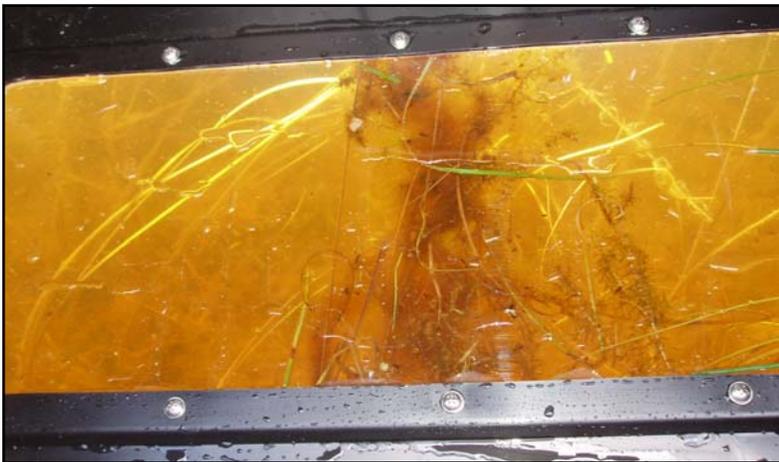


# The Trunk Scope

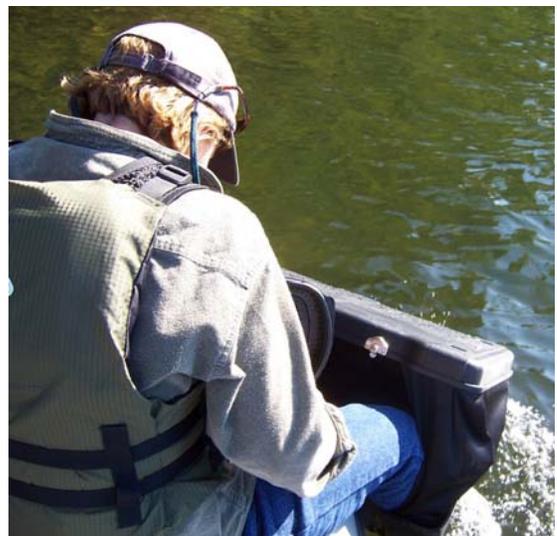
Invasive Plant Patroller Ross Wescott, dissatisfied with the limitations of the bucket scope (e.g., not well shielded from backlighting; limited view area) set out to make improvements. By the time Ross completed his self-imposed redesign project; Maine had its first "trunk scope" (or as we here at the VLMP are inclined to call it: "Ross's Rolls Royce"). The trunk scope is crafted from a large heavy-duty plastic trunk. It floats on the surface and may be lashed to the front, back, or side of the boat. A Plexiglas window in the bottom of the trunk provides three times the view area of the typical bucket scope, while the hinged top and black-curtain sides shield out unwanted light. The scope is ergonomic and easy to use; just sit back and observe the wonders passing before you!



We predict Ross's ingenious viewing device will not only soon be used by many other Plant Patrollers here in Maine; it will be sweeping the nation! Ross is also moving forward on a new scope designed specifically for lone-kayakers. So stay tuned!

Ross Wescott's detailed step-by-step instructions on how to construct your own trunk scope are now available on line at

[www.MaineVolunteerLakeMonitors.org/publications/TrunkScope.pdf](http://www.MaineVolunteerLakeMonitors.org/publications/TrunkScope.pdf)



# BILL OF MATERIELS & TOOLS

## HARDWARE / COMPONENTS

- “Deluxe Trunk Locker”
  - Contico<sup>®</sup> International, LLC, A Kathy Drive, Bridgeton, MO 63044
  - Model Number: W2323
  - SKU: 0 20027 22942 0
  - Size: 32” x 17” x 12.25”
  - Quantity: 1
  - Vendor(s): WalMart
- Machine Screws
  - Stainless Steel Pan Head Phillips drive
  - Size: 10-32 x .75”
  - Quantity: 18<sup>1</sup>
  - Vendor(s):<sup>2</sup>
- Lock Nut
  - Stainless Steel Nylon Insert (Nylok)
  - Size: 10-32
  - Quantity: 18<sup>1</sup>
  - Vendor(s):<sup>2</sup>
- Flat Washer
  - Stainless Steel
  - Size: # 10
  - Quantity: 18<sup>1</sup>
  - Vendor(s):<sup>2</sup>
- Acrylic (Plexiglas) or Polycarbonate (Lexan) Sheet<sup>3</sup>
  - Clear
  - Finished size: .25” x 9.25” x 23.5”
  - Quantity: 1
  - Vendor(s):
    - Window Glazing Supply (i.e. Portland Glass, PPG, etc.)<sup>4</sup>
    - Photo / Large Scale Graphics “Lab” –or- Trade Show / Display “House”<sup>5</sup>
    - Hobby or Craft Store
- Silicone Sealant clear
  - Vendor(s):<sup>2</sup>
- 2” Tape (masking or 3M<sup>®</sup> blue painting)
  - Vendor(s):<sup>2</sup>
- Opaque Black Cloth: 2 pieces 16” x 27” in size (minimum dimensions)
  - Vendor(s): Fabric or sewing shop
- “Hook” Velcro<sup>®</sup> with adhesive backing: .75” x 8’
  - Vendor(s):
    - Fabric or sewing shop
    - Wal Mart
    - Hobby or Craft Store
    - The Home Depot
- “Loop” Velcro<sup>®</sup> without adhesive backing: .5” x 8’
  - Vendor(s):

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<sup>1</sup> It may be less expensive to purchase a box of 100 than to pay a per/each price

<sup>2</sup> The Home Depot; Lowes; Well stocked Hardware Store

<sup>3</sup> Polycarbonate is more flexible and less prone to cracking than acrylic, and is thus preferable. However, it must be cut with either a table or jig saw. Acrylic can be hand scored and broken with an appropriate scribing tool. Consequently, the choice of material may be dependent upon the available tools.

<sup>4</sup> The plastic supplier may be able to cut the piece to finished size, and may also have “cut-off” or remnant pieces of material at a reduced price. ASK!!!

<sup>5</sup> These companies mount images on acrylic plastic and generate quantities of scrap that may be available at no charge.

## BILL OF MATERIELS & TOOLS

- Fabric or sewing shop
- Wal Mart
- Hobby or Craft Store
- The Home Depot
- Sand paper: 120 / 150 grit
- Support Hinge
  - Ives (Schlage)®
    - Left Hand – Part # C9210F3LH
    - Quantity: 1
    - Right Hand – Part # C9210F3RH
    - Quantity: 1
  - Vendor(s): The Home Depot

### TOOLS

- Power
  - Required
    - Drill (corded or cordless)
  - Optional (desirable)
    - Drill press
    - Table saw
    - Reciprocating (jig) saw with metal cutting (fine toothed) blades
    - Orbital or pad sander –or-
    - Stationary drum sander –or-
    - 1" belt sander
    - Sewing machine
- Hand
  - Drill Bit - #9 (number bit) .1960"
  - Plastic scribing tool
  - Razor Knife (segmented or carpet type)
  - File
  - Metal straight edge
  - Tape measure or 36" rule
  - Philips screwdriver
  - Pliers (slip joint)
  - Scriber or push pin
  - Pencil or waterproof marker
  - Sewing needle & thread
  - Scissors
  - OLFA Plexi Scriber (if making viewing window out of Acrylic/Plexiglas)
  - Nut Driver (handy for holding the nut while screwing; optional)

McMaster Carr is a good online tool catalog

# VIEWING BOX CONSTRUCTION

## DESIGN & FABRICATION CONSIDERATIONS

The design objectives for this viewing box were predicated upon the following criteria:

- Wide angle view.
- Portable and maneuverable.
- Easy deployment
- Self contained (functions without peripheral components).
- Box fabricated of opaque material.
- Shaded interior.
- Capable of being constructed to the extent possible with “off the shelf” readily available parts
- Require only modest skill and fabrication to construct

The following discussion focuses on the fabrication of a viewing box using the Contico trunk specified in the Bill of Materials<sup>1</sup>. The selection of this box was primarily based upon the design of this trunk’s bottom.

- The central portion of the bottom is recessed toward the inside of the trunk body and the interior is free of any “ribbing” or molded reinforcement. This produces an unobstructed flat surface
- The removal of a rectangular segment produces a viewing opening with a “flange” against which the clear plastic “window” can be seated and attached.
- The recess and the raised square “feet” molded into the bottom also function to protect the viewing window plastic from damage.
- The hinged lid provides a means of shading the interior of the box from overhead light and thus reduces reflections off the surface of the clear plastic viewing window.

The clear plastic viewing window must be mechanically attached to the box. The silicon sealant forms a watertight gasket but is not sufficient to bond the plastic to the box body. The attachment method is to through bolt the viewing window using machine screws that fully penetrate the window and are secured with washers and nylon lock nuts.

## FABRICATION SEQUENCE

- 1 Fabricate the Viewing Window Panel:
  - a Trim plastic (acrylic or polycarbonate) to finished size of 9.25” x 23.5” (leave protective film or paper (masking material) on the piece.<sup>2</sup>
  - b Radius the corners of the window panel.
    - i Position the paper template (1) at one end of the blank.

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<sup>1</sup> It is possible that other similar boxes exist which have the same characteristics and which would be perfectly acceptable for modification into a viewing box. Ideally the box should have a hinged lid and a molded bottom. A large plastic storage bin with one side of the lid “hinged” to one side of the rim of the box using electrical ties would also work. If another box is chosen the following instructions and template(s) may not work.

<sup>2</sup> Use care when cutting polycarbonate on a table saw. The material is flexible and the teeth of the blade can set up a vibration that will cause the stock to oscillate dramatically with the possibility of loss of control of the plastic and bodily injury. If using scribing tool on Acrylic/Plexiglas, use light pressure with initial scribe; increase pressure on second pass. Place scribe along edge of table or plywood surface and use the heel of your hand to gently break.

## VIEWING BOX CONSTRUCTION

- ii Transfer the curves at the corners to the masking sheet on the plastic using an indelible pen.
  - iii Rotate the template 180° and position it at the opposite end of the blank and repeat the transfer marking as above.
  - iv Sand and/or file the radius to shape and smoothness.<sup>3</sup> Give particular attention to “deburring” the edges of the plastic so that the top and bottom surfaces are smooth.
  - c Drill Holes for Mounting Screws
    - i Position template 1 at one end of the window blank.
    - ii Transfer the center cross hair (“+”) for each of the mounting holes to the masking material. This can be accomplished by piercing the “+” in the template with a sharp pointed instrument (push pin or pointed scribe) thereafter by marking through the resulting hole with an indelible pen or by simply pushing the point of the scribe through the “+” and impressing a “hole” in the plastic material. If this latter method is used it might be helpful to circle the resulting “hole” with an indelible pen to facilitate locating it.
    - iii Carefully drill holes (at a right angle to the surface of the plastic) for each of the marked spots. The use of a drill press is recommended if available. Hole size should be: .1960” (#9 Number twist drill).<sup>4</sup>
  - d This completes the fabrication of the viewing window. It will now be used as a template for marking and drilling mounting holes in bottom of the viewing box.
- 2 Fabricate the Viewing Window Opening:
- a Drill mounting holes in the Box.
    - i Latch the box lid and turn it bottom up on a work surface.
    - ii Verify that the window fits within the recess. If it does not, file and/or sand the window for fit.
    - iii Place a small piece of masking or blue painters tape at one corner of the window and a second piece of tape on the box near the same corner.<sup>5</sup>
    - iv Secure the window to the box using tape to reduce the chance that it will shift.
    - v Carefully drill holes in the box using the window as a drill guide. Use the same drill bit (# 9 number drill size) that was used in the fabrication of the window (above).
    - vi Remove the window panel once all holes have been drilled in the box.
    - vii Carefully remove any plastic burrs around the drilled holes. Both the interior and exterior surfaces of the box should be smooth and flat.
  - b Create a mounting flange for the viewing window by removing a rectangular panel from the box bottom.

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<sup>3</sup> A stationary drum sander or 1” belt sander if available can be used to finish the radius corners.

<sup>4</sup> The construction of the cutting tip (rake) on a standard twist drill bit tends to “snag” or catch in acrylic plastic as the bit breaks through (exits) the back surface of the sheet when a hole is being drilled. This can fracture the brittle acrylic and ruin the hole. To avoid the possibility of this occurring, apply light pressure on the bit when drilling the hole is necessary. Let the bit do the cutting and go slow. An alternative is to purchase bits that are specifically designed for drilling in acrylic material. A step drill will safely drill clean holes in acrylic

<sup>5</sup> It is possible that the holes previously drilled in the window are not symmetric. This step should assure that during future fabrication the window will be oriented so that the holes in the window and box align properly.

## VIEWING BOX CONSTRUCTION

- i Position the paper template (template 1) at one end of the recess in the box bottom. The edges of the template should match the lower “break” in the molded recess.
  - ii Using a sharp pointed instrument (scribe, push pin, etc.) pierce the template at the “x” hairs to mark the outline of the area to be cut out.
  - iii Rotate the template 180° and position it at the opposite end of the recess and repeat step ii above.
  - iv Align a metal straight edge with the marks for one side of the opening and draw a line through the marks with a pen. Repeat until all four sides of the opening have been marked to form a rectangle.
  - v Position the viewing window plastic so that a radius corner is positioned at a corner of the rectangle drawn in step “iv” and draw the radius onto the tape. Repeat until a radius corner has been marked in each of the four corners of the opening.
  - vi Cut out the opening with:
    - (1) A segmented blade or other razor knife using a metal straight edge. Repeated passes will be needed with light to moderate pressure on the knife. **Use extreme care to prevent the knife from riding up over the edge of the straight edge and be vigilant as to the location of your body parts, particularly your fingers.**
    - (2) A reciprocating (jig) saw with a fine tooth metal cutting blade. To start the cut either make a “plunge cut” if you are familiar with the technique, or drill a ¼” diameter hole near the line to allow insertion of the blade.
  - vii Remove any “burrs” of plastic that remain after cutting out the viewing opening. Lightly sand as necessary to smooth and flatten both the inner and outer surfaces of the box bottom.
- 3 Install viewing window in the box.
- a Verify that:
    - i Holes have been drilled in the viewing window panel and the box to accept mounting screws.
    - ii The edges of both the window panel and the opening in the box are clean and free of “burrs” or defects, which would prevent the mating surfaces of the window and box from being in contact with each other.
  - b Prepare flange and apply silicone:<sup>6</sup>
    - i Clean the flange surrounding the viewing window opening on the box with 90% isopropyl or denatured alcohol.
    - ii Apply the alcohol twice using a clean rag or paper towel for each application.
    - iii Let the alcohol dry (evaporate) completely. This should assure that any grease has been removed from the surface.
    - iv Apply a “Z” or zigzag bead of silicone around the perimeter of the flange on the box. The bead should cover the area from the “break” in the molded plastic to the window opening. Be fairly liberal and keep the “Z” about 1” apart. More is better.<sup>7</sup>

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<sup>6</sup> If the box is soiled first use a mild soap & water solution, Windex or similar product and dry thoroughly before using applying the alcohol.

<sup>7</sup> Silicone on the screw threads is good since it will help seal and lock the nuts in place.

## VIEWING BOX CONSTRUCTION

- c Position & seat window panel:
    - i Peel the protective release paper or plastic film from the surface of the window panel opposite to the side that is marked with tape in the corner (step 2), a, iv above).
    - ii Align the tape mark on the window panel with the tape on the box, and carefully place the window panel into the recess of the box.
    - iii Press down firmly and move the window panel from side to side and top to bottom to assure that the silicone is evenly distributed in the space between the plastic and the flange. Ideally a bead of silicone will be extruded beneath the edge of the window and into the open space of the box cutout.
    - iv Verify that there are no air gaps or bubbles in the silicone and that it is evenly distributed over the entire contact area between the window and the box.
  - d Attach and secure the viewing window:
    - i Install notes:
      - (1) A washer should be positioned under BOTH the screw head and the nut.
      - (2) The screw head should be positioned on the outside of the box.
    - ii Insert a screw with washer through each of two opposite corner mounting holes on the window panel and box. Finger tighten nuts and washes to them.<sup>8</sup>
    - iii Insert the remaining screws, washers, and nuts, and tighten them snugly.<sup>9</sup>
  - e Allow the silicone to cure for about 24 hours. When the silicone is completely set, carefully trim off the extruded excess with a razor knife.<sup>10</sup>
- 4 Install hinges:
- a Mark hinge hole positions:
    - i Place the box in an upright position with the lid closed.
    - ii Position template 2 on the raised portion of the lid at the right hand side of the box.
    - iii With a scribe or other sharp pointed instrument transfer a mark through the cross hair marks on the template onto the lid.
    - iv Repeat steps (i-iii) on the left side of the lid.
    - v Position template 3 on the flat recessed surface below the handle at the end of the box.
    - vi Transfer the cross hair mark on the template to the box as above.
    - vii Repeat at the opposite end of the box.
  - b Drill holes through the box at the marked locations, and deburr them.
  - c Open the box lid and starting on the right side, insert one screw with washer through the back hole in the lid.
  - d From the underside of the lid, insert the back mounting hole of the right hand hinge-mounting flange over the screw that protrudes through box top. Attach a washer and nut to the screw loosely.
  - e Insert a screw and washer through the remaining top hole and hinge flange and affix a nut and washer on the underside.
  - f Insert a screw and washer through the side hole beneath the handle and attach the bottom of the hinge with a nut and washer.

<sup>8</sup> These will function as locating "pins" to align the remaining mounting holes.

<sup>9</sup> Plexiglas is brittle and over tightening the screws could cause the material to crack.

<sup>10</sup> The edges of the window panel and box cutout should be used as guides. Trim close.

## VIEWING BOX CONSTRUCTION

- g Repeat steps c-f on the left side of the lid.
  - h Tighten all nuts until snug.
- 5 Fabricate Side Curtains
- a Assemble template 3 by cutting out panels 1-5 to create a cutting pattern for the side curtains.
  - b Place two pieces of fabric face to face or back to back and pin the assemble pattern to them.
  - c Cut the fabric to the shape of the pattern.
  - d “Try fit” the fabric pieces to the box lid and evaluate whether additional trimming and/or gathering or “darting” will be necessary to turn the front and back corners of the box lid.
  - e Modify as necessary to assure a smooth fit.
  - f Stitch Velcro to the fabric.
  - g Adhere Velcro with pressure sensitive adhesive to the box lid and sidewalls.
  - h Install side curtains.