

Red-headed Woodpecker Nest Camera Frame Construction and Installation





The Red-headed Woodpecker Recovery project (RhWR) was organized in 2007 and is a 501(c)(3) tax-exempt non-profit organization.

Investigation and research activities about Red-headed Woodpeckers (RHWOs) at Cedar Creek Ecosystem Science Reserve began in 2008 when Cedar Creek ESR gave a permit to the RhWR to initiate those activities on site. The RhWR has continued investigation and research activities since 2008 both at Cedar Creek ESR and at other locations.

Field observation efforts for included information occurred between 2012 and 2025 in all 12 months of the year, with a combined 2,563 days and 15,438 hours by Siah St. Clair and work partner Jim Howitz. All observations were made during a succession of RHWO study and research projects. Many activities required extensive experience and expertise as well as special permits and permissions.

By conducting these observation activities new natural history behaviors of RHWOs have been documented and will be used to help reduce the decline of this species and other species impacted by the presence of RHWOs.

Unless otherwise noted, the information and photographs provided herein are based solely on observations by Siah L St. Clair, a volunteer of the Red-headed Woodpecker Recovery project.

Red-headed Woodpecker Nest Camera Frame Construction and Installation

Text, Drawing, and Photography by Siah L. St. Clair



Nest camera focused to three feet with attached frame at an active Red-headed Woodpecker nest.

In 2019, after careful and close observations of Red-headed Woodpeckers (RHWOs) at their nests for over 6 years, it became apparent that a better method of observing was needed. Goals and answers to questions about behavior were not being reached through personal observations. I received permission to install cameras close (3 feet) to RHWO nest cavities at Cedar Creek Ecosystem Science Reserve (Cedar Creek ESR) in East Bethel, Minnesota in the summer of 2019.

Figuring out how to physically attach cameras three feet from active RHWO nests took some planning. A trial camera was placed near a nest first to assure that the Red-headed Woodpeckers would not be alarmed or abandon their nest. This trial demonstrated that the RHWOs completely ignored the presence of the camera and quickly returned to the nest after the installation process.

I came up with a design for a simple wooden frame that could be attached to the side of most RHWO nest trees while holding the camera itself three feet in front of the nest cavity entrance hole. A box arrangement on the frame made it easy to remove the camera to replace batteries and memory card and then replace the camera usually without requiring re-aiming of the camera. I also designed a simple aiming tool as the cameras need to be fairly precisely aimed because of the short focal length (three feet) of the camera.

Cameras used for this work were Reconyx HP 2X Hyperfire 2 Gen 3 No-Glow Infrared models. The company is able to re-focus these cameras on the assembly line to three feet. I personally purchased two of these cameras and two universal mount brackets from Reconyx (total \$974.87 for 2 cameras and brackets in 2019 plus costs for batteries and memory cards). The Red-headed Woodpecker Recovery Project directly purchased from Reconyx six more of the cameras and brackets in the spring of 2020.

What follows in this article is a rough design drawing of the nest camera frame, materials needed, construction instructions for the frame, and installation instructions for attaching the frame onto a nest tree. There are also pictures to help illustrate this whole process.



This picture 2020 shows the author with a nest camera frame ready to be installed. The author is holding the 'plug' which will drop into the wooden box once the camera is attached. The vertical 'arm' will be attached to the tree. Notice the pre-drilled holes in the vertical arm for lag screws. Picture by Jim Howitz.

Red-headed Woodpecker nest camera frame construction instructions:

These RHWO nest camera frames have lasted for 6 years as of this writing, and most have survived the tree they were attached to falling to the ground. All of the camera frames have been taken down and moved to different trees more than once. Two camera frames have burned up from prescribed burns, along with the trees, but not the cameras or the boxes they were in.

Before starting construction, it is important to understand that these frames are built differently for a right-handed or a left-handed attachment to the tree. A right-handed frame has the camera box attached to the left side of the frame as you look towards the nest tree. Every nest tree is different. The nest camera frame needs to lay fairly flat along the trunk of the tree for a successful attachment. Bulges, bends, branches, etc. may make one side of the nest tree impossible to attach the camera frame on that side of the tree.

I originally made half of the 8 frames I made be right and half left-handed to plan for this. It is possible to change the handedness of a frame in the field but it is time consuming and requires tools. Left or right-handed attachments both give the same camera results.

The frames used to attach nest cameras to nest trees at Cedar Creek ESR were constructed in the following manner. (Drill pilot holes and countersink them for all screw fastening. All screws-except lag screws-should be flat topped countersink screws. You will need a battery powered drill/screw driver for this work)

Construction sequence:

1. Purchase all materials from the materials list on the sheet with the drawing.
2. Rip cut the 8' 2x4 into two 8' 2x2s (I used a table saw).
3. Cross cut one of the 2X2s into a 48", a 44", and a 4" piece (I used the table saw).
4. Construct the main frame using 6 of the 2 ½" screws, as in the drawing. Red lines in the drawing show screw placement and direction. Pilot holes and countersink holes in the first wood piece that the screw threads will pass through are essential for a tight fit.
5. Cut an 8" 2x2 piece from the remaining 8' 2X2 and attach it as in the drawing using 2-2 ½" screws.
6. Take a 40" piece of the remaining 8' 2X2 and rip it in half to make two 1X2s.
7. Cut the two structural support pieces from the 1X2s, one 22" long and one 34" long. Make sure the ends are cut at a 45-degree angle as per the drawing. Each of these pieces will be attached as per the drawing using 4-2" screws. Two screws on each end. It is important that these pieces be attached on the side of the frame opposite the side that the camera box will be attached. Pilot holes and countersinks are again essential.
8. Attach the 6" 1x6, as per the drawing on the side of the frame opposite to the support pieces using 4-2" screws. Use two screws on each side outside of the camera box placement area. This piece is important as it holds the camera far enough away from the frame so the camera will fit in the camera box.
9. Cut 1x6 pieces and 2X2 pieces for the camera mounting box as per picture. Cut the slot in the box front for the camera mounting bracket at this time. The box will be attached through the 2X2 piece on the side. Use 1 ¼ screws to connect the 1X6 pieces to each other and to the 2X2s.
10. Attach the box to the frame through the 2X2 (1.5" X 1-3/8") side piece using 2-2 ½" screws. Drill pilot holes first. You have to disassemble the box to do this, then reassemble it after it is attached to the frame. Use three screws on each side to attach to front and back, and four screws to attach the bottom. Use pilot holes and countersink or wood will split.
11. Make sure the front box piece is cut exactly as the drawing. The slot for the camera mount needs to be cut left of center as the drawing shows or the camera will touch the frame and cannot be aimed properly.

12. Cut the 4" piece of 2X2 for the camera mount to the dimensions shown and sand the corners of the bottom so it fits easily into the slot. If it is too loose in the slot, you will need shims to hold it in place when you place the camera into the box after the frame is attached to the tree. Attach the universal mount bracket for the camera to this 'plug' at this time. Place the plug into the camera box and mark a spot with a pencil. The bracket should not touch the sides of the slot in the front of the box. Drill a pilot hole for this or the plug will split. Screw the bracket onto the plug using a socket wrench.
13. I painted the camera frames black so they would not stand out in the nest trees, although the birds didn't seem to care at all.
14. Construct the aiming tool using a 6" piece of 1/2" dowel, and a 30" piece of 1/4" dowel. Drill a 1/4" hole through the center of the 6" dowel. It is important that the hole is perpendicular through the dowel. Sand an end of the 1/4" dowel and push it into the hole of the 1/2" dowel. It needs to be tight.

The picture on the right shows the assembled and attached camera box.

The two screws can be seen inside the box that attach to box to the frame. Also, the countersunk screws that attach the front to the camera box. The back is attached the same way.

The bottom is attached in a similar way.

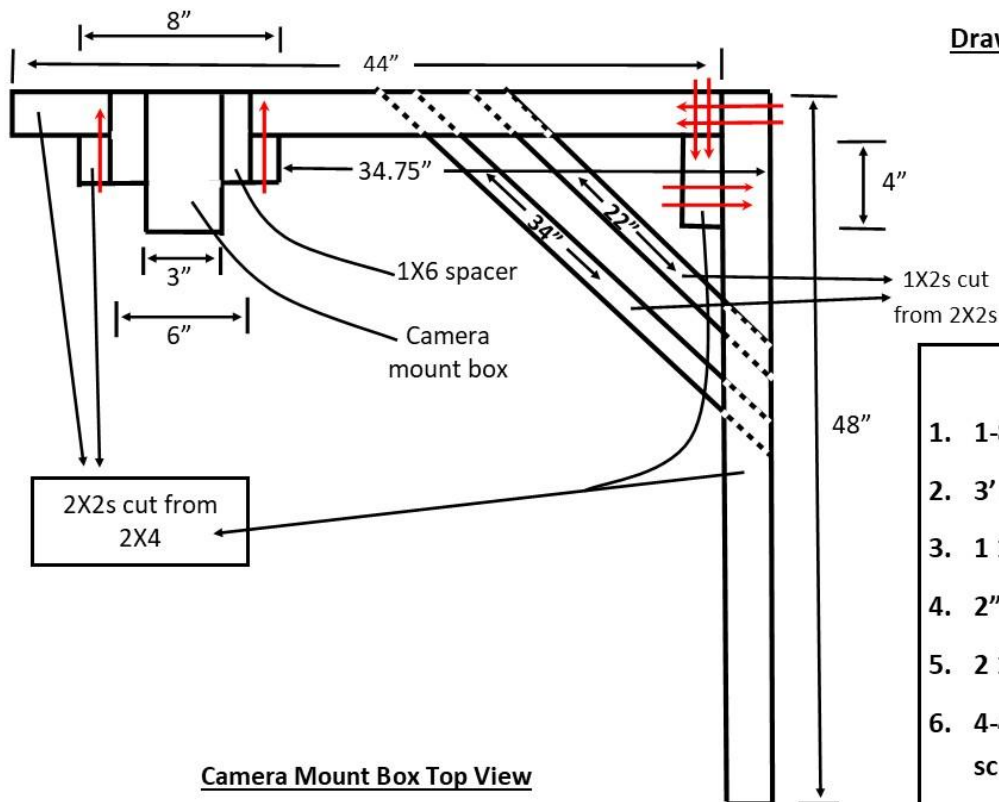
The 1x6 spacer piece can be seen and two of the screws attaching it.

The thin piece on top is brought forward to keep animals from accidentally removing the camera.



RHOW Nest Camera Frame Construction

Drawings not to scale

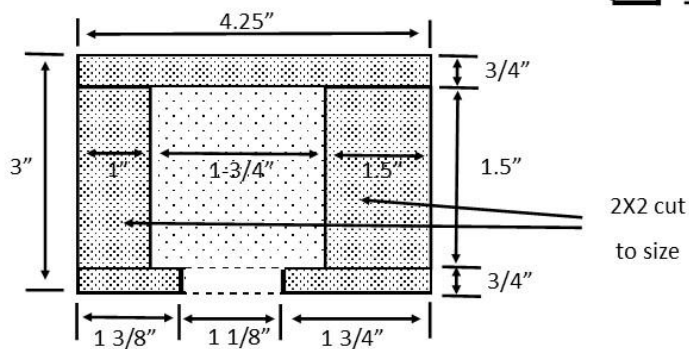


Arrows indicate screw location and direction

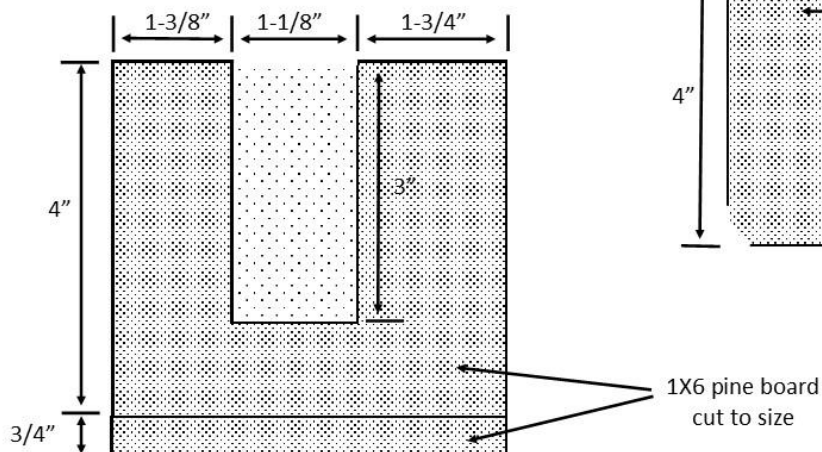
Materials

1. 1-8' 2X4 fir
2. 3' of 1X6 pine
3. 1 1/4" screws 20
4. 2" screws 12
5. 2 1/2" screws 8
6. 4-4"X3/8 hex lag screws
7. 6-7" dia adjustable stainless steel duct clamps
8. 1/2" and 1/4" dowels
9. Heavy duty 48" zip ties

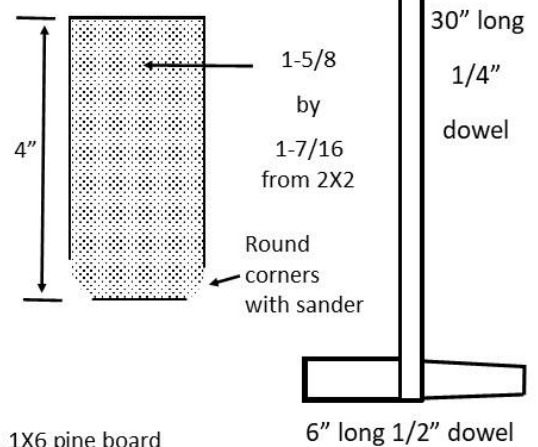
Camera Mount Box Top View



Camera Mount Box Front View



Camera Mount Plug



Aiming Tool

Attaching the nest camera frame to a nest tree:

1. The nest camera frame should be attached to the nest tree so the camera will be above the nest hole (6-10") and very slightly to the side (no more than 22 degrees) or directly in front of the nest hole. Being above the nest hole keeps the camera from picking up direct sun during sunrise and/or sunset, losing key observation times during the day. Being slightly to the side allows color bands to be seen, but seeing into the hole is also very helpful to see action there. Having the camera directly in front of the hole is better than having it too far to the side of the hole.
2. The tree should be prepared first, removing any branches, bumps, etc. where the frame will rest against the tree, using a reciprocating saw or other device.
3. If the nest is high and only one person is on the ladder to attach the frame, that person must be wearing a climbing harness and attach themselves to the tree with a safety strap for freedom of hands and arms. A rope or heavy cord should be attached to the climbing harness and go to the ground for the support crew/person to attach materials that can be pulled up with the rope. Place the ladder so the person on the ladder is 90 degrees behind the final planned frame vertical structural piece location on the tree when starting this attachment process.
4. The top of the ladder should be at the level of the nest hole. Haul up the camera frame along with several 48" cable zip ties. Use long zip ties around the frame and tree to temporarily hold the camera frame in place. I sometimes had to connect some zip ties together to make it around the tree. This gives some chance to move the frame up or down and front or back. Once the correct position is determined (helpers on the ground can help view this) use a drill with a socket bit to screw the 4" lag screws into the tree through predrilled holes in the frame. Three or four of these lag screws are enough. Make sure a lag screw does not penetrate into the nest cavity.
5. The lag screws do not hold the frame very securely by themselves. This is accomplished by the large adjustable stainless steel duct clamps. Depending on how big the diameter of the tree is these clamps may need to be "daisy chained" together to reach completely around the tree and the camera frame. I often used three connected together. There should be one of these as high on the camera frame as possible and another 2/3 or more down the frame. It helps if these are out of the view of the camera. Tightening these clamps with a power drill using a socket bit is what really holds the frame securely to the tree.
6. Once these clamps are attached move the ladder around to the side of the tree directly opposite the frame structure (as to the nest hole). With the camera attached to the 4" camera mount plug with a universal camera mount bracket (from Reconyx) place the camera into the camera box on the frame.
7. The camera now needs to be aimed. Slightly loosen the knobs on the universal camera mount. Use the aiming device described by placing the 1/2" dowel with a narrowed end into the round hole/tunnel on the front of the camera body, aim the camera at a spot a few inches (2") below the hole. (Make sure that the long projecting aiming dowel is at a right angle to the nest camera. I make a mark on the short dowel and line it up with a mark on the camera to make sure this is as accurate as possible.) When aiming is complete, tighten the knobs on the universal camera mount as tight as fingers will allow. Raccoons, squirrels, Great Horned Owls, etc. will be sitting on the camera and will move it out of alignment if the knobs are not tight. Make sure the camera is turned on with batteries and a memory card in place and the work is done.
8. When replacing camera batteries and memory cards the camera may be simply lifted out of the camera box with the 4" 2X2 attached. With care you will not need to re-aim the camera when replacing it, but it is always good to check the aim.



The picture on the left shows the Reconyx camera attached to the universal mount bracket and the mount bracket attached to the camera box plug. The bracket should be attached to the plug before the camera is attached. Drill a pilot hole into the plug for the bracket screw. Use a socket wrench to tighten this screw.

The attachment point of the bracket to the plug is important so that the bottom of the bracket does not touch the bottom of the slot in the front of the wooden camera box.

Notice the sanded rounded corners of the camera box plug bottom. This is important for plug to easily fit into the camera box.



The picture on the left shows how the plug slides into the camera box when the mount bracket and the camera are attached.

Once the camera is fully in the box and is aimed and the knobs on the bracket are tightened, the camera will be easy to remove and replace when changing out batteries and memory cards.

If the camera is out in the winter with Red-headed Woodpeckers around it may be difficult in the spring to remove the camera. Red-headed Woodpeckers will cache acorns in the crevices around the plug in the winter and with wet spring weather the wood will swell making the plug too tight to move

In the summer spider webs will often need to be removed from the lens area. The sun's rays will refract on the web and distract from the video.

The picture on the near right shows ladder placement for nest camera frame and camera installation. The ladder should be 180 degrees on the other side of the tree for frame installation and placed as shown for camera installation. Picture by Jim Howitz.

The second picture shows the safety harness around the tree with carabineers attached to the climbing harness on the installer.



The above picture shows the view looking down from the frame installer's perspective from the top of the ladder with the helper on the ground, tools and equipment present, and the rope hanging from the installer's climbing harness. Tools and equipment are tied to the rope and pulled up and lowered as needed.



The nest camera frame can be temporally held in the approximate correct position with long zip ties at the top and bottom as seen in this picture with the arrow. This is the most physically difficult part of this process. Once the zip ties are holding the frame up the frame can still be moved to the proper position so the camera will be a few inches (6-10) above and generally directly in front of the nest hole. Once the frame is in this position screw the lag screws into the tree using a socket bit and the predrilled holes in the vertical frame 2x2, as seen in this picture. Make sure none of the lag screws go into the nest cavity.



Steel duct clamps are what really hold the nest camera frame onto the tree tightly. Lag screws can work but often will pull out of dead rotten wood on these usually dead nest trees. Steel duct clamps can be daisy chained to reach around a larger tree. Place one of these clamps as high as possible (as seen in the picture) and a second at least 2/3ds of the way down the frame. Tighten these using the proper socket bit in a power drill.



Once the frame is completely attached move the ladder to place and aim the camera. I placed lines on the aiming tool and the camera so the aiming tool will be pointing at exactly 90 degrees in front of the camera. The aiming tool is inserted into the camera as shown in the picture above.



In this set up example photo taken in my backyard, the aiming tool is at a right angle to the camera body and is pointing at the bottom of the cavity nest hole. Tighten the knobs on the mounting bracket. At this time the nest camera is fully installed and simply needs to be turned on.

Attaching these nest camera frames and cameras high in usually dead trees is hard work and can be dangerous. Make sure the nest tree is stable and not ready to fall. Place the ladder as close to the bottom of the tree as possible so your weight is mostly supported by the ladder and not leaning into the tree. My work partner Jim Howitz and I used 24 foot and 32 foot extension ladders depending on the height of the nest hole on the tree. Occasionally there were low nests and we used a 10 foot step ladder in those situations.

When attaching nest camera frames we made sure all the tools and materials were at hand and ready to use so our time at the nest site was as short as possible. We could usually complete this process in an hour from time of arrival to time of leaving the site. This took careful planning and good teamwork. We usually visited the site a day ahead of time to plan which side of the tree the frame would be attached to, where the ladder and tools would be placed on the ground and tree, and if branches or obstructions on the tree needed to be cut.

While placing the cameras and frames onto a nest or roost can be difficult, the rewards are always substantial. No pair of Red-headed Woodpeckers has abandoned any nest where these cameras have been placed (28 locations). The cameras have produced over 500,000 videos and pictures with over 293,000 hours of surveillance 24 hours a day all year. Extensive Red-headed Woodpecker nest behavior has been documented as well as 36 vertebrate species recorded interacting with RHWO nest cavities, including predation, usurpation, nesting, and extensive night life activities.