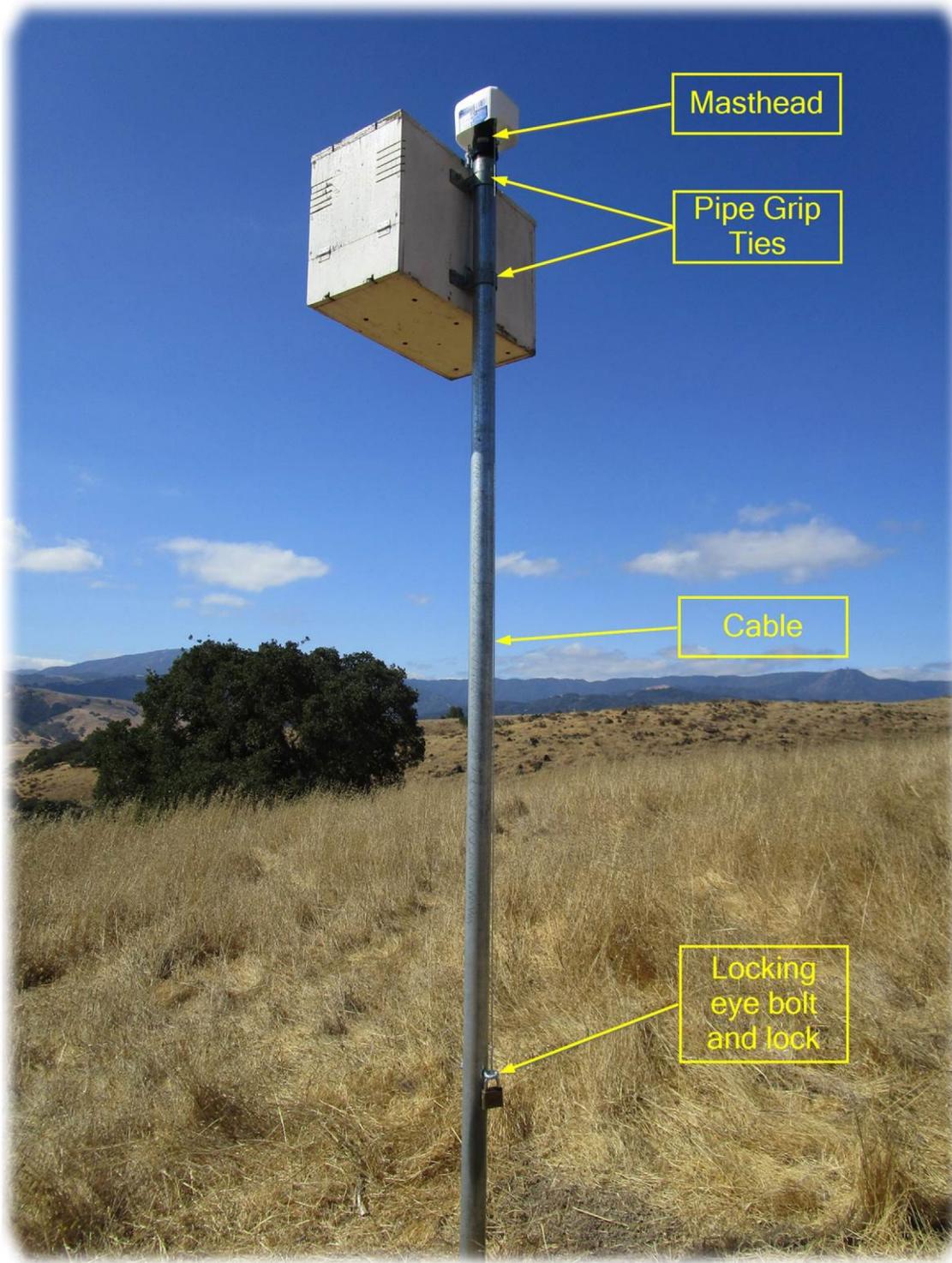
If the nest box is occupied, ***easier access to a nest box should not invite unwarranted observation of its occupants.*** Generally you should not lower or raise the nest box when it is in use, as this can disturb the birds and potentially cause abandonment. However, if you're a wildlife rehabilitator or professional researcher, you may need to access the box in cases where the disturbance is justified.

In cases where the nest box is occupied, the entrance hole should be plugged before the nest box is lowered, and remain plugged for some minutes after the box is raised to ensure the occupants don't attempt to exit the nest box.

Lowering and raising the nest box should always be done in a controlled manner, however if occupied, extra caution should be used as dropping the box can have disastrous consequences.

## Overview

Pictured below are the pulley system's major components.



### ***The major components are:***

1. Masthead – This component is the heart of the pulley system. It contains a pulley and attaches to the 2" diameter pole.
2. Pipe Grip Ties –These ties attach the nest box to the pole. In general usage, the ties are tightened to the pole to prevent movement, but for this pulley system both are left loose allowing the box to slide vertically on the pole.
3. Cable – The cable rides on the pulley. It is attached to the nest box on one end, and to an eye bolt near the bottom of the pole.
4. Locking eye bolt and lock – The lock secures one end of the cable to the locking eye bolt. This eye bolt also limits the extent to which the box can be lowered. (Note that the bolt and lock could be replaced with a winch if preferred as discussed later in this document.)

### **Parts List**

- A 4-3/4" length of 2" ABS pipe
- One 3" long 3/8" diameter smooth shaft bolt and nylon locking nut
- One 2" ABS end cap (preferably flat)
- One 2" ABS coupler. If the 2" pole on which the assembly is to be mounted is threaded, the coupler should be internally threaded on one end, and slip on the other end. If the 2" pole on which the assembly is to be mounted is not threaded, the coupler should be internally slip on both ends.
- One Extra Heavy Duty 3" Garage Door Pulley.
- 1/8" galvanized steel cable such as often used in garage door openers. A rough guess at the length of cable needed is a length equal to the pole's exposed height.
- Two 1/8" cable ferrules
- One 3" Tee Plate with mounting screws
- One 6" long 5/16" diameter eye bolt, flat and lock washers, and nut
- ABS Cement
- Two 2-3/8" Pipe Grip Ties with 4 each mounting bolts, fender washers, and lock nuts
- One 4-1/2" long 3/8" diameter forged galvanized eye bolt. (Such an eye bolt cannot be pryed open.)
- A keyed or combination lock
- Bottom half of a white 1/2 gallon plastic milk container and two 1/2" sheet metal screws
- Four each bolts, fender and lock washers, and nuts to secure the box to the Pipe Grip Ties. The length and diameter of the bolts is as needed.

## Preparatory Activities

The below activities need not be done at the site of installation, and can be done in a more convenient location such as a workshop.

### *Assembling the masthead:*

1) As shown on the right, cut a notch  $\frac{1}{2}$ " wide and  $3\text{-}\frac{1}{4}$ " long on opposite sides of the pipe. The pulley will fit into these notches.



2) Drill a  $\frac{3}{8}$ " hole through the pipe 2" from the notched end. The holes **must be** at a 90 angle to the notches.



3) Insert the 3" bolt through the pipe and pulley as shown. Install the nylon lock washer allowing a little play—do not compress the pipe.



4) Cement the appropriate coupler to the bottom of the assembly's pipe.



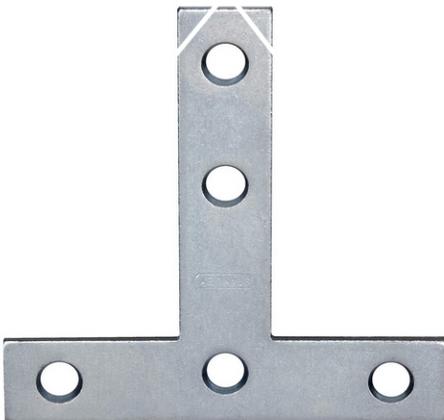
If the assembly is to be mounted at the top of a threaded pipe, drill a 5/16" inch hole through the coupler 7/16" from its top, and inline with the notches.

If the assembly is to be mounted at the top of an unthreaded pipe, drill a 5/16" inch hole through the coupler 7/16" from the bottom of the assembly, and inline with the notches.

The figure on the left shows how a 6" eye bolt will eventually be inserted through the assembly.

### ***Attach Cable to a Pipe Grip Tie:***

- 1) Slip a ferrule over one end of the cable.
- 2) Remove the locking bolt from one Pipe Grip Tie, and slip one end of the cable through the removed bolt's 2 holes.
- 3) Form a loop by slipping the cable's end into the ferrule.
- 4) Close the ferrule.



### ***Prepare and Install the Tee Plate***

- 1) Cut off the corners of the Tee Plate as shown on the left. This leg of the Tee Plate will serve to stabilize the raised nest box.
- 2) Attach the Tee Plate to the center of the back of the box such that the trimmed leg juts above the box's top. (See the photo below.)

## On-site Activities

The below activities are to be done at the box's installation site.

### ***Preparing the Nest Box***

1) Slip the Pipe Grip Tie with the attached cable pointing upward over and down the pole followed by the other tie.

2) Place the back of the box near the ties. You may choose to set the box on something to make working on the box easier.

3) Measure and drill the mounting holes in the box for the ties. The ties should be centered on the back of the box with one tie near the top of the box, and the other near its bottom. The holes should be spaced such that the ties will allow the box to slide smoothly vertically without wobbling. The upper tie's locking bolt should not be tightened.

4) Attach the ties to the box using 4 bolts—2 each per tie. The holes in the ties may have to be enlarged to accommodate the bolts.

5) Slip the cable upwards through the upper tie between the box and tie's locking bolt.



Ignoring the absence of the pole, the back of the box should look similar to this photo.

### ***Installing the Masthead:***

1) Install the masthead onto the pole. The masthead's eye bolt to be installed should be oriented to point in the direction the box's entrance hole will face.

If the pole is threaded, screw the masthead onto the pole ensuring it is tight.

If the pole is unthreaded, slip the masthead onto the pole, and drill a 5/16" hole through the pole using the holes already drilled in the coupler as a guide. (The eye bolt will pass through the pole.)

2) Place a flat washer over the 6" eye bolt's shaft. Insert the eye bolt through the masthead's holes. Slip a lockwasher onto the eye bolt's shaft, and turn the nut to lock the eye bolt into place while ensuring the eye is positioned horizontally as shown.



### ***Install the Locking Eye Bolt:***

1) Drill a 3/8" hole through the pole such that the direction of the holes align with the the direction the box will face. The height of the holes will determine how low the box can be lowered, and should be at a height allowing the box to be easily serviced—possibly 3'.

2) Raise the box above the hole, and insert the forged galvanized eye bolt such that the eye points in the opposite direction the box will face. Secure the eye bolt with the eye in a horizontal position using a lock washer and nut. As a deterrent, the exposed threads on the bolt's shaft could be damaged by beating them with a hammer to hinder the nut's removal.

## ***Finish the Pulley System's Installation:***

1) String the cable over the masthead's pulley and down towards the locking eye bolt.

2) Cement the ABS End Cap onto the masthead.

3) Place the inverted bottom half of recycled plastic milk carton over the mast head, and secure it using 2 sheet metal screws. Doing so provides some protection for the masthead from the elements.

4) Pull the cable to carefully raise the box into position ensuring the sharpened leg of the Tee Plate enters the eye of the masthead's eye bolt. (The combination of the Tee Plate leg, and eye bolt form a 'stabilizer' which inhibits horizontal movement of the raised box.)



5) Measure the length of the cable needed to form a loop with the lock's hasp passing through the locking eye bolt while ensuring the box remains fully raised.

6) Fix the size of the loop by closing the ferrule.

7) Cut off the excess cable.

8) Secure the box in a raised position by locking the cable to the locking eye bolt.

### **Using the Pulley System to Lower and Raise the Nest Box:**

As discussed in the introduction section, lowering and raising the box should be done in a very controlled manner. This can be accomplished by either:

1) Attaching a rope to the locking end of the system's cable, and with a tight grip on the rope, removing the lock, and slowly moving the box. If the box is being lowered, its lower grip tie should rest on the locking eye bolt. When raising the box, pull the cable to carefully raise the box into position ensuring the sharpened leg of the Tee Plate enters the eye of the masthead's eye bolt, then secure the box in a raised position by locking the cable to the locking eye bolt.

2) Attach a winch below the locking eye bolt. The winch may be permanently or temporarily attached. The photos below provide insight into installing a winch on the pole.

### **Winch Assembly Parts List:**

The parts used to assemble the winch assembly consist of:

- The winch – The smallest winch I could find was a 600 lb. Steel Cable Hand Crank Gear Winch, and it is beyond adequate.
- One *Fernco* P1056-22 2" Stock Coupling
- Two ¼" 20 ¾" long machine screws with nylon locking nuts
- One 12" long, 1-1/8" wide, ¼" thick mending brace (*National Hardware* N220-335 118 Mending Brace, Zinc Plated)
- One cable ferrule the size of which fits the winch's cable
- One 3/8" Quick Link (*Crown Bolt* 3/8" Zinc-Plated Quick Link)



### ***Assembling the Winch Assembly:***

1) Cut a notch in the top (as oriented) of the mending brace as shown. The brace will abutt the locking eye bolt when the winch assembly is installed on the pole to ensure the winch doesn't slip upwards on the pole.

2) Using the brace as a template, mark the positions of 2 of the brace's holes that contact the back of the winch. At these 2 positions, drill two 1/4" holes through the winch's back.

3) Position the coupling's clamps between the brace and winch as shown.

4) Attach the brace to the winch's back using two 1/4" machine screws and locking nuts.



5) Slit the coupling vertically and insert it within the clamps.

6) Form the brace slightly toward the coupling so that when the assembly is mounted, the notch in the brace fits around the locking eye bolt's shaft.

7) You may choose to remove the winch cable's large quick connect. If you do remove it, form a closed loop in the cable using a ferrule. The smaller 3/8" quick connect will be used instead.

### ***Using the Winch Assembly to Lower the Nest Box***

- 1) Open the assembly's coupling and clamps.
- 2) Slip the assembly with brace pointing upwards onto the pole below the locking eye bolt.
- 3) Slip the assembly upwards so that the brace's notch contacts the locking eye bolt's shaft.
- 4) Tighten the couplings clamps.
- 5) Join the box's and winch's cables using the quick connect.
- 6) Turn the winch's handle taking up any slack in the cables, and lock the winch's ratchet direction such that the box can't drop.
- 7) Remove the lock from the locking eye bolt and box's cable.
- 8) With one hand on the ratchet's handle, set the ratchet so the box can be safely lowered. Stop lowering the box when the box's lower grip tie contacts the locking eye bolt.

### ***Using the Winch Assembly to Raise the Nest Box***

- 1) Reverse the winch's ratchet mechanism, and turn the winch's handle to raise the nest box while ensuring that the sharpened leg of the Tee Plate enters the eye of the masthead's eye bolt.
- 2) Lock the cable to the eye bolt.
- 3) Remove the winch assembly.

### ***Installing the Winch Assembly Permanently***

Obviously the winch assembly could be left on the pole permanently. If so, the 2 cables could be a single cable instead. If you have just one nest box, this may be appealing. However, using one removeable winch assembly with multiple boxes makes its use more cost effective.