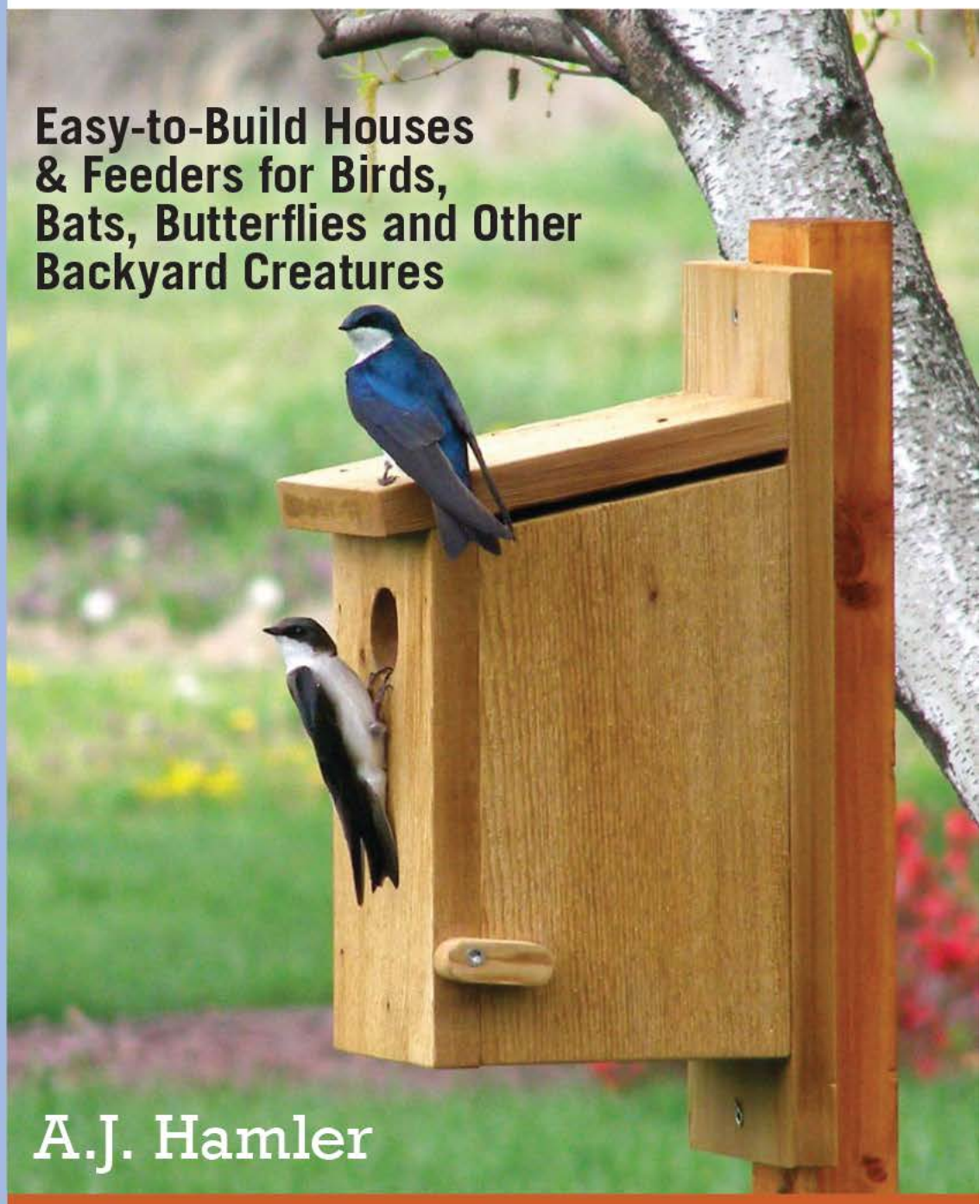
POPULAR WOODWORKING

Birdhouses & More

Easy-to-Build Houses & Feeders for Birds, Bats, Butterflies and Other Backyard Creatures



A.J. Hamler

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POPULAR WOODWORKING BOOKS
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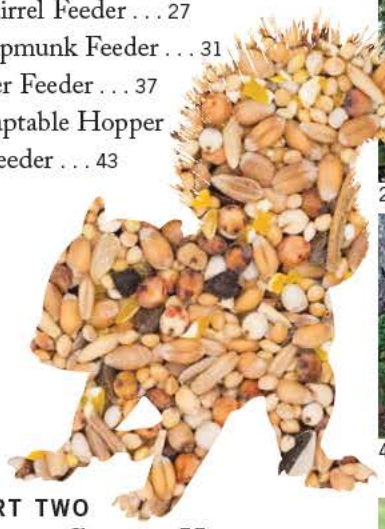

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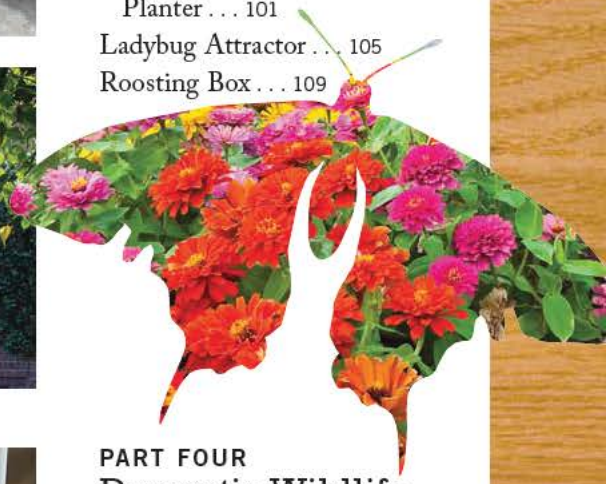


INTRODUCTION

Wildlife Woodworking

Our good friend Noah Webster defines habitat as, "…the region where a plant or animal naturally grows or lives; native environment." Though pretty broad, that's a perfect theme for the book you hold in your hands.

The native environment of our favorite wildlife has several key components:

- Animals need to find enough of the right kind of food. Whether it's to help them survive through harsh weather or merely to attract them to our yards so we can watch and appreciate them, everyone enjoys providing sustenance for our animal friends.
- Not all animals use or require shelter for breeding or getting out of the weather, but shelter must be readily available for those that do. Animals can find their own shelter—hollow logs, tree cavities, beneath rocks or inside caves—but by providing shelter we can entice them to spend time with us, enriching both our lives and theirs.
- Their environment must be complete and well rounded. Food and shelter are basic requirements, of course. But just like their human counterparts, animals live a more fulfilling life when other comforts and conveniences are available. Outdoor wildlife such as birds enjoy a ready source of nest material, for example, while indoor wildlife such as a house cat will certainly thank you for a window-mounted perch allowing them to watch those birds. From a safe distance, naturally.

Whoa, wait… a house cat is indoor wildlife? You bet. We humans love animals, which is the reason cats (and dogs and a host of other animals) were domesticated in the first place. Some animals, such as horses, were domesticated so we could put them to work, but many others were tamed simply because we enjoy having them around us. So, while this book concentrates mostly on the great outdoors, the animal lover in me could never forget our indoor friends.

This young tree swallow is nearly ready to fledge.

LEFT Paint on good materials has helped this roadside birdhouse remain in service for more than 10 years.

Woodworking for Wildlife—What to Expect

Making wildlife habitats is an extremely satisfying form of woodworking. Many of us love to build large pieces of furniture, but those often require massive amounts of wood, plenty of room for construction, and a lot of time.

The things we make for wildlife are typically smaller, require less material, and usually can be completed in an afternoon or over a weekend. Finishing methods are not complicated and, in many cases, aren't even required unless you need to weatherproof materials or add a splash of painted color.

This book is not a tutorial introducing a host of woodworking tools and techniques; I assume you already have a basic grasp of both. The projects presented here aren't difficult and should be within the reach of beginning woodworkers and do-it-yourselfers. Rest assured, I won't leave anyone wondering how to get things done: Every project has full step-by-step instructions along with photographs of each key step.

There are 25 great projects here designed to please both you and your favorite animals. But before we get started let's discuss a few techniques and materials specific to wildlife woodworking, with emphasis on construction for outdoor use.

Construction Basics

Like all woodworking, any wildlife project you make will be most successful with a good balance between tools and techniques. Let's look at both.

Most of these projects are small and require only minimal joinery, so you won't need a workshop full of state-of-the-art power equipment. Any of these projects can be constructed with a basic kit of hand tools: hammer, hand saw, hand drill, screwdriver, utility knife, a good square and a straightedge, combined with an assortment of sandpaper and a selection of exterior-grade nails and screws.

That said, power tools will certainly make things go more quickly and easily. The two most important and useful of these are a powered drill and a saw.

Teamed with a good selection of bits (including spade or Forstner bits that excel at drilling entrance holes), a drill can produce accurate results quickly and reliably. A drill press, with its higher power and ability to make perfectly vertical holes, is even better.

A good jig saw can handle a host of cutting chores, with crosscutting to length and ripping to width the most crucial. Further, a jig saw's thin blade easily cuts curves and holes, and its tilting sole allows you to cut angles and bevels. Benchtop and stationary saws—table saw, band saw or scroll saw—add a large measure of accuracy and ease for turning out parts repetitively.

Rounding out the list of power tools for the wildlife woodworker are nailers and sanders. Brad nailers, either electric or pneumatic, make for very fast work. The thin nails they use have small heads that aren't noticeable in the finished projects. A hand sander helps make smooth surfaces on just about any workpiece or finished project, while disc and spindle sanders excel at curved shapes.

You won't need any woodworking techniques specific to wildlife construction. All the methods shown here are common tasks that any do-it-yourselfer is familiar with. However, let me cover a few things you'll encounter.

Wood Grain

Grain direction is always a consideration in woodworking, and it's especially important for exterior construction because wood exposed to the weather is under more stress than indoor items. Whenever possible, the wood grain should run in the direction of the longer dimension. Moisture can warp wood, and matching long grain with the long dimension adds strength. It's also best to orient the grain vertically whenever you can. Water runs vertically down the sides of an animal's house when it rains, and is less likely to soak into wood if the grain also goes vertically. This is especially important with rough wood like cedar.

Although not always possible, try to orient end-grain away from flowing water. Likewise, when making joints strive to cover end-grain on upper parts of a project by overlapping it with long grain.

Drainage

Drainage is important to allow rainwater to exit. For houses that have a floor inserted and attached between the walls, the simplest method is to cut the corners off the floor. Or you can just drill a few holes through the floor or along the lower edge of a side.

Drainage holes also offer a bit of floor ventilation. We'll discuss general ventilation in a moment, but floor drainage allowing air movement helps to keep the interior dry even when collected rainwater isn't an issue.

Ventilation

Any house or habitat will get hot in the summer, especially those placed in direct sun. Entrances allow for some air movement, as do floor drainage holes. However, adding at least one hole near the top where the hottest air collects helps keep occupants comfortable.

For houses with traditional roof crowns, cutting the top ¼" to ½" off the crown of the rear wall works well, especially if the roof overhang helps block rainwater from getting in. For houses with doors, simply make the door slightly shorter than the door opening to create a small gap at the top that will allow for airflow.

If neither of these options is available in a particular design, you can simply drill a few holes near the top of the house. It's best to locate these holes under an overhanging roof, but in any case drill these ventilation holes at an upward angle so rainwater isn't channeled inside.

Safety

It should go without saying that woodworking can be dangerous. There's a safety warning posted at the front of this book, and I'd like to reinforce it here. You may notice that I've removed the guard on my table saw in some of the photography to make procedures easier to see, but I recommend you use all proper guards and safety equipment intended for your tools. Have adequate lighting in your work area and be sure to provide sufficient ventilation when working with glue, paint and stains. Above all, be sure to protect your eyes and ears.

There are a lot of sharp edges involved in woodworking, and a new one seems to have popped up in recent years: staples. Because price stickers can fall off, home

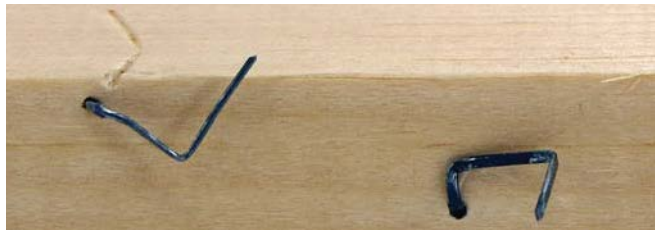
ENTRANCE HOLES
To drill large entrance holes, use (from top left) a hole saw, Forstner bits, or spade bits.

ADJUSTABLE CUTTER
An adjustable hole cutter can be set to a variety of sizes, but for safety it can only be used in a drill press.

USEFUL SAWS
Typical saws in your arsenal may include, from top, a jig saw, table saw, regular hand saw, and a Japanese-style pull-saw.

DRAINAGE
Proper drainage keeps wildlife housing dry on the inside.

VENTILATION
A simple hole drilled underneath a roof edge helps provide adequate ventilation.



NASTY STAPLES
Staples driven into the ends and edges of lumber are unexpected cuts just waiting to happen. Be sure to pull these out before working with the wood.

GOOD WOOD
Excellent choices for outdoor structures include, clockwise from lower left: cedar, pine, oak, exterior-grade plywood, Baltic birch plywood, birch-veneer plywood.

centers have taken to stapling price tags on the ends of lumber. Be absolutely certain to remove these before working with the lumber, as they can ruin blades if you inadvertently cut through them. If whoever put the staple there wasn't careful, one end of the staple may have missed the wood and be sticking out just waiting to skewer an unsuspecting finger. Even more distressing is the recent practice of applying multiple staples to wood edges. These are applied to "bridge" boards to keep them from sliding as they're stacked and shipped. The problem is that once the boards are separated one end of the staple comes out, resulting in dozens of sharp staple prongs sticking out of board edges. Be on the lookout for these when lumber shopping, and remove them immediately with pliers before working the lumber.

Wood

For natural-looking wildlife structures, you probably want to leave the wood unfinished. For that reason, you'll need to choose your wood carefully. Softwoods, which are lighter and easier to work with than hardwoods, are the best choice. If a house or feeder needs repair, softwood components will be easier to remove and replace. Cedar, redwood and cypress are among the most moisture-resistant softwoods you can find. They stand up well to the weather, and resist both fungus and insect attacks. These wood species weather well, taking on a silvery gray patina with exposure.

Although not quite as weather resistant as cedar and redwood, woods from the spruce/pine/fir families (usually referred to as SPF lumber) are good choices, as is exterior-grade plywood. Houses made with these woods will last for years when left unfinished, and their useful lives can be extended with paint or stain.

Hardwood lumber can make nearly indestructible wildlife homes, but hardwood can be difficult to work, especially with hand tools. Houses made with hardwood may be double (or more) the weight of a comparable house made of softwood. Among the hardwoods teak is probably the best choice, but very expensive and not commonly available through home centers. White oak, less expensive and more available, also is a good hardwood choice.

While you can use woods not noted for weather resistance and plywood not rated for exterior use, you should always protect them with paint, oil, or varnish.

Avoid wood with cracked edges or ends, oddly shaped grain, or obvious loose knots.

Never use treated lumber for wildlife houses or feeders. Treated lumber is fine for mounting posts or poles (likewise, it's OK to mount projects on existing structures made with treated material, such as telephone poles or deck beams), but it should never be used any portion of a house or feeder with which the animals will come into constant contact.

Hardware and Fasteners

Hardware also needs to resist the elements. Galvanized nails are better than bright nails, and likewise, galvanized, stainless steel, or coated exterior-grade or "deck" screws are preferable. Hinges, hooks, hangers, screw-eyes and other

PLYWOOD VOIDS
Home-center plywood nearly always has voids in the edges that allow water to get between the plies, leading to eventual deterioration.

hardware should be of brass, stainless steel or other non-corrosive metals, or should be coated for protection against the elements. You should periodically examine anything you've made for outdoor use, and replace rusty hardware as needed.

Paint and Stain

Any house or feeder can be painted or stained, however there are several things to keep in mind. First, use only exterior-grade paint, preferably a latex-based paint that cleans up with soap and water. Stick with lighter colors for structures that will be placed in full sun because light colors reflect sunshine better than dark colors, keeping the interior a bit cooler. Reserve dark colors for structures placed in protected areas, for example on shaded tree trunks, beneath bushes, or in garden arbors.

Use paint and stain only on exterior surfaces. Fumes from the coatings (especially in hot weather), or chipping paint inside a house or feeder can harm the animals. Avoid getting paint on the inside surface of entrance holes and doors, because that's a problem area where paint will chip free as the residents come and go.

When painting wood for extra protection, it's important to cover all exposed surfaces to prevent water from soaking into the wood itself. Fill nail holes and small gaps in joints before painting, especially on plywood that has voids, gaps or other openings on the edges. Water will be attracted to those voids like a magnet, and the wood will be destroyed from the inside out. Fill edge voids with a filler and sand smooth before painting.

Any painted project for outdoors, particularly one made of plywood, will benefit from a coat of primer before painting. Priming seals the wood, especially edges and end grain, adding a layer of protection even before you apply the paint. Priming also gives the wood a uniform color, helping paint cover uniformly for the best appearance.

House and Feeder Mounting

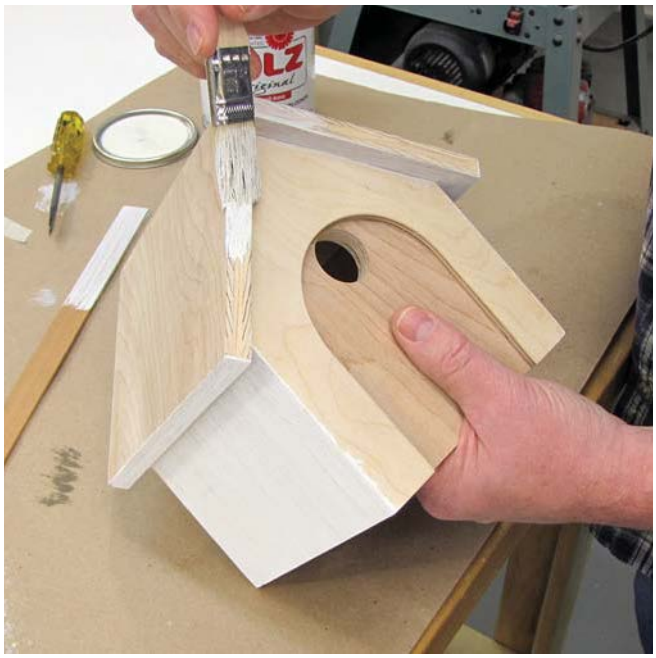
If your project isn't likely to be disturbed by high wind or neighborhood predators, you can simply hang it on hooks through a hole drilled in the back. For more security, drill mounting holes through the back and screw the project directly to a tree or post.

If you have overhead support, you can hang your project. Some of the projects here, like the Ladybug Attractor (**PAGE 105**) and Birdbath (**PAGE 96**), are designed to be suspended with lengths of chain.

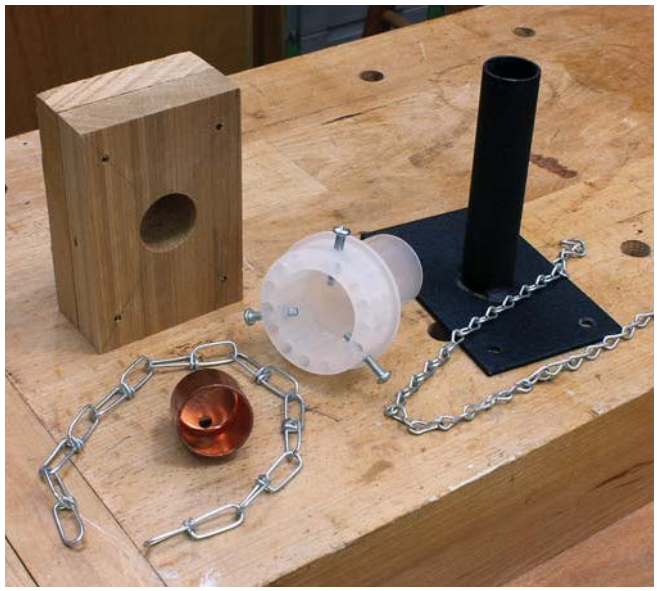
Many bird and animal houses, and most feeders, work best when mounted a few feet off the ground out in the open. A mount attached to the underside works best. Any store that carries wildlife supplies will have metal mounting brackets. These consist of a short pipe welded to a flat plate that can be screwed to the bottom of a structure, allowing it to be slipped over a pole. If you can't find these mounts, it's easy to make them yourself. The plumbing department at the local home center sells copper end caps in a variety of sizes. Drill a few holes in the bottom of the cap and screw it securely to the underside of the project, then select a mounting pole that fits snugly into the cap. You can also make a mounting block by gluing or nailing two rectangular pieces of wood together. Drill a large hole all the way through to match the size of your mounting pole, then attach the block to the underside of the house or feeder with screws.

Finally, although this is a woodworking book from beginning to end, we'll also use adaptable non-wood materials that lend themselves well to wildlife structures. The Deer Feeder (**PAGE 37**), for example, uses PVC plumbing pipe and fittings as the main material; later I'll show you how to adapt a metal barbecue grilling tool for the Nest Material Dispenser (**PAGE 92**). You'll need ceramic or plastic inserts for the Birdbath project, and we'll make handy use of a cylindrical concrete post-form to create the Cat Condo (**PAGE 122**). These probably aren't the kinds of things you use every day in your workshop so I hope you'll come away with an appreciation for new materials you could use in future projects.

Are you ready to get started? Let's go, the animals are waiting…and they're getting hungry.



PRIMER
Primer seal plywood, helping it withstand the elements and improving paint adhesion and appearance.



MOUNTING
Outdoor wildlife structures can be mounted in several ways. Clockwise from upper left: shop-made mounting block, screw-adjustable plastic pole mount, metal house/feeder mount, chain, and copper plumbing end cap.

PREDATOR PROTECTION
Neighborhood predators won't be able to climb past this pole-mounted guard.

The Basic Birdhouse, shown under construction on **PAGE 50**, is made of Western red cedar nailed together. The house weathers gently into the landscape, becoming a home to which the birds can return year after year.

From forests, to wide-open spaces, to right in our own backyards, making new wildlife habitats—or enriching existing ones—is both fun and rewarding.

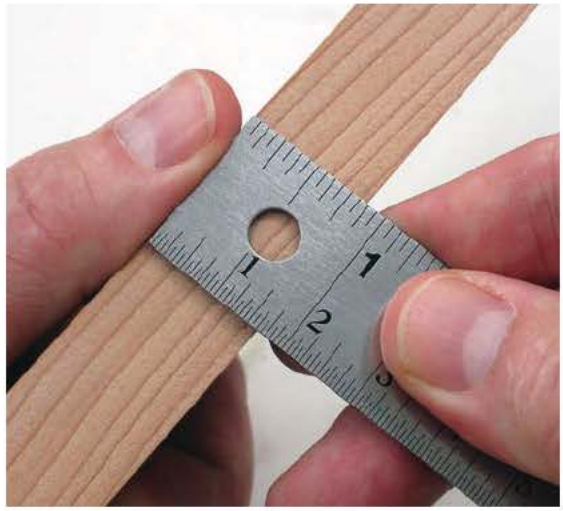
A Note on Cedar Thickness

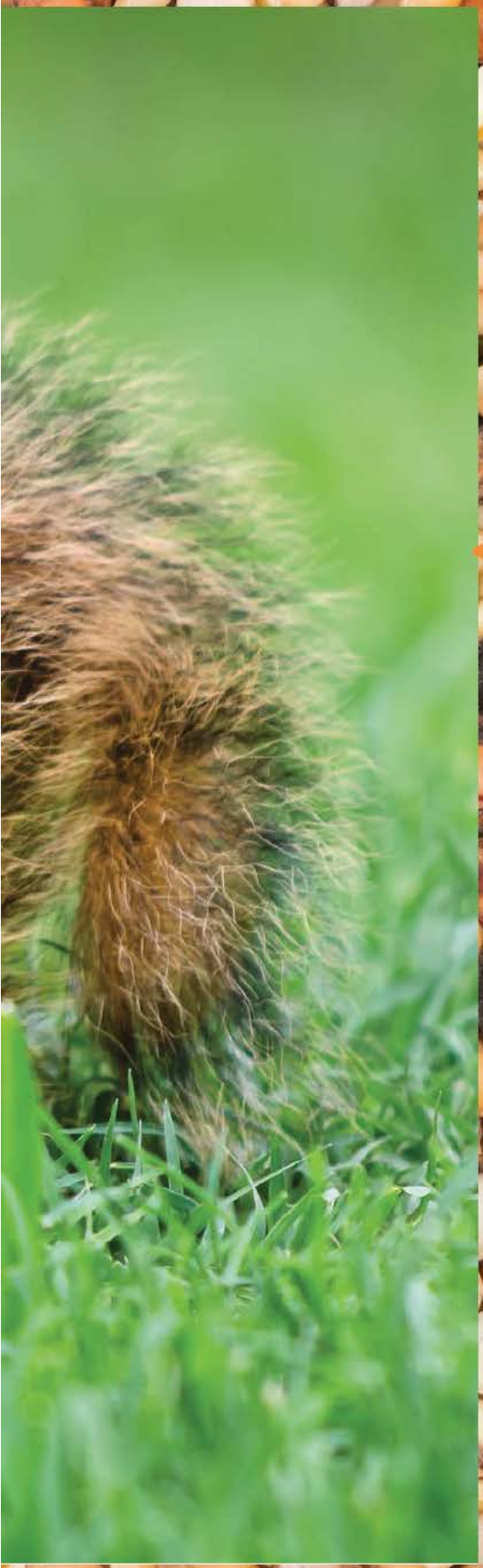
Western red cedar is a perfect choice for outdoor projects, and I'll recommend it a lot throughout the book. In spite of its light weight, it's plenty strong enough for wildlife homes and feeders. It's easy to work with power or hand tools, and it smells absolutely wonderful every time you make a cut. Best of all, it's naturally weather- and pest-resistant.

Cedar is sold as dimensional lumber—much like a 1x2 or 1x6—and although such "1-by" lumber is nominally 1" thick, it's all really only ¾" thick. Other dimensional lumber, which is planed smooth on both sides, is dependably ¾" thick on the nose. However, cedar is almost always sold with one rough side and one smooth side. Depending on the originating mill, that roughness may or may not be included in the thickness. This means your cedar could be exactly ¾" thick, but you might find it a bit thicker, sometimes a full ⅞", as shown in the photo below.

All the projects in this book include a cut list to guide you when cutting your project parts to size. But even though the thickness may be listed as a standard ¾", your cedar may actually be a bit thicker. Consequently you may need to alter some parts to accommodate this extra thickness.

When used for birdhouses, cedar's rough face has additional benefits. Nestlings sometimes have difficulty climbing up to the entry hole when it's time for them to leave the nest. There are ways to help them out with secure footing—I'll recommend some on the individual projects—but by orienting the rough side inward the nestlings will have an easier climb.





Dinner Time

The surest way to entice friends to visit your home is to invite them over for dinner. Not surprisingly, our wildlife friends are no different.

Pet stores, farm supply outlets, and department stores sell a wide array of food types. You'll find the greatest variety in bird food, of course, allowing you to cater to whatever local species considers your backyard home. But increasingly, stores are offering feed for other animals as well, from squirrels to deer to wild turkeys.

Always be sure the feed you provide is fresh. Check feeders frequently, and replace feed that has become spoiled or water-damaged. Be sure to keep your feeders filled—a sudden disappearance of your favorite wildlife is a sure indicator that it's time for a refill.

Whether you're supplementing their diets when their regular food is scarce during winter months or just because it's a good way to bring their natural beauty into your backyard at any time of the year, this collection of feeders will certainly provide plenty of ideas.

Photo by Leena Robinson/Shutterstock.com, background photo WimL/Shutterstock.com

Window Feeder

Let's start with a feeder that's usually called a platform design. This type of feeder—four sides with a flat bottom to form a shallow tray—really couldn't be more basic. Thus it is a perfect project to alter any way you like to suit your needs, (something I'll encourage you to do throughout this book).

Platform feeders can be simple trays as described above, placed on any flat surface. If you have a flat stump in your yard, you can screw the platform feeder to the top. To mount it on a deck railing, add a pair of 1x2 wood cleats to the feeder's underside. Or drill a hole in each of the four sides, slip cord or chain through the holes, and hang the feeder anywhere you spy some hungry birds.

To prove my own point, I've designed this feeder to go onto a window using a pair of mounting supports that hang on suction-cup hooks found at the home center. With the feeder placed on the outside of one of your windows, you'll be able to enjoy the birds anytime they stop in for a snack.

I've chosen Western red cedar for this feeder. It is a perfect wood for outdoor projects, so you'll see it a lot in this book. But cedar lumber typically has one smooth side and one rough side, so before cutting anything you'll need to decide on how you want to orient the wood—rough side in or out. I like the look of rough cedar, so I almost always orient the rough side to outside of the feeder. This has an additional benefit: The smooth side facing inward makes cleaning the inside of the feeder easy, because there are no nooks and crannies in the wood surface to collect dirt and debris. Still, the choice is yours whether the project is a feeder or birdhouse, though it's best to be consistent within an individual project.

The first step of any project is to use the Cut List to create the individual parts, and you'll get used to the projects all starting that way as you work your way through the book. However, sometimes it's best to do some operations before cutting parts to size, and that's the case here.

Building the Window Feeder

This platform bird feeder has a mesh bottom that fits into grooves cut into the lower inside edges of the sides. You could cut all the parts to width and length and then cut the grooves, but you'd be working with smaller pieces. It's easier—and safer—to make these grooves in one long piece rather than in short individual pieces.

Cut a piece of 2½"-wide cedar to at least 48", long enough to make all four of the feeder sides. Set the table saw's blade at ¼" high, and then set the fence ¼" from the blade. Run the workpiece along the fence to cut the groove in a single continuous pass, as shown in **PHOTO 1**.

With the groove done, cut the individual side pieces from the longer workpiece. These parts each have a 45-degree bevel that will form mitered corners for the feeder tray. You can cut these miters on the table saw, but they can also be done by hand using a miter box (**PHOTO 2**).

The feeder uses perforated sheet mesh for the bottom, which lets rain and moisture pass right through, and allows air circulation to help keep seed fresh. The mesh I've used is 1/16"-thick powder-coated steel with 1/16" holes, but any stiff mesh with openings smaller than the seeds will work fine. Cut the mesh to 8" x 12" with metal snips.

The mesh bottom fits into the grooves at the bottom of the mitered sides, and once the feeder tray is joined together it traps the mesh in place. To assemble the tray we'll use an old box-maker's trick. Lay the four sides inside-face down on your work surface, butted tightly together one after the other, long-short-long-short. Apply a piece of packing tape over each junction, plus have an extra piece of tape handy. Now, carefully flip all four pieces over so the open miters face up.

Dab waterproof glue into the miters (**PHOTO 3**). Slip the mesh into a groove of one of the longer sides, and then fold the structure closed as in **PHOTO 4**. Put a bit of glue into the last miter, fold the last side into place, and wrap a piece of packing tape tightly around the corner. The tape clamps everything together while the glue cures.

Remove the packing tape once the assembly has dried and reinforce each corner with a pair of nails. In **PHOTO 5**, I'm using a brad nailer with 1¼" brads, but 3d or 4d finish nails driven by hand are fine, too.

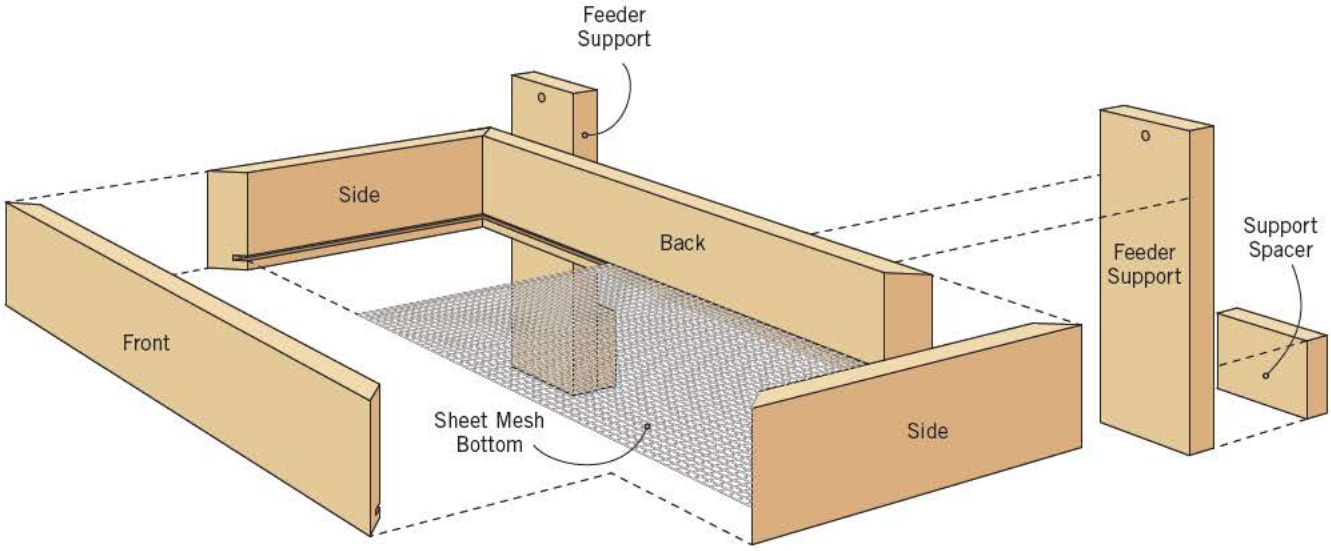
Cut the mounting supports to size and drill countersunk pilot holes through each, then glue and screw them to the back of the tray as in **PHOTO 6**. Locate these supports ¾" from each end, and attach them so 1¼" of each support clears the top edge of the tray.

The suction-cup hangers I've used here have a hook of about 40 degrees on the bottom. To accommodate this, I drilled a hole with a matching angle through the top of each mounting support. Adjust the hole angle to match the hooks you find.

The last step is to go ahead and hang the feeder on your desired window so you can measure for the support spacers. Because the hooks support the feeder slightly away from the window it doesn't hang level. With the feeder in place, lift it away from the window glass until it is level and measure the distance between the glass and the bottom of the mounting support. Cut a pair of 2" x 2½" spacers of the appropriate thickness (mine came to ⅝" thick), and attach them to the lower back of the mounting supports with waterproof glue and brads or finish nails.

PHOTO 1 Saw the groove for the feeder bottom before you crosscut the side pieces to length.

Window Feeder



WINDOW FEEDER CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	2	Back/Front	Cedar	¾"	2½"	13¼"	Thickness of support spacers depends on the hook/hanger you use.
B	2	Sides	Cedar	¾"	2½"	9⅛"	
C	2	Feeder Supports	Cedar	¾"	2½"	8"	
D	2	Support Spacers	Cedar	⅝"	2"	2½"	

Overall Dimensions: 13¼" wide x 9⅞" deep x 8" tall

PHOTO 2 You can saw the corner miters by hand, using a miter box.

PHOTO 3 Tape the outside of the feeder parts with the miter points tight together, then dab glue into the miters.

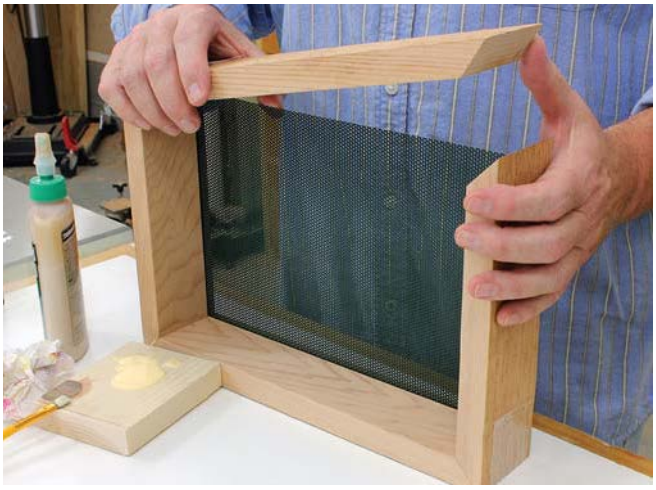


PHOTO 4 Fold the feeder closed and tape up the last corner. The tape holds it while the glue dries.

PHOTO 5 Reinforce each corner with two nails. Drive them with a hammer or with a brad nailer.

PHOTO 6 Glue and screw the mounting supports to the back of the feeder tray.

Gravity Feeder

The platform feeder in the previous chapter is the simplest means of providing food for wildlife. It's essentially a dinner plate on which you've put out some food: flat, open, no protection from the weather, and when it's empty all you're left with is a dirty plate. But the capacity is lower than other types of feeders and you wouldn't want to overfill one or the weather could spoil the food before it's eaten.

A gravity feeder, on the other hand, incorporates a platform or open tray that birds and other animals can access, but all of the feed isn't exposed at all times. Instead, a vertical hopper stores the supply and as the food is eaten, gravity allows more feed to fall down into the platform tray. As a result, you can fill gravity-style feeders with lots more food than you'd put into a simple platform feeder. The small gravity feeder in this chapter holds about five times as much feed as you'd want to put in the flat window feeder from the previous chapter. Plus, since vertical hoppers typically have lids, the uneaten food is protected from the elements until it falls down into the tray.

This gravity feeder is of a typical design. It has a hopper with a slanted plastic window that creates an open tray on the bottom and channels feed down to it, while the top has a hinged roof for easy refilling. Cleaning is easy—just open the roof, pull out the plastic window and you've got full access to the inside.

Building the Gravity Feeder

As we begin cutting the parts, we'll take advantage of workshop trick I use a lot, which is doubling up identical pairs of parts to cut them at the same time. For the feeder sides, select two pieces of 6" stock about 12" long. Copy the feeder pattern from **PAGE 21** onto one of them, as shown in **PHOTO 1**. Place this piece on top of the other and use brads or small finish nails through the waste areas around the pattern to attach the pieces together. Remember that if you're using cedar as I am here, you'll want these two pieces to be mirror-imaged so you can orient their rough faces in the correct direction for your project—when nailing the two pieces together, the rough sides should both be facing in, or both facing out. Note, too, that in **PHOTO 1** I've only placed a single nail in the waste area by the front curve. This makes it easy to separate the two pieces later.

Now, cut out most of the shape. I'm using a band saw in **PHOTO 2**, but a jig saw or cutting by hand with a coping saw would also do the trick. I mentioned that you should cut out "most" of the shape, but don't yet cut the curve on the front—we'll need that continuous straight edge in a moment. Separate the two pieces and pull out the remaining nail.

The plastic front window fits in slots cut into the inside faces of the feeder sides, and we'll cut these slots on the table saw. Since the plastic material used for the window is slightly less than ⅛" thick, a standard table saw blade can make a perfect slot. Set the saw's fence at 1½", and raise the blade to cut a ¼"-deep groove in a single pass (**PHOTO 3**). Again, be sure your workpieces are oriented so the rough sides will face in the direction you prefer.

With both slots cut you no longer need that straight edge, so cut out the waste from the curved edges of both workpieces. Smooth the inside curve by hand sanding, or speed up the process by doing the curves on a spindle sander (**PHOTO 4**).

Glue and nail the bottom between the two sides, as in **PHOTO 5**. In this photo I'm using nail set to place 4d galvanized finished nails just below the surface. If you have a power nailer load it up with 1½" brads and use that. Note here that I've temporarily placed a piece of scrap of the same width as the feeder floor on the opposite end, to hold the assembly square as I do the nailing.

Now, glue and nail the tray front into place as in **PHOTO 6**. Attach the ¼" x ½" window spacers at the inside bottom corners right behind the tray front with glue and a pair of brads, with the ½" faces of the spacers against the sides. The spacers set the height of the window to create

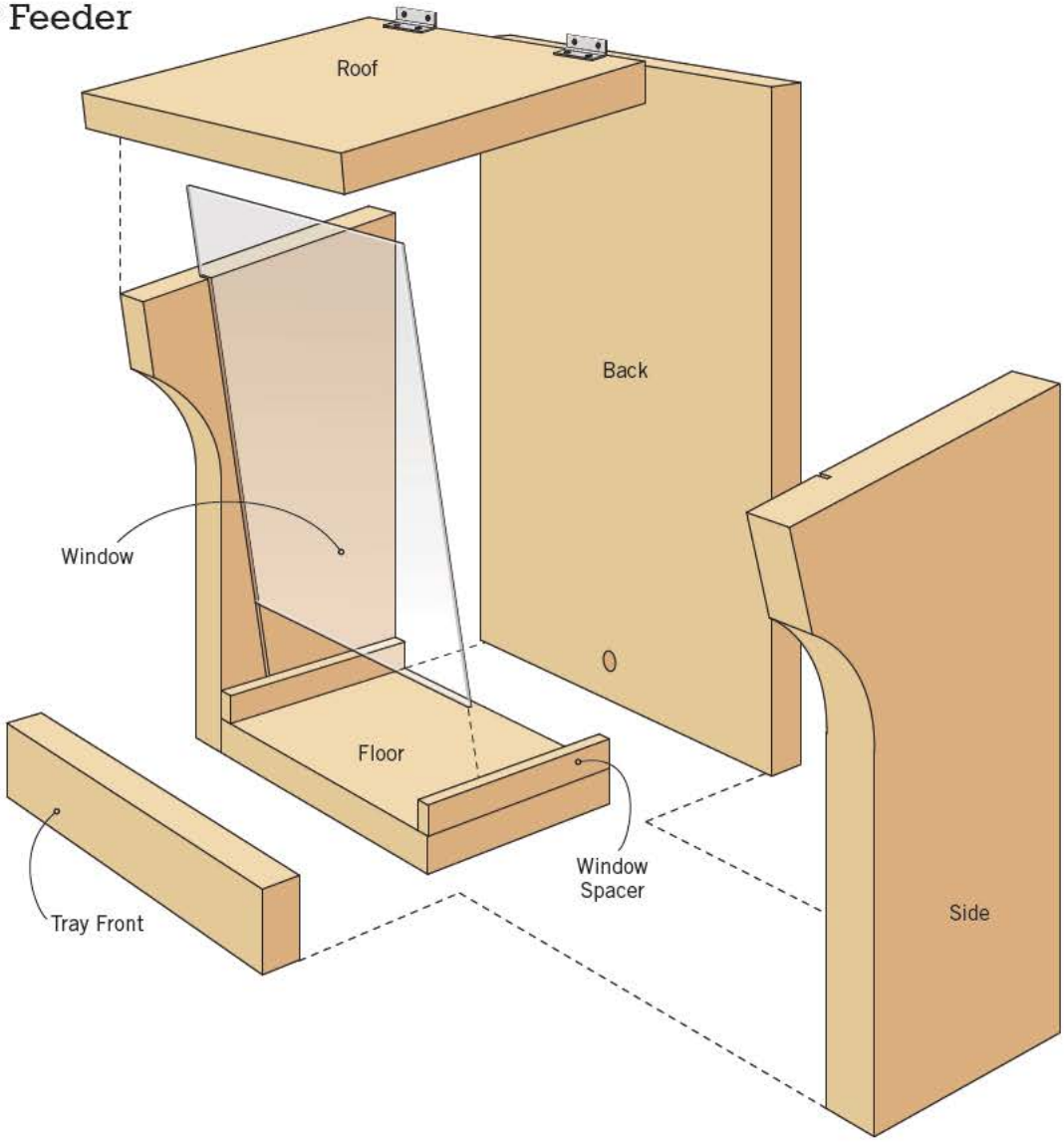
PHOTO 1 By doubling up matching workpieces, you cut two pieces in half the time and ensure that both are identical. Place brads in the waste.

PHOTO 2 Make all the cuts for the feeder sides except the curved front. Leave it a perfectly straight edge for now.

PHOTO 3 Cut a ¼" deep groove on the inside face of each side to accommodate the clear window.

PHOTO 4 A spindle sander makes for fast work when smoothing curved cuts.

Gravity Feeder



GRAVITY FEEDER CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	2	Sides	Cedar	¾"	5⅞"	11"	
B	1	Floor	Cedar	¾"	4⅛"	5¼"	
C	2	Window Spacers	Hardwood	¼"	½"	4⅛"	
D	1	Tray Front	Cedar	¾"	1½"	7"	
E	1	Back	Cedar	¾"	7¼"	14"	
F	1	Roof	Cedar	¾"	6¾"	7¼"	

Overall Dimensions: 7¼" wide x 10" deep x 14" tall

ADDITIONAL MATERIALS

Clear plastic, 5½" x 8⅞" (acrylic, Plexiglas, polycarbonate, etc.)

Brass hinges (2), 1" x 1½"

Pattern for Sides (Part A) (1" squares)

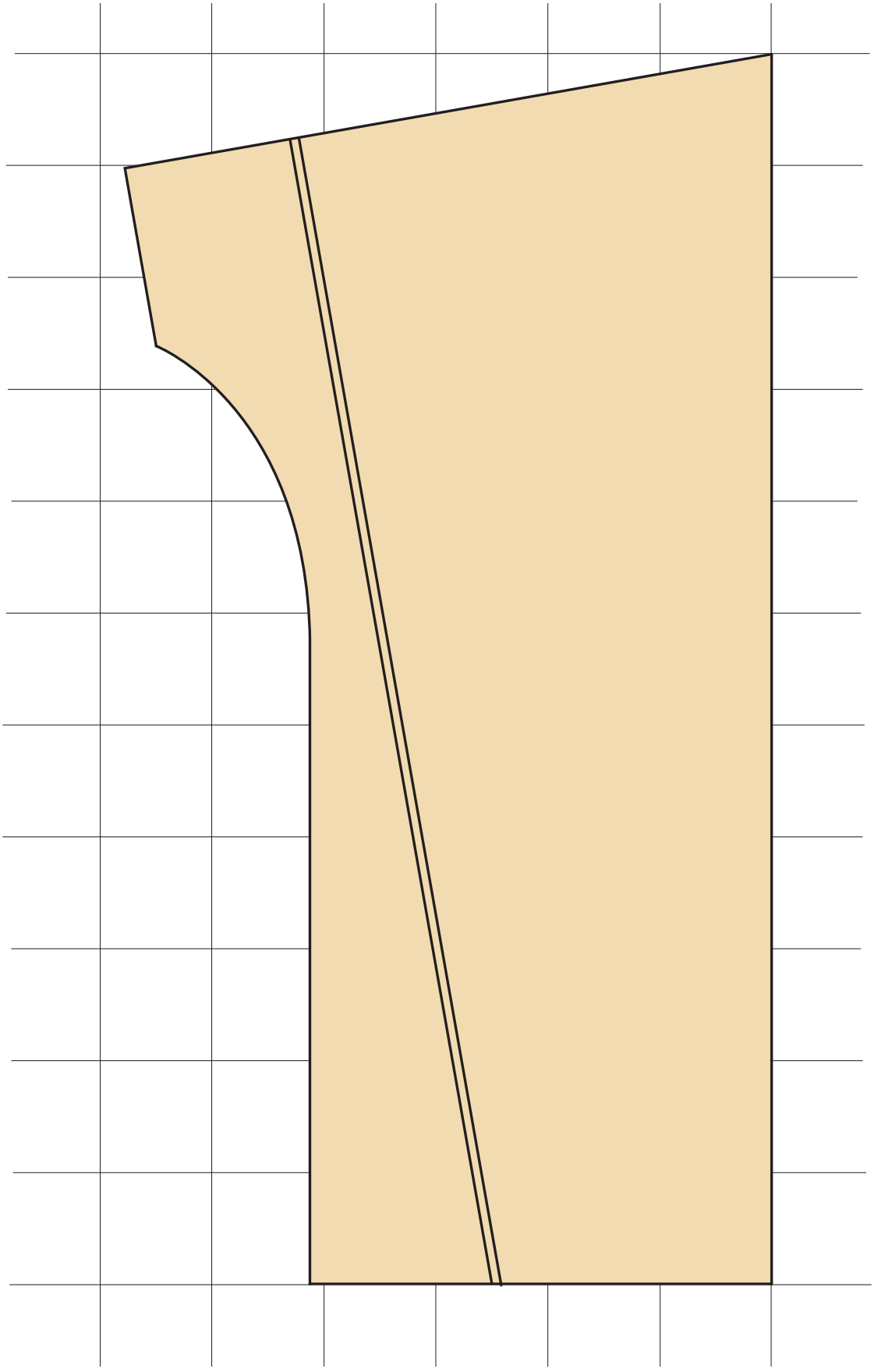


PHOTO 5 Using a temporary spacer as a support—seen at left in this photo—keeps everything even and square while you nail the structure together.

PHOTO 6 Galvanized nails or other weather-resistant fasteners are a must for outdoor projects like this feeder. Always use a nail set to drive the nail just below the surface.

a gap for seeds to flow into the feeder tray. These spacers can be made of any weather-resistant wood, but because the window rests on them it's best to use hardwood. The window isn't heavy, in fact it barely weighs a few grams, but over time it will still tend to sink into soft cedar.

Set the feeder upright and measure the exact distance between the bottoms of the slots (it should be about 5¾") and cut the window to width, allowing maybe ⅛" clearance on each side. I found that 5½" wide works well. The length of the slot from the spacers to the top of the feeder is about 9", but cut the window length a bit shorter, about 8⅞", to leave a small ventilation gap at the top. With the window cut, give it a test fit as in **PHOTO 7**. In this photo, you can also see how those spacers are placed.

The protective plastic film is still on the window; it's a good idea to always leave this film in place to protect the plastic while working. Remove the window and attach the feeder back with exterior-grade screws, as shown in **PHOTO 8**. You'll probably notice as you work your way through the projects that I usually use nails. However, I nearly always use screws when fastening the mounting surface, because it encounters the most stress.

Prepare the feeder for mounting by drilling a countersunk hole in the center of the top extension of the back, plus another inside the feeder. Drive screws through both holes to secure the feeder.

Then, it's just a matter of peeling off that protective film, inserting the window, and filling the feeder with your local bird's favorite feed mix.

PHOTO 7 Test fit the window and trim as needed for a smooth but slightly loose fit.

PHOTO 8 Drive screws carefully to ensure they're centered into the feeder sides.

Suet Feeder

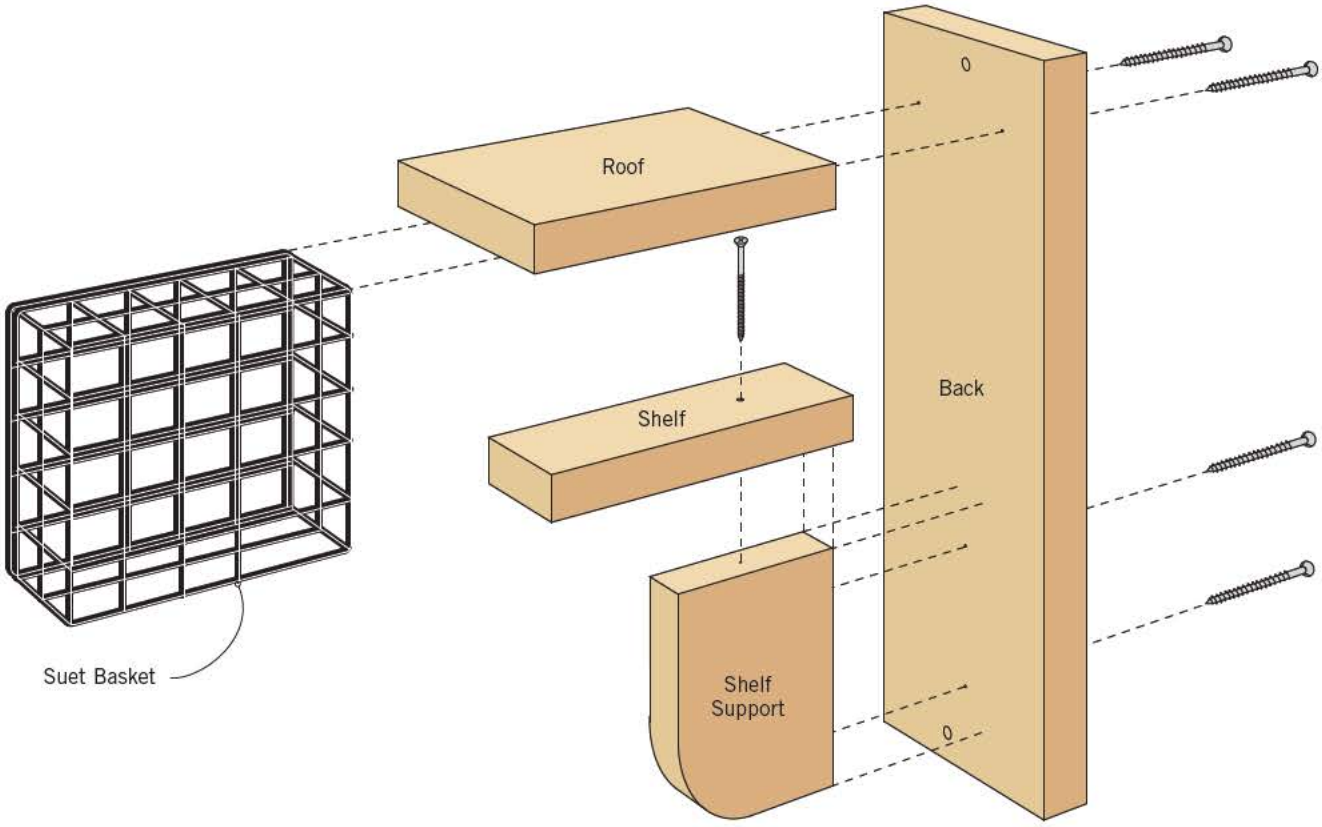
Not all birds live entirely on a diet of seeds, and instead prefer insects as the major portion of their regimen. You won't find these birds hanging around either of the previous two feeder projects.

In cold weather, however, those delicious bugs become scarce. That's not a problem for birds that head south in winter to a more bug-friendly climate, but birds that don't migrate have a difficult time finding a high-protein replacement for insects. Likewise, birds that are happy eating seeds all summer also like to supplement their winter diet with food containing more fat and protein. For both kinds of birds, suet fits the bill.

Suet is made from beef fat that has been cooked down and reconstituted as a solid. Sold in square cakes with the consistency of a hard chunk of butter, suet offers the high-protein, high-fat diet needed by such birds as woodpeckers, chickadees, nuthatches, wrens and other nonmigratory species with high metabolisms.

Birds can access suet most easily when it's contained in a wire basket or cage that holds the cake upright. The birds will hang on the wire and feed through the openings in the basket. You can find suet baskets anywhere animal supplies are sold for only a couple dollars, but these are always of a style designed to hang from a short length of chain. This is fine if you have a place to hang it, but if you don't (or if you want to attract large birds like flickers or

Suet Feeder



SUET FEEDER CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	1	Back	Cedar	¾"	3½"	13½"	
B	1	Roof	Cedar	¾"	3½"	6"	
C	1	Shelf	Cedar	¾"	1⅝"	6"	
D	1	Shelf Support	Cedar	¾"	3½"	4"	

Overall Dimensions: 3½" wide x 6¾" deep x 13½" tall

NOTES

Adjust dimensions to accommodate suet basket.

woodpeckers who have a difficult time with a swinging suet basket), a suet feeder you can mount firmly to a post or tree may work better.

We'll build this project around a commercially available suet basket, which we'll insert into the feeder mount. Most suet baskets are about 5" x 5" square and about 1½" thick. That's the size of the one I bought, and I've sized the parts to fit that. Measure the suet basket you get, and adjust the project dimensions accordingly.

Building the Suet Feeder

Cut the project parts to size. The first three parts are simple rectangles you can quickly cut to size, but the shelf support incorporates a curve, which I've cut on the band saw (**PHOTO 1**). You could make this cut by clamping the workpiece to the table and cutting with a jig saw, which you'll see in later projects. By the way, I've chosen Western red cedar but this particular piece of lumber was very light-colored, hardly red at all. It'll have all the weather resistance of its darker cousins, however.

Glue the roof to the feeder back piece at a right angle, placing the roof 1½" down from the top, and clamp in place as in **PHOTO 2**. This is a simple butt joint, not the strongest of woodworking joints, so to reinforce it once the glue has dried remove the clamps and drill a pair of countersunk pilot holes through the back and into the shelf, then drive 1⅝" exterior-grade screws (**PHOTO 3**).

Secure the assembly upside down in a bench vise or clamp it to a work surface. Center the suet basket on the underside of the roof, making sure that the access door opens freely to one side or the other, and attach the basket with fence nails or staples that can be hammered into place. In **PHOTO 4**, I've already hammered in two nails and am about to add a third halfway between them.

To create the support shelf assembly, glue and clamp the two pieces together as in **PHOTO 5**. As before, when the glue has dried drill a countersunk pilot hole from the top of the shelf and into the center of the support, and reinforce the assembly with a 1⅝" exterior screw (**PHOTO 6**).

Hold the support assembly snugly beneath the suet basket and mark its outline in pencil, then drill a pair of pilot holes centered in the outline as shown in **PHOTO 7**. I've made the outline dark here so it shows up well in the photo, but make your pencil marks as light as you can. With the holes drilled, countersink them from the back.

Glue and clamp the assembly into place as in **PHOTO 8**, then when the glue has dried drive a pair of 1⅝" screws through the back to reinforce the assembly.

Finally, place the feeder into a bench vise once again,

PHOTO 1 Use a band saw or a jig saw to cut the curve on the support block.

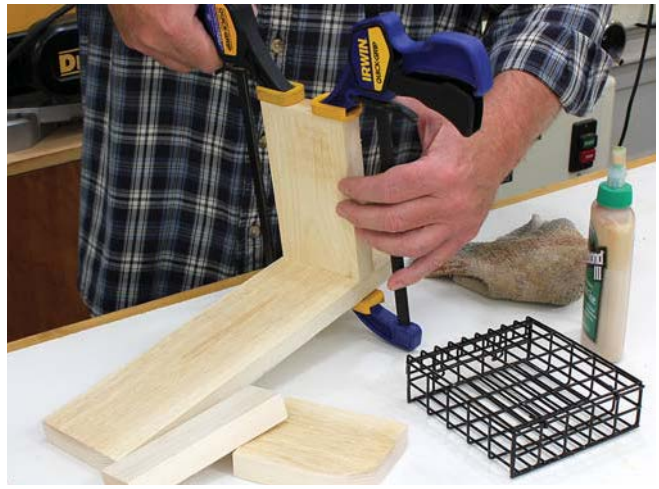


PHOTO 2 Glue and clamp the roof to the feeder back.

PHOTO 3 To reinforce the butt joint, drill pilot holes and drive exterior-grade screws.

PHOTO 4 Attach the suet basket with fence staples or nails.

PHOTO 5 Glue and clamp the support to the shelf.

PHOTO 6 Reinforce the assembly with a weatherproof screw driven in from the back.

PHOTO 7 Position the supports assembly beside the basket and outline it in pencil so you can drill pilot holes.

PHOTO 8 When the glue dries reinforce the assembly with exterior screws driven in from the back.

right side up this time, and hammer in three fence nails to secure the basket to the shelf.

That curved shelf support really isn't necessary because the feeder will be plenty strong with the screws we drove in, along with the added rigidity of the wire basket. The more important reason for it is to provide a tail rest for larger birds. While tiny chickadees, nuthatches and downy woodpeckers will happily climb all over the basket and feed from any position including upside down, flickers and larger woodpeckers typically feed on suet in an upright position. The tail rest helps them balance while eating.

Suet comes in a variety of formulations, many with seeds, nuts or raisins in the mix. As a result, don't be surprised if you see seed-eating birds like cardinals and finches inviting themselves to dinner.

Although suet is especially important in winter, you can put it out year-round. Be careful in hot weather, though: High temperatures can melt the suet or turn it rancid. Fortunately, animal suppliers now offer a "no melt" formulation for hot-weather use. In the summer, use this type of suet or place the feeder in a shady spot, or do both.

Squirrel Feeder

Squirrels are fun to watch… unless they're raiding your bird feeders that is. It's not that you actually mind feeding the squirrels—I certainly don't—it's just that when they're in the bird feeder the birds won't go near it. They also make a huge mess wastefully tossing seed around.

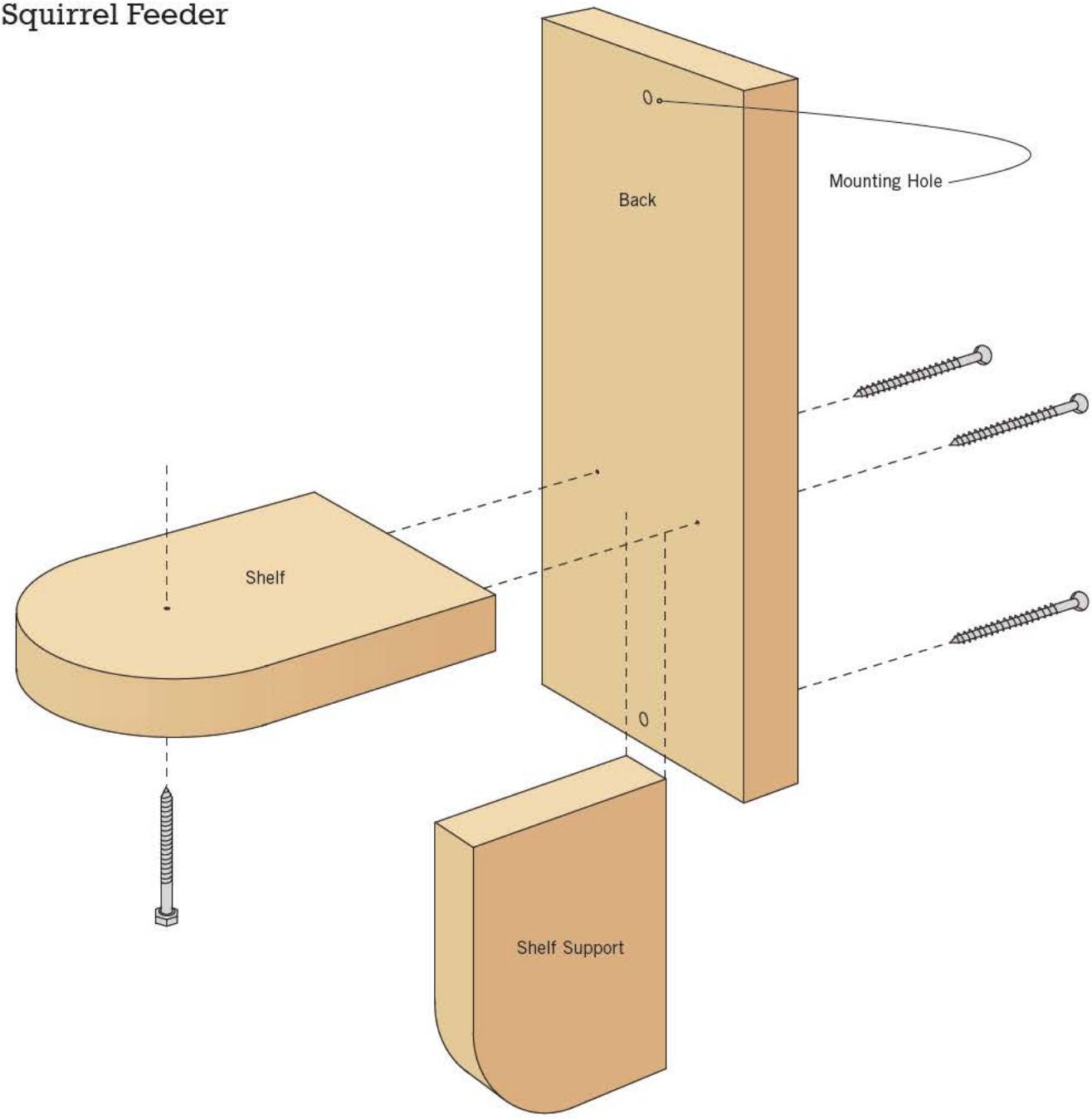
You can guard your bird feeders with a squirrel deterrent of the type described in the introduction, and while that's always a good idea why not give the squirrels a feeder of their own? Make it easily accessible to the little furry bandits, and there's a good chance they'll leave your guarded bird feeders alone—as long as there's a fresh corncob on the menu.

Building the Squirrel Feeder

Begin by cutting your parts to overall size, then cut the front curve on the feeder shelf with a jig saw, scroll saw, or band saw (**PHOTO 1**). Follow this up by cutting a similar curve on one side of the shelf support. The exact shape of these curves isn't critical at all; you can just trace a drinking glass or coffee cup to get the curve.

Drill a ¼" hole about 1½" from the front of the shelf to accept a 3" lag screw, which will hold the corncob. Drill the hole all the way through, then counterbore it to a depth of ¼" from the underside as shown in **PHOTO 2**. This will allow the head of the lag screw to be recessed below the surface of the wood.

Squirrel Feeder



SQUIRREL FEEDER CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	1	Back	Cedar	¾"	3½"	10"	
B	1	Shelf	Cedar	¾"	3½"	5"	
C	1	Shelf Support	Cedar	¾"	2½"	4"	

Overall Dimensions: 3½" wide x 5¾" deep x 10" tall

Twist the screw into place from the underside of the shelf until you reach the unthreaded portion, which will leave the head protruding about an inch. Mix up a small amount of epoxy glue and spread it on the top of the screw shaft and under the head (**PHOTO 3**). Insert the screw the rest of the way into the counterbored hole and allow the epoxy to cure according to package directions.

Glue the shelf support onto the underside of the shelf and clamp in place, as in **PHOTO 4**. Note that this will cover the counterbore and screw head. Once the glue dries, drive a couple of 1½" brads or 4d nails down through the top of the shelf to reinforce the glue joint, as in **PHOTO 5**.

Prepare the feeder back piece by drilling countersunk mounting holes about ¾" from the top and bottom. Now, drill and countersink three pilot holes to secure the shelf assembly from the back of the feeder. Locate these holes so the surface of the shelf is about 6" from the top of the back piece. To make this easier, you may want to first hold the shelf assembly in place and trace around it in pencil to act as a drilling guide, as with the shelf assembly on the suet feeder in the previous chapter. Apply a bit of waterproof glue to the back edges of the shelf assembly and screw it into place with three 1⅝" exterior-grade screws (**PHOTO 6**).

Commercial squirrel feeders use a thin, smooth rod to hold the corncob. These don't work particularly well because the squirrels have no trouble knocking the corncobs off the rod and onto the ground. By using a lag screw, however, you can twist the corncob securely onto the feeder (**PHOTO 7**). The screw doesn't need to be sharp at the tip, so use a file or sanding block to dull the tip and prevent sticking yourself when mounting corncobs.

Locate the feeder on a tree or other squirrel-accessible surface at eye level or slightly above so everyone gets a good view of the action, but keep it away from your regular bird feeders. Most important, always keep a fresh corncob available. Squirrels will happily go after the easy pickings on their own personal feeder as opposed to trying to rob the less accessible bird feeders. But let their feeder get empty, and they won't hesitate to make a full-scale assault on your bird feeders.

PHOTO 1 Cut the front curve on the feeder shelf using a band saw or jig saw.

PHOTO 2 Drill a counterbored hole for the lag screw that will hold the corncob.

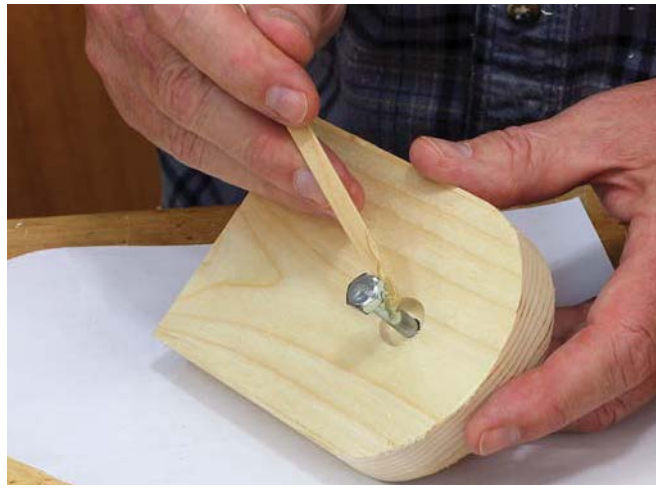


PHOTO 3 Mix a small amount of epoxy glue to hold the lag screw in place.

PHOTO 4 Glue the shelf support to the underside of the shelf. It covers the countersunk head of the lag screw.

PHOTO 5 Reinforce the glue joint with a few nails.

PHOTO 6 Glue and screw the shelf assembly to the back of the feeder.

PHOTO 7 Twist a corncob onto the lag screw. The squirrels won't be able to knock it off.

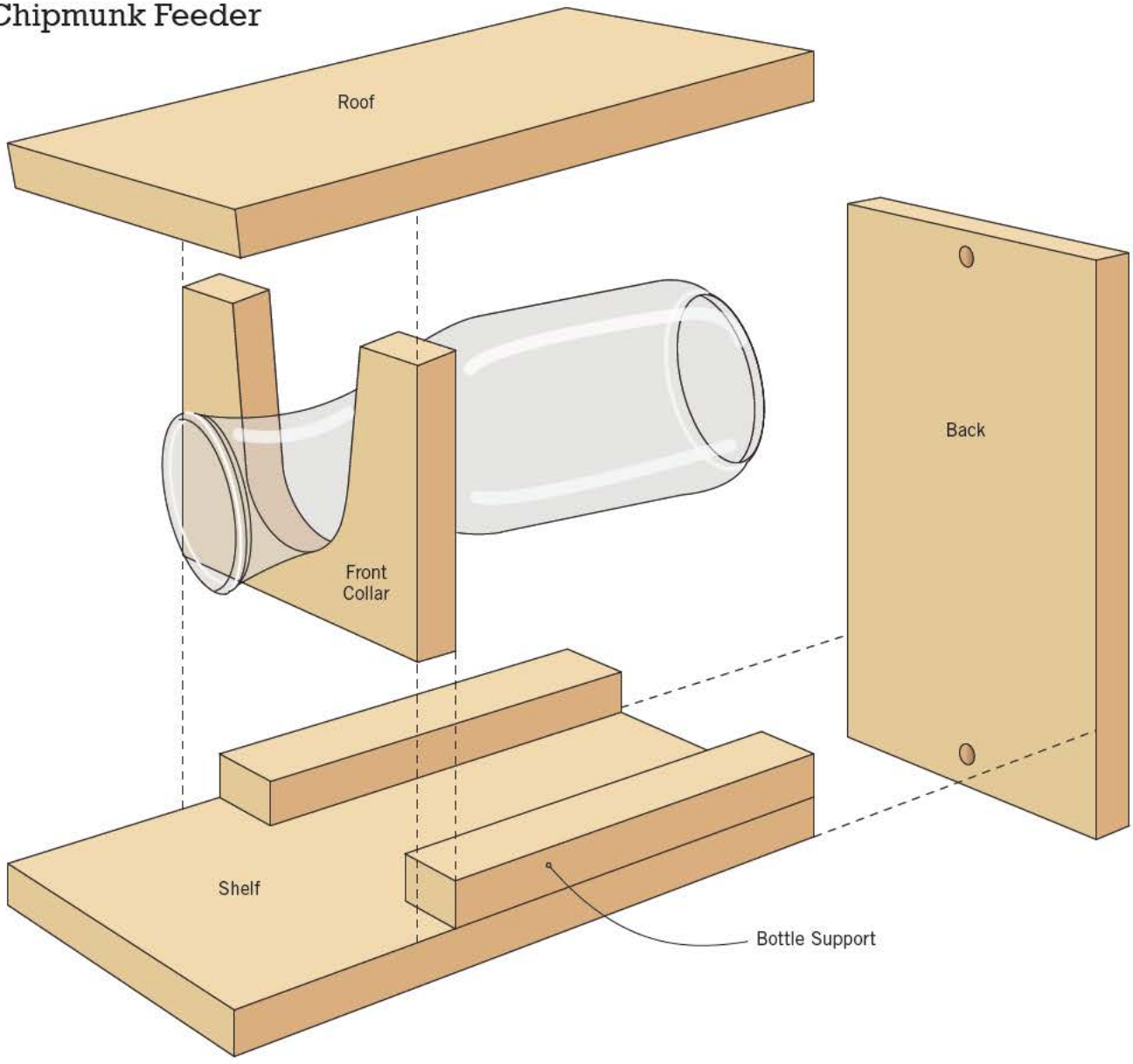
Chipmunk Feeder

Squirrels are great, and I love feeding and watching them, but chipmunks have always been my favorite. Maybe it's because my daughter was in love with Chip & Dale when she was little (she never could decide which one she wanted to marry… fortunately), or maybe it's their high-speed antics as they chase each other around. In truth, it's probably their racing stripes.

Attracting chipmunks is easy. You just put out the same feed you would for squirrels, usually whole corn. But if you do the chances are good the squirrels will scarf down all the chow before the chipmunks get a shot at it, and so will large birds like jays and crows. The solution is to put out the food so the chipmunks have full access but nobody else does, by putting the feed inside something chipmunks easily can get into, but squirrels can't.

This project solves the problem by using a glass bottle to contain the feed. By choosing a bottle with a neck diameter sized just for chipmunks, they happily climb right into corn heaven. A diameter between 1½" and 1¾" will admit all but the fattest chipmunks, and keep out all but the tiniest squirrels. Any bottle will work, but glass is best—a plastic bottle with a perfectly sized neck won't stay that way long, because squirrels will quickly gnaw a larger opening. Wine carafes, the type with heavy glass, work particularly well. While the actual neck diameter is small, the flared top allows easy access for chipmunks and makes

Chipmunk Feeder



CHIPMUNK FEEDER CUT LIST

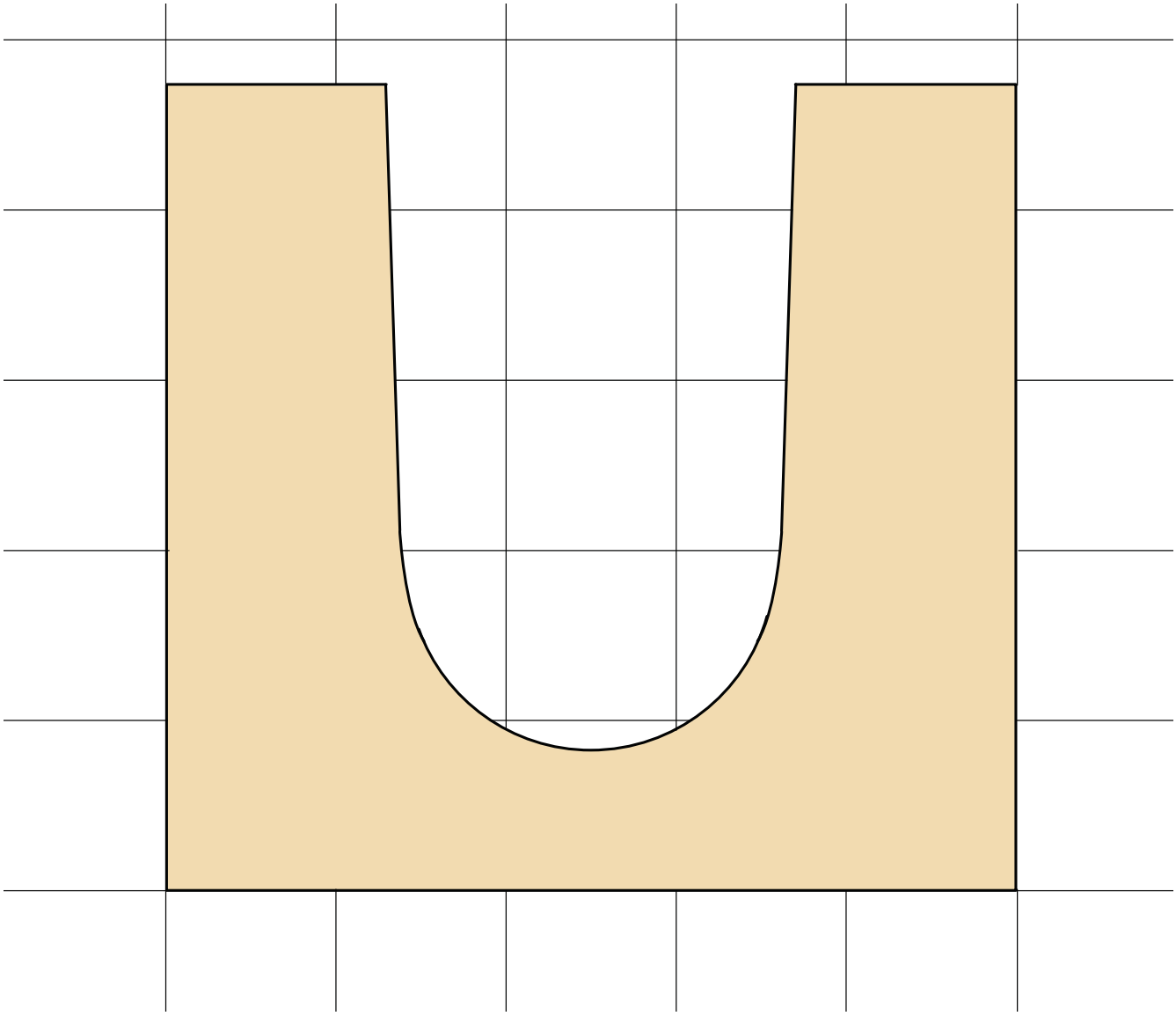
REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	1	Back	Cedar	¾"	5"	11"	
B	1	Shelf	Cedar	¾"	5"	11"	
C	2	Bottle Supports	Cedar	¾"	1"	7¼"	
D	1	Front Collar	Cedar	¾"	5"	4¾"	
E	1	Roof	Cedar	¾"	5"	11"	

Overall Dimensions: 5" wide x 11 ¾" long x 11" tall

ADDITIONAL MATERIALS

Glass bottle or wine carafe with inside neck opening between 1½" and 1¾".

Front Collar pattern (1" squares).



Although chipmunks are omnivorous, they readily welcome a feeder full of corn kernels as they hoard food for the winter.

Photo by Margaret M. Stewart/Shutterstock.com

for easy refilling for you.

Most of the projects in this book begin with cutting all the parts to size. But because everything in this project is sized to fit the bottle or jar you'll use for the feed container, you can't do much cutting until after some measuring. While the actual construction isn't difficult, there is a lot of measuring to get right.

Building the Chipmunk Feeder

Because the bottle nestles between a pair of ¾" x 1" supports, cut two short lengths of this material to use as sizing guides. Align one of the guides on the edge of a piece of ¾" stock (I'm using Western red cedar). Now, place your bottle up against it, then snug the second piece along the other side of the bottle and mark it, as shown in **PHOTO 1**. This will determine the width of all the other project components. In my case the final width came to exactly 5" as presented in the Cut List on **PAGE 32**, but adjust yours to the bottle you have.

Now measure the outside diameter of the bottle's neck. The front of the feeder has a cutout matched to this diameter that acts as a collar to hold the bottle, so measure exactly (**PHOTO 2**). The last measurement you need to make is the distance between the outside of the bottle's neck and the body of the bottle. When laid down on its side, this measurement will determine the height of the cutout in the front collar.

When all your critical measuring is done and written down, cut the project parts to overall length and width by whatever means you prefer. In **PHOTO 3**, I'm making a perfectly straight rip cut with a jig saw by clamping a straightedge to the workpiece to guide the cut.

The feeder roof has a slight slant to it, so when cutting parts make a 5-degree bevel on the top of the front collar and the back edge of the roof. You could adjust the base of your jig saw to a 5-degree angle and cut the bevels that way, and in other projects I show cutting bevels with a hand saw and miter box, but this time I'm using the table saw (**PHOTO 4**).

Prepare the front collar by first marking a vertical center line. Set a compass to the bottle's outside neck diameter and draw a circle on the workpiece positioned to match the height needed to support the bottle neck (the last measurement you made above), as in **PHOTO 5**. Be sure the bevel is oriented to the top. Extend the sides of the circle to the top of the workpiece, angling them just slightly to the outside edges. You want this opening to be slightly wider at the top to make it easy to insert the bottle without binding, but tight enough so it rests snug at

PHOTO 1 Measure the overall width with bottle and side supports in place. This will determine the width of all other project components

PHOTO 2 Calipers are perfect for getting the exact diameter of the bottle neck.

PHOTO 3 A piece of 1x2 clamped to the workpiece allows you to make beeline-straight rip cuts in long stock.

the bottom, as shown on the pattern on **PAGE 33**. Keep in mind that this pattern is sized to exactly match the bottle I used and you'll need to make your own.

Cut out the opening on the band saw as **PHOTO 6**, or with your preferred method (jig saw, coping saw, scroll saw, whatever).

Place the front collar underneath the bottle's neck and position the assembly on the feeder shelf so the back of the bottle is about ⅛" from the end of the workpiece, as shown in **PHOTO 7**. Measure this distance to determine the length of the two bottle supports, then cut them to length. Mine came out to 7¼", but yours may be different.

Attach the two bottle supports to the feeder shelf with waterproof glue and nails (**PHOTO 8**). By nailing from the underside, the nails will be less visible in the finished project.

Glue and clamp the front collar in place at the front ends of the bottle supports. Drill and countersink two pilot holes from the underside of the shelf up into the collar, then drive in a pair of 1⅝" exterior-grade screws (**PHOTO 9**).

Correctly positioning screws from the rear of a project can be difficult. To help attach the shelf assembly to the feeder back, first set it in place 2" from the bottom and trace around it as in **PHOTO 10**. Now, drill pilot holes through the outline and countersink them from behind. This is also a good time to drill the countersunk mounting holes, one each centered at the top and bottom of the back.

Insert the bottle so it nestles down into the collar and supports, and then clamp the roof in place. Drill two countersunk pilot holes through roof and down into the front collar, and another pair through the back and into the rear portion of the roof (**PHOTO 11**). With everything still held in place by the clamp, drive screws to secure the roof but don't glue it, in case you ever want to remove the bottle for a thorough cleaning or replacement.

Now just mount the feeder, fill it with corn, and sit back to watch the chipmunks enjoy their own private dining room… and the frustration of the squirrels who can't get in.

PHOTO 4 Saw a 5° bevel on the end of the roof piece.

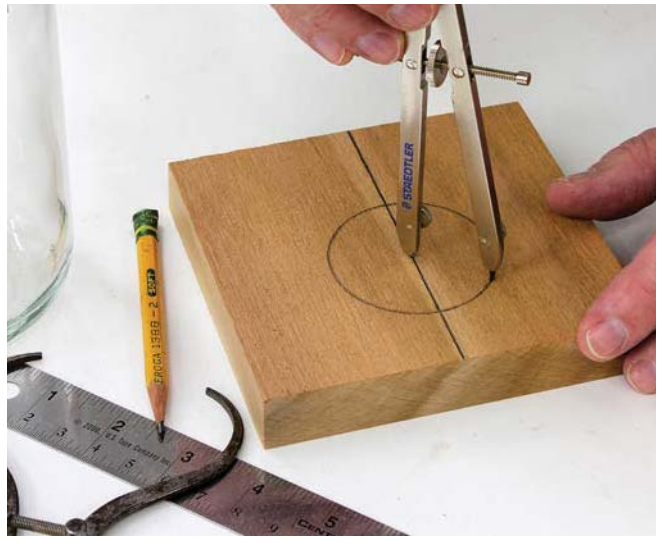


PHOTO 5 Use a compass and center line to draw the bottle's outside neck onto the wood.

PHOTO 6 Cut out the collar opening carefully for a snug fit when the bottle is in place.

PHOTO 7 With the bottle and collar in place, check for square then measure for the length of the bottle supports.

PHOTO 8 A brad nailer makes for fast work, but galvanized 4d finish nails would also work fine.

PHOTO 9 Exterior-grade wood screws will secure the project components without rusting or corroding.

PHOTO 10 Avoid errors in screw placement by tracing an outline of the shelf assembly, and then centering pilot holes.

PHOTO 11 After clamping the roof in place, pencil an outline of the roof thickness to act as a guide when drilling countersunk pilot holes.

Deer Feeder

Except in times of drought, deer do pretty well for themselves in the wild when it comes to finding enough to eat. Even so, they're beautiful creatures, and many people enjoy attracting them to their yards. Of course, in rural locations like mine the deer don't need much more attracting beyond seeing all the flowers, shrubs and other landscaping just waiting to be snacked on. If the deer have something else to eat, they'll often leave our landscaping alone. A deer feeder can help.

So far we've stuck pretty much with wood for our projects. But there are a lot of other materials suitable for wildlife structures. Some, like the PVC pipe and fittings in this deer feeder project, are perfect for outdoor use—in fact, the PVC will most likely outlast the wooden pole it's mounted on.

This PVC deer feeder keeps everyone happy. The deer can chow down at their leisure, our bushes live in peace, and we have the enjoyment of watching it all. Painted to blend in with trees and shrubs, the cylindrical feeder design fits into most landscapes.

It's also easy to make—you can probably turn one out in about an hour—because it uses off-the-shelf PVC in a variety of diameters from the home center. I've used 4" foam-core pipe here, but a feeder of the same size made from 6" pipe holds more than twice as much feed. The foam-core pipe is much easier to cut than solid PVC.

In addition to the pipe itself, you'll need a pipe cap to close off the top, and a 45-degree wye fitting of the same diameter as the pipe. These will be regular solid PVC, not foam-core, but you won't need to cut them.

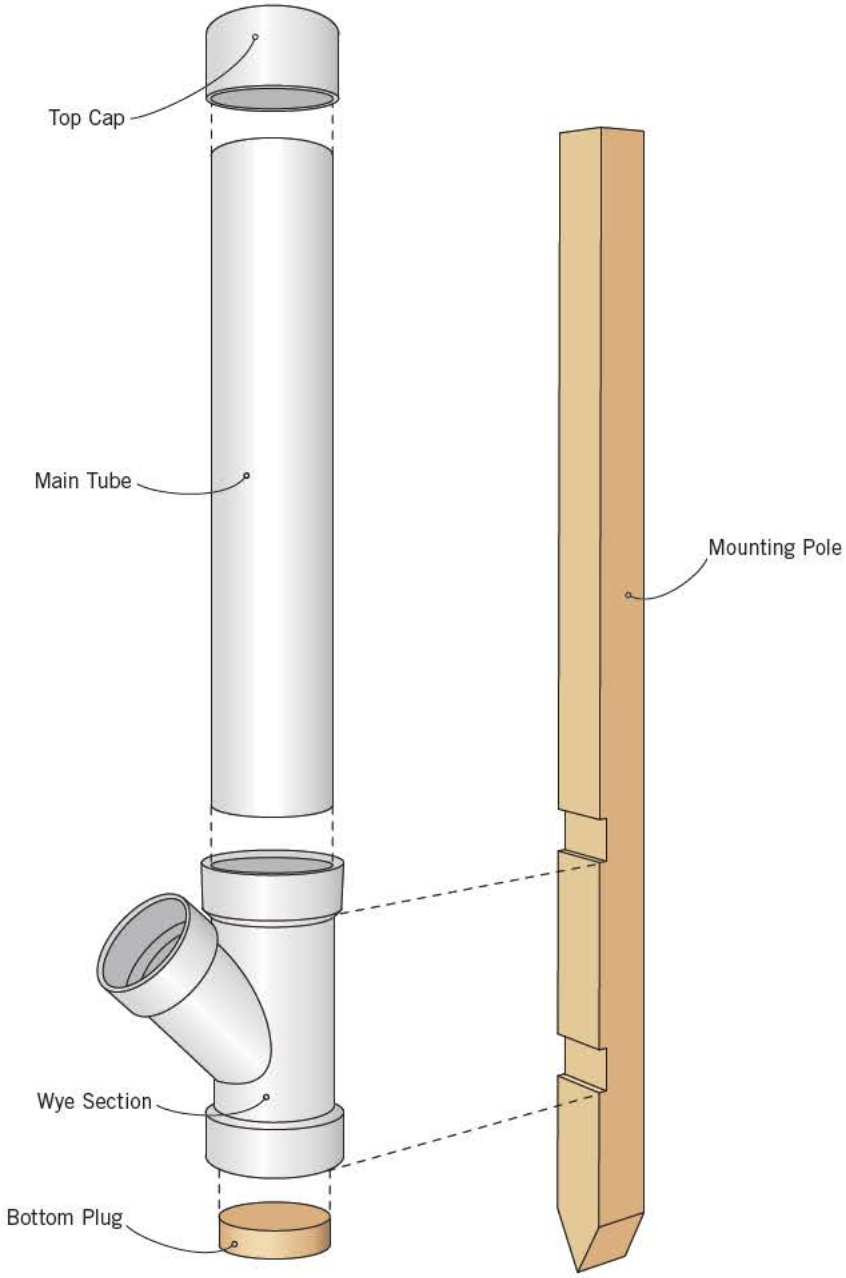
Start by cutting the pipe to the length you want. For the project feeder I've chosen a short 24" section of pipe. You may prefer a taller feeder that goes longer between fillings, so consider a 48" or even a 60" length if you don't mind reaching up pretty high to refill it.

Building the Deer Feeder

Cut PVC in a miter box with a hand saw; foam-core pipes cut quickly and easily. A table saw is not safe; you can use a band saw but only if you make a jig to hold the pipe steady, otherwise the saw blade is liable to catch and shatter the pipe, the blade, or your hand.

Because the top will go on and off a lot, use a loose PVC cap on the top of the feeder. You won't need to take the bottom off much, if at all, so it can be a wooden plug

Deer Feeder



DEER FEEDER CUT LIST

REFERENCE	QUANTITY	PART	STOCK	DIAMETER	LENGTH	NOTES
A	1	Main Tube	PVC	4" Nominal	24"	Adjust length of main tube to suit your needs.
B	1	Wye Section	PVC	4" Nominal	12"	
C	1	Top Cap	PVC	4" Nominal	n/a	
D	1	Bottom Plug	Pine	4½"	n/a	Diameter approximate; measure opening of wye section.
E	1	Mounting Pole	Pine	2x2	48"	

Overall dimensions: 35½" high not including mounting pole

inserted from the bottom and attached with screws.

Make a tracing of your pipe on a piece of scrap 2x6 as shown in **PHOTO 1**. PVC is generally sized by inside diameter, so a 4" nominal pipe will have an overall diameter that includes the thickness of the pipe walls, and will be approximately 4½". By tracing it, you'll get an exact fit for the inside of the wye. Cut out the plug with a jig saw, coping saw or on the band saw (**PHOTO 2**). Test the plug in the bottom of the wye to ensure it slips in and out easily. You don't want a tight fit because outdoor dampness will likely swell the wood a bit. Adjust the fit by sanding the plug until it inserts smoothly and easily.

Drill a few ¼" drainage holes in the plug, and then insert it into the bottom of the wye. Drill countersunk pilot holes, one on each side, and secure the plug with 1¼" exterior-grade screws as in **PHOTO 3**. Once you've set up the feeder, if you ever need to clean it, just back out the two screws and reach inside the wye opening to tap the bottom plug out.

If you plan to leave your deer feeder plain you can skip ahead, but now's a good time to paint the feeder if desired using a spray paint formulated for plastics. Lightly scuff-sand the surface of the PVC all over to help the paint adhere, put the top cap into place, and mask off the opening of the wye to prevent paint from getting anywhere inside. A large wad of newspaper shoved into the opening with masking tape around the edges does the trick nicely.

With the assembly lightly sanded and the opening masked, adjourn outdoors for the painting itself. Be sure to follow label directions on the can, but generally you'll want to hold the can 8" to 10" from the feeder and move quickly up and down as in **PHOTO 4**. Paint right over the top cap, but avoid getting paint up into the joint underneath the cap or you may have trouble getting it off. The idea is to paint everything visible, but leave unpainted the top portion of the pipe where the cap slips on, to allow the cap to be removed easily. By painting with the cap in place, the cap itself masks off the top to keep it paint-free.

You probably already know where you want to place your feeder, but depending on the location you may have a choice of ways to mount it upright. If there are trees you can simply attach the feeder to a tree with screws, strap it in place with zip ties or other strapping, or if it is a seasonal feeder just hang it in place with duct tape and take it down at season's end.

There's no tree needed if you attach a mounting pole to the feeder and drive it into the ground. I've used a standard piece of 2x2 pine sharpened at the bottom and coated with an exterior stain for protection.

The white-tailed deer ranges from northernmost South America all the way up to the southern reaches of Canada.
Photo by Guy J. Sagi/Shutterstock.com

PHOTO 1 Tracing the pipe onto a piece of 2x6 gives an exact size for the bottom plug.

PHOTO 2 A band saw makes quick work cutting out the bottom plug.

To mount the pole flush with the back of the feeder, you'll need to cut some shallow notches—about ¼" deep—to accommodate those bulges at the top and bottom of the wye fitting. Trim the upper part of the pole to finish just below where the top cap rests. Place the pole against the feeder and mark where the notches need to go, as shown in **PHOTO 5**.

As shown in **PHOTO 6**, to make chiseling out the notches easier, make a series of ¼"-deep cuts between your marks with a hand saw or jig saw . Secure the pole notch-side up in a vise, and use a bench chisel to pare out the waste (**PHOTO 7**).

Drill two pilot holes through both the pole and feeder from the back side, one near the top and one through the center of the wye fitting. Slip a washer onto a ¼" x 2" hex bolt, slide it through the pole and into the feeder, top with another washer and a nut from the inside. You'll need to reach into the wye section with a small wrench or pliers to hold the nut while you tighten the bolt from the outside (**PHOTO 8**).

All that's left now is to take the feeder outside, drive it into the ground in a spot away from any landscaping you want the deer to avoid, and fill it up. Your deer aren't fussy and will eat just about anything (they've been munching on landscaping, remember?). You can find feed formulated for deer at any outdoor or feed/supply store, plus goat feed and other farm mixes work well, as does plain corn.

To make your new café complete, add a salt lick to further entice the deer.

PHOTO 3 Exterior-grade screws are essential for outdoor projects. These coated screws will last for years.

PHOTO 4 Use spray paint in a well-ventilated area; outdoors is always best.

PHOTO 5 Carefully mark the pipe's bulge locations on the mounting pole for clearance notches.

PHOTO 6 Make several relief cuts before cutting out the notches.

PHOTO 7 Pare the waste out of the notches with a sharp bench chisel, then sand smooth if needed.

PHOTO 8 Locate the lower bolt in a spot that's easy to reach from inside the wye fitting.

Working with PVC

There are different types of PVC pipes depending on the plumbing use, but for our deer feeder water pressure isn't an issue. That means you can use "foam-core" PVC—the lightest, least expensive and easiest to cut variety. Although the outer and inner surfaces are hard and smooth, the material inside the pipe walls is soft and airy. Don't let that fool you, these pipes are strong.

PVC is covered with markings printed right on the plastic. If you leave the PVC plain they're unsightly and if you paint it they're likely to bleed through, so remove them if you can. The manufacturer may have used ink that rubs off easily with a rag dampened in denatured alcohol. Some manufacturers use more permanent ink, but light sanding will remove it (**PHOTO 1**).

Connecting PVC components is a two-step process using primer and cement; you must work in a well-ventilated area. First, you prime the mating surfaces with purple primer, usually sold in a kit containing both primer and cement. This stuff will stain permanently so spread out newspaper and you may want to put on gloves and an apron.

Both primer and cement have applicator swabs attached to the lids. Rub the primer applicator around the entire inner surface at the top of the wye fitting, then around the bottom of the pipe that will go inside the fitting (**PHOTO 2**). The primer will dry very quickly as its solvent evaporates.

Now swab cement on the freshly primed surface. You don't need a lot—you're not plumbing a house so there are no worries about code inspections here—so swab on just enough to seal the joint and keep the rain out. Working quickly while the cement is still fresh, twist the pipe into the fitting until it seats at the bottom of the wye opening (**PHOTO 3**). Set the assembly aside and allow it to dry. It won't take long.

One last note: The nominal dimension for PVC is inside diameter.

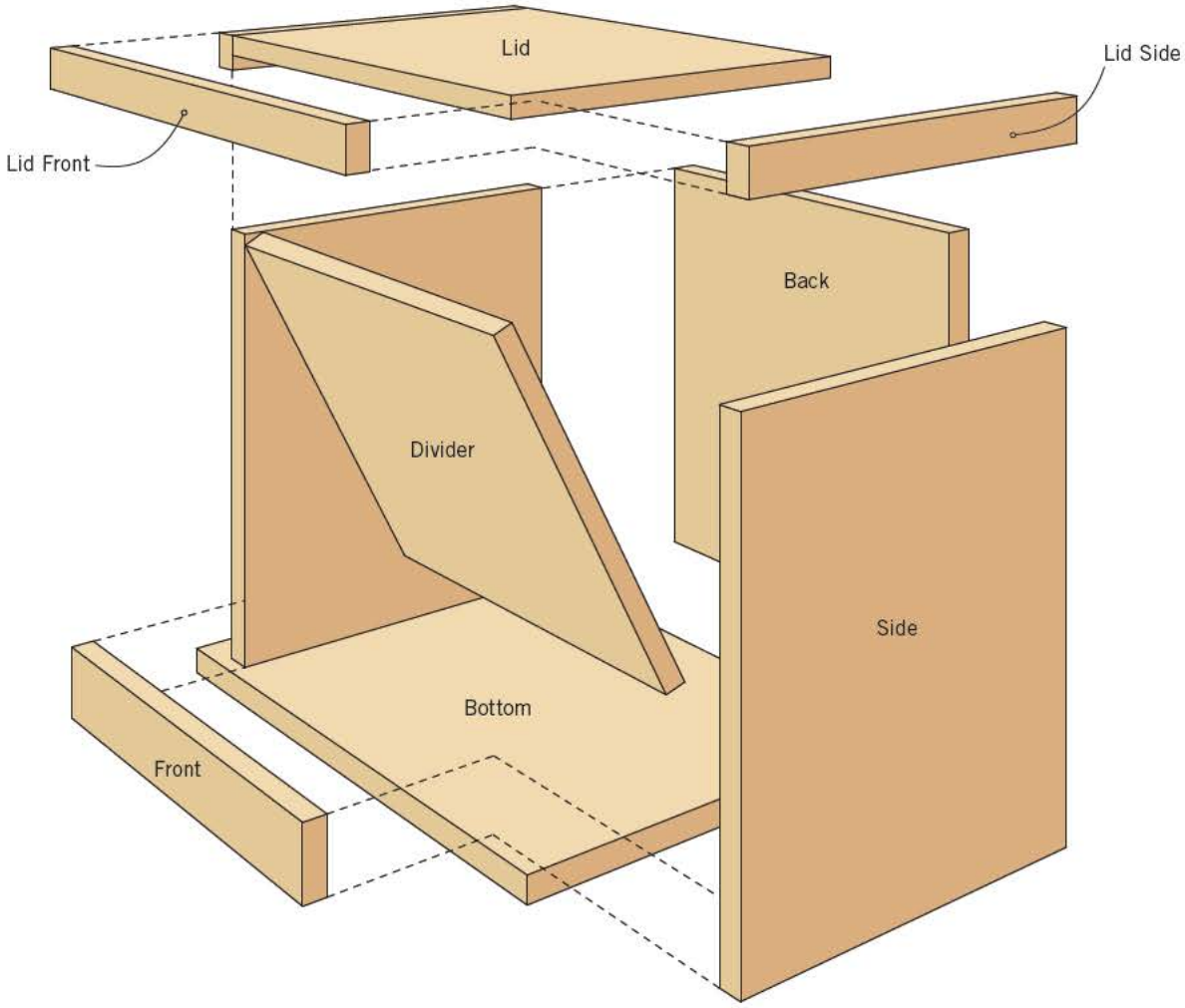
Adaptable Hopper Feeder

A gravity feeder works perfectly for birds. The hopper style lets you fill it with a large quantity of feed that lasts longer, while its enclosed nature keeps the food clean and dry. But the design isn't just for the birds; it'll also work for just about any other animal you want to feed. With that in mind, here's a large hopper feeder you can customize for whatever animal you have in mind.

When adapting this feeder, the main thing to adjust is the angle of the divider. For larger animals like deer or big dogs, you'll want the divider angled closer toward the back to allow the animals to get their heads into the feeding tray opening at the bottom. Smaller animals like ducks, wild turkeys, smaller dogs or cats don't need such a large tray, so you can angle that divider farther forward. As a benefit, the more forward the divider is angled, the greater the hopper's storage volume.

The feeder I'm building in this project is for my daughter's two large dogs, so I've set the angle of the divider to allow for an opening that extends about 6" into the feeder. Plenty of room for Merle and Hank to get their slobbery heads in there and chow down.

Adaptable Hopper Feeder



ADAPTABLE HOPPER FEEDER CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	2	Sides	Pine	¾"	11"	16"	
B	1	Back	Pine	¾"	12"	16"	
C	1	Divider	Pine	¾"	14½"	12"	
D	1	Front	Pine	¾"	2½"	12"	
E	1	Bottom	Pine	¾"	12"	15½"	
F	1	Lid	Pine	¾"	11⅛"	13¾"	
G	2	Lid Sides	Pine	¾"	1¾"	11⅛"	
H	1	Lid Front	Pine	¾"	1¾"	15¼"	

Overall Dimensions: 15½" wide x 12" deep x 17½" tall.

ADDITIONAL MATERIALS

Weatherproof hinges, 2½"

Weatherproof latch

Building the Hopper Feeder

Cut your stock to size per the Cut List on **PAGE 44**. I'm using a jig saw to make the crosscuts in **PHOTO 1**, but use whatever method and tool you prefer.

Now, lay out the location of the angled divider. You want the divider gap at the bottom where the feed comes out to be even with the tray front, which is 2½", so draw a line 2½" from the bottom edge. Now make a mark at the front at ⅝" from the top; this gap will allow for clearance of the angled top of the divider, plus a ¼" gap for ventilation. Now it's just connect-the-dots by placing your 14½" divider on the ⅝" mark to where it crosses the line at 2½". This will angle the divider at 27 degrees, as you can see in **PHOTO 2**.

In my example here, the opening in front will be 6". For a shorter tray opening, angle the divider down along that mark at 2½" until you have the opening you want, then shorten the divider as needed. By the way, you'll only need to do all these marks on one of the sides. Once that side is secured, the other will automatically be in position, as you'll see shortly. Also, I've made all these markings really dark for photographic purposes, but if you lightly pencil your markings they'll be easier to remove.

Place the divider on your line and pencil in its outline to use as a guide, then drill two pilot holes through the center of the outline as in shown **PHOTO 3**. Then countersink these holes from the outside.

Attach this marked side to the feeder back with waterproof glue and nails (**PHOTO 4**). I'm using a nailer with 1½" brads, but you could instead hammer in 4d or 6d galvanized finish nails.

Place the resulting assembly on your worktable and glue the divider in place on your marks, as shown in **PHOTO 5**. Allow the glue to set up for several minutes, then carefully flip the assembly over and drive 1⅝" exterior-grade screws into the divider from the outside (**PHOTO 6**).

Flip the assembly over again. Put glue on the divider edge and then carefully position the remaining side in place. Drill countersunk pilot holes through the side and into the edges of the divider, then drive home screws to secure the assembly.

Put a bit of glue on the ends of the tray front and slip into position at the bottom/front of the assembly, then clamp in place (**PHOTO 7**). Then reinforce with a couple of brads or finishing nails.

Finally, attach the feeder bottom with countersunk 1⅝" screws and your work on the main portion of the feeder is done (**PHOTO 8**).

To cover and protect the feed and still have easy access

PHOTO 1 When crosscutting large stock with a jig saw, always clamp the material to a secure work surface.

PHOTO 2 Mark the feeder sides for accurate placement of the divider. My markings are dark for the camera. Make yours lighter and easier to remove.

PHOTO 3 With the divider location marked, drill pilot holes for screws. Countersink them from the other side.

for refilling, you'll want a hinged lid. Measure the completed feeder and cut a lid that allows ⅛" overhang at the front and on both sides of the feeder for smooth lid clearance. Cut a pair of 1½" wide side pieces matching the lid width. Attach these to the lid sides with glue and brads or nails, being sure that the side pieces are flush at the front and back. Now cut a longer piece of 1½" stock for the front, long enough to extend flush at the front over both side pieces. As before, attach with glue and nails (**PHOTO 9**).

Set the lid in place atop the feeder, positioning it for ⅛" clearance at the sides and front, and clamp in place. Mount a pair of 2½" hinges on each side of the lid, as shown in **PHOTO 10**. Any hinges are fine for indoor use, but use weather-resistant hinges for outdoors. The hinges shown here are solid brass.

At this point the feeder is complete, so long as there's no danger of animals getting the lid open and accessing the feed. That might be the case if you're making this to feed wild turkeys, but most other large animals (like the aforementioned Merle and Hank) will easily get under the lid. So to secure the lid in the closed position, add a latch of your choosing to the front (**PHOTO 11**). Because you'll attach a latch to a straight lid and an angled front, depending on the type and style of latch you choose you may discover a clearance issue when opening the latch. If that's the case, use a rasp, chisel, fine-tooth saw or other tool to cut a small relief notch to provide clearance when the lid is opened and closed.

I've chosen to use pine for this project, but any type of wood will do. For an outdoor feeder be sure to use a wood species that weathers well, or give the outside of the feeder a few coats of weatherproofing exterior-grade stain (don't finish the inside). For an indoor feeder for pets an attractive stain and varnish will work nicely, which is what my daughter plans to do with this one. Or, you could consider an attractive hardwood like oak.

For indoor use drainage isn't an issue, but if you plan to use this hopper feeder outdoors drill a few small drainage holes in the bottom of the tray opening.

PHOTO 4 Attach the marked side to the back piece with glue and nails.

PHOTO 5 Glue the divider in place on your marks.

PHOTO 6 When the glue has partially set, carefully turn the assembly over and drive the screws home to secure the divider.

PHOTO 7 Glue and clamp the tray front into place, then reinforce with nails.

PHOTO 8 Drill countersunk holes through the bottom and up into the feeder sides, then attach it with waterproof screws

PHOTO 9 Complete the lid assembly with glue and nails, sizing the lid to overhang the feeder by ⅛".

PHOTO 10 Attach the lid with a pair of brass or other weatherproof hinges and screws.

PHOTO 11 Mount the latch beneath the lid. Because the divider is sharply slanted, your latch may require a small relief to allow the latch body to pass through.

Home Sweet Homes

A well-fed animal is a happy animal, right? Sure, but remember that ample sustenance is only one part of all wildlife's three basic needs. While food is the most important, they also need shelter from the elements. When predators are around they'll need a secure place to become less conspicuous. And at breeding time they must have a safe and comfortable place to bear and raise their young.

From high-flying birds to ground-dwelling toads—and a few animals that live somewhere in between—what follows is a selection of homes for common wildlife you'll likely find near you. Keep in mind that while I'll give component sizes and materials that are specific to the projects, you can alter these any way you wish, especially when it comes to homes for birds. Along those lines, I'll give you some alteration suggestions with the projects to help adapt the homes to your local wildlife.

Photo by Birdiegal/Shutterstock.com, background photo Myimagine/Shutterstock.com

Basic Birdhouse

When it comes to building homes for wildlife, birdhouses are the most popular. They're quick and easy to build, they're readily adaptable (as you'll find out shortly), and the intended recipients are rarely fussy about the neatness of the results.

Nesting preferences boil down to two types: Birds that prefer an enclosed space, or "cavity nesters," will set up housekeeping in any cavity, such as a hollow tree, rock cleft, an opening in an attic or shed, etc. Those not preferring enclosures will build nests anywhere—in trees, under gutters, on the ground, against building ledges, or on any other surface that's either flat or will securely hold a nest. The next chapter addresses the second group with an adaptable shelf-based nest platform, but first let's take a look at the typical birdhouse or nest box that cavity nesters like.

This project is a basic birdhouse with a natural appearance. By using this project as a jumping-off point and adjusting its overall dimensions, floor size, interior height, and entrance size to match the specific needs of a desired species, you can happily accommodate literally any cavity-nesting bird. When planning your house, look at the chart on **PAGE 53** to find the specifications needed for a particular species.

The information in the chart should be treated as guidelines only. Cavity-nesting birds adapt readily and aren't all that picky. If they like the neighborhood, if they can easily enter and exit the house's entry hole, and if there's enough room for a nest and chicks, they'll move right in.

Before we start building, here are some of the typical requirements and considerations for birdhouses geared toward cavity nesters.

Doors and access

Every birdhouse should have a way to open it. Because you'll occasionally want to observe a house's contents and occupants, and because all birdhouses require occasional cleaning, it must be possible to get inside. A dedicated door is the easiest method.

You can create a traditional door with weather-resistant hinges, but access can also be designed right into the house by making one part moveable. In this project, the door is hinged using a pair of nails driven into each side of the door about an inch from the top, allowing the side of the house to pivot upward for access. You can keep this pivoting door closed with a twisting toggle like the one shown in this chapter, or with a hook-and-eye arrangement, or with a single screw driven in to keep it closed. As an alternative, you can attach one part with screws—typically the floor or roof—so it can be removed for access.

House sizes

Cavity nesters require a minimum amount of space for nest construction and freedom of movement. For best results in attracting specific birds, stick closely to the guidelines in the chart, but you do have some wiggle room. For example, a wren likes a cavity measuring about 4" x 4", but you can make this space narrower if you correspondingly increase the other dimension. With all other specs being acceptable, a house with an interior measuring 3½" x 5½" would be inviting to any wren. Likewise, adding extra inches to the minimum height listed on the chart will make little difference to prospective tenants.

Interior considerations

Nestlings must be able to climb out of the house when it's time for them to fledge, so the wall of the house with the opening shouldn't be smooth on the inside.

You can assist nestlings in a number of ways. If you're using rough wood, like Western red cedar, you can orient the rough face toward the inside of the house. Or, as with this chapter's project house, you can cut shallow horizontal grooves below the entrance hole. If you're adapting the project house for larger birds like kestrels, owls, or wood ducks, staple a piece of wire mesh beneath the entrance hole for nestlings to use like a ladder when they fledge.

Hole size and shape

Entrance holes must be large enough to admit the desired bird, but small enough so undesired birds can't get in. Holes don't have to be round. Bluebirds, swallows, and wood ducks like oval entrances more than other birds do, so an oval hole on a bluebird house may discourage undesired species.

Choosing a hole size in the middle of a range will encourage more than one type of bird to use the house. Wrens use holes from ⅞" to 1¼", for example, but so will chickadees, creepers, and titmice.

The entrance heights listed on the chart are optimal heights that are sufficient to clear the top of the nest structure. You have some flexibility here, but you'll have greater success staying close to the recommended heights. As far as bird species are concerned, a slightly too-high hole is better than one that's too low.

Building the Basic Birdhouse

If there's any birdhouse I've made more than another, it's the one shown here. Although my original intent was to attract bluebirds, after making my first one several years ago I soon discovered that both bluebirds and tree swallows liked it. Not surprising when you take a look at the chart, because the two species' preferences overlap pretty much across the board.

This is an excellent basic design that can be altered to suit almost every bird on the chart. All you need to do is cut the parts to the size indicated, and in a short time your target bird species will have a new home.

Begin by cutting the house sides and floor to size per the Cut List on **PAGE 52**, and also go ahead and cut the house front, back and roof to length, but don't cut them to width yet.

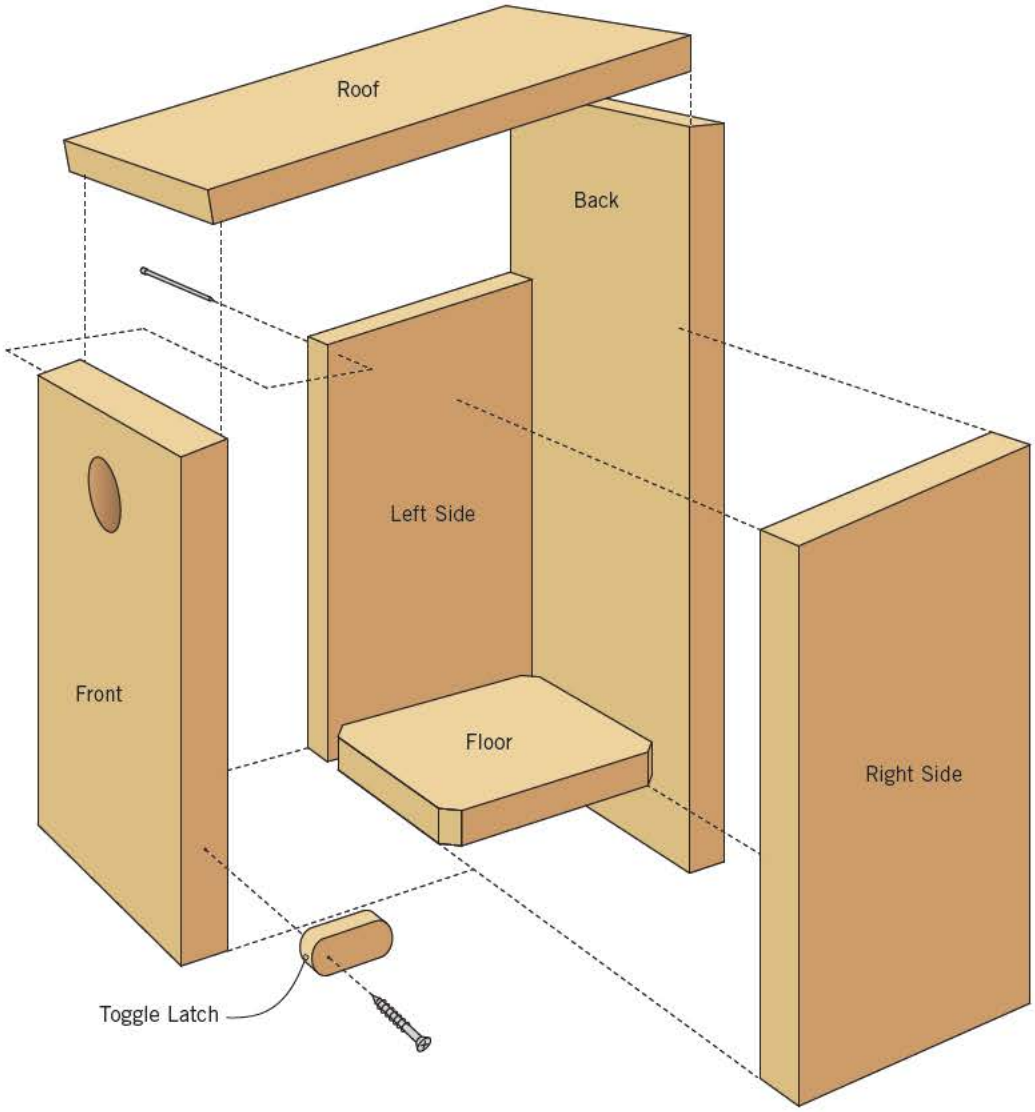
The sides, one of which will act as a lift-up door, are angled at the top to match the roof slope of 10 degrees. You can make this cut on the table saw or band saw, with a miter saw, with a hand saw or with a jig saw as in **PHOTO 1**.

Now, cut ¼" to ⅜" off each corner of the floor, as shown in **PHOTO 2**. This will provide drainage and help encourage air circulation to keep the house cool and dry.

With the house sides and floor prepared, let's revisit the front, back and roof. The cedar I bought for this project was actually ⅞" thick, a full ⅛" thicker than its nominal ¾" thickness. This means that when you attach the ¾" (nominal) house sides to the 4¼"-wide floor, the front and back of the house will need to be larger than on the Cut List, which is geared to lumber of a standard ¾" thickness.

Because this extra size can throw off dimensions, you should dry-assemble the house sides and floor to check its exact width before cutting the front, back, and roof to fit. With standard ¾" wood the overall width of the birdhouse (and the needed width of the front and back pieces) would have been 5¾". But that extra ⅛" on each of

Basic Birdhouse



BASIC BIRDHOUSE CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	1	Front	Cedar	¾"	5¾"	9¼"	Cedar thickness can vary; adjust widths of front, back, and roof.
B	1	Right Side	Cedar	¾"	5½"	10"	
C	1	Left Side	Cedar	¾"	5½"	10¼"	
D	1	Floor	Cedar	¾"	5½"	4¼"	
E	1	Back	Cedar	¾"	5¾"	16"	Cedar thickness can vary; adjust widths of front, back, and roof. Adjust length of back for mounting.
F	1	Roof	Cedar	¾"	5¾"	10"	Cedar thickness can vary; adjust widths of front, back, and roof.
G	1	Toggle Latch	Cedar	¾"	¾"	2¼"	

Overall Dimensions: 5¾" wide x 7" deep x 16" tall

BIRDHOUSE CHART

SPECIES	FLOOR SIZE inches	HOUSE HEIGHT inches	ENTRY HOLE SIZE inches	ENTRY HOLE HEIGHT inches	MOUNTING HEIGHT feet	NOTES AND COMMENTS
Bluebird (Eastern)	5x5	8–12	1½	6–9	4–8	Oval hole should be 1⅜ x2¼
Bluebird (Western & Mountain)	5x5	8–12	1⁹⁄₁₆	7–10	3–6	Oval hole should be 1⅜ x2¼
Cardinal	7x7–8x8	7–10	open shelf	open shelf	5–8	A nearby feeder will help attract cardinals to nest shelf
Chickadee (Black-Capped & Carolina)	4x4	8–12	1⅛	6–8	5–15	Floor dimensions shown are for square-sided house
Flicker	7x7	16–18	2½	14–16	6–20	A tree-mounted location is best
House Finch	6x6	6–7	2	4–6	8–12	Entry size may attract house sparrows
Kestrel (American)	6x6–8x9	9–15	3	9–12	12–30	Mount near open field with some trees or utility poles; add wood chips or other nest material; if mounted high on a barn, screech owls may move in
Mourning Dove	8x8	8–10	open shelf	open shelf	8–20	Dove nests are extremely loose, so a shelf enclosed by a low rail is best
Nuthatch (White-Breasted)	4x4	8–10	1¼	6–8	10–20	Wooded location is best
Nuthatch (Red-Breasted)	4x4	8–10	1¼	6–8	5–15	Extremely protective of nest, and will chase away other birds attracted to house, such as chickadees and even white-breasted nuthatches
Owl (Barn)	20x20	15–18	6	6	15–25	Entry hole can be round or 6x6 square
Owl (Screech)	8x8	12–16	3	9–12	15–30	Kestrels may also use this house if mounted in the open
Phoebe (Eastern)	7x7	6–8	open shelf	open shelf	8–12	Nest shelf may also attract robins
Prothonotary Warbler	5x5	6–8	1½	4–6	4–12	Mount near open water
Purple Martin	6x6	6	2 to 2¼	1–2	8–20	Mount in or adjacent to open field
Robin	6x7–7x8	7–9	open shelf	open shelf	6–12	Can be mounted near house window
Swallow (Barn)	6x6	6	open shelf	open shelf	8–12	Mount under roof or barn eaves
Swallow (Tree)	5x5	6–9	1½	4–6	4–10	Tree swallows often use bluebird boxes
Swallow (Violet-Green)	5x5	6–8	1½	4–6	5–15	
Wood Duck	9½ x12	19–22	3x4	12–17	6–20	Entry hole is horizontal oval; floor size shown is minimal dimension; add wood chips or other nest material
Woodpecker (Downy)	4x4	8–10	1¼	6–8	5–20	Mount in partial to heavily wooded area
Woodpecker (Hairy)	6x6	12–15	1½	9–12	10–20	Mount in partial to heavily wooded area
Woodpecker (Red-Headed)	6x6	12–15	2	9–12	10–20	Mount in partial to heavily wooded area
Wren (House)	4x4	6–8	⅞ to 1⅛	4–6	4–10	Mount near bushes and low trees
Wren (Carolina)	4x4	6–8	1⅛	4–6	5–10	Mount near bushes and low trees
Wren (Bewick's)	4x4	6–8	1¼	4–6	4–12	Mount near bushes and low trees

the sides extends the width of the front and back to a full 6" (**PHOTO 3**). This isn't a problem so long as you always measure for exact sizes when working with cedar, and then adjust part widths as necessary.

Both the front and roof are beveled to match the 10-degree roof slope, which I've elected to do on the table saw (**PHOTO 4**). You could do this job using any kind of saw, or even make the bevel with a wood rasp or a sanding block and coarse-grit paper. The house front is beveled at the top, while the roof is beveled at the back.

If you're making this house for bluebirds or tree swallows, drill a 1½" entrance hole through the front, 6½" up from the bottom edge, which puts it right in the range for both species. In **PHOTO 5** I'm using a Forstner bit, but instead you could use a spade bit or a hole saw. Place a piece of scrap beneath the workpiece to prevent tear-out on the back side.

When it's time to fledge, nestlings may have trouble climbing up the smooth interior surfaces, so help them by cutting some grooves beneath the entrance hole (**PHOTO 6**). A rotary tool makes quick work of the task, but you could also use a saw, a chisel, or a utility knife to score the surface. Turning cedar so its rough side is inside also helps the fledglings climb.

Using glue and nails, assemble the back, left side, front and floor (**PHOTO 7**), making sure that the beveled front aligns with the angled left side. Note in this photo that I've temporarily put the right side in place, but am not attaching it yet. Dry-fitting the right side while assembling the rest of the house helps get things aligned and nailed properly, but take care not to get any glue on it.

With the house nailed together, test the fit of the right side. This side will become the access door, so it should slip out easily. If it's tight and hard to remove, adjust it with sandpaper or a hand plane so it will pivot easily. Note that this right side is shorter than the left, to leave a ¼" ventilation gap at the top.

To attach the side and create the door, align the bottom edge of the door with the bottom of the house, then measure about 8" up from the floor of the house and drive galvanized nails through both the front and back of the house to act as pivots (**PHOTO 8**). While the 8" height of the nails isn't critical, be sure to locate the front and back nails exactly even with each other or the door will twist as it opens. When you're satisfied with the door action, set the nails just below the surface with a nail set.

Apply a bit of waterproof glue along all the top edges except the door, and nail the roof in place so that its rear bevel fits flush with the back piece.

Cut a ¾" x ¾" x 2¼" piece of cedar to function as a toggle latch for the door. I've rounded each end of this piece with a disc sander, but it's fine to leave them square. Hold the latch against the right/front edge of house about an inch or two up from the bottom, and drill a pilot hole through the latch and into the house edge. Drive an exterior-grade screw to secure the latch just tight enough to keep it from moving, as in **PHOTO 9**. Don't over-tighten, or you could split the latch.

PHOTO 1 Use the jig saw to cut the roof angle on the house sides.

PHOTO 2 Provide drainage by sawing the corners off the floor.

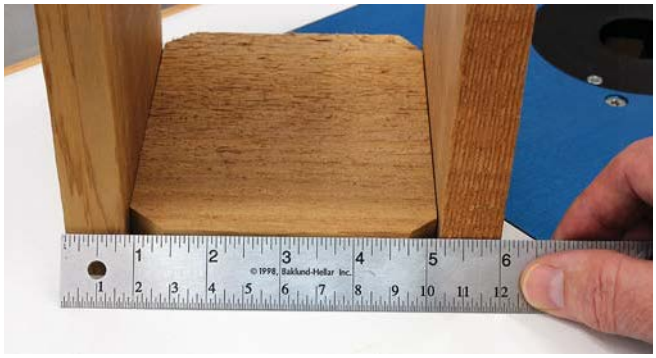


PHOTO 3 Dry-assemble and measure, then dimension the front, back, and roof parts to match.

PHOTO 4 Bevel the top edge of the front and the back edge of the roof to match the roof slope.

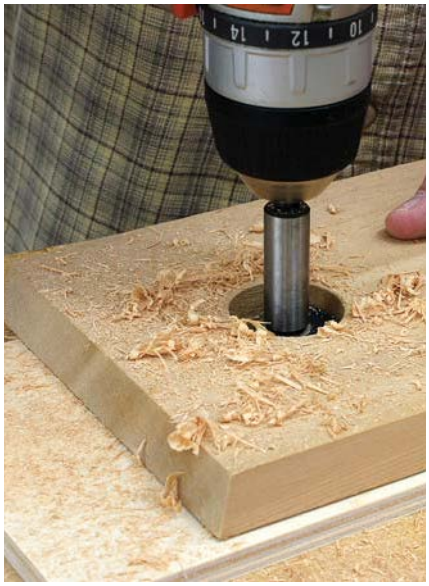


PHOTO 5 Drill into scrap to prevent splintering the back side of the entry hole.

PHOTO 6 Give the little birds a ladder to climb by scoring some grooves beneath the entry hole

PHOTO 7 Use glue and nails to assemble the back, left side, front, and floor. Dry-fit the right side to help keep things square and neat but don't attach it yet.

PHOTO 8 The access door pivots on two galvanized nails driven through the front and back and into the sides of the door.

PHOTO 9 Screw the latch to the house front. Make it snug but not so tight the wood splits.

Nesting Shelf

Unlike their cavity-nesting cousins, some birds prefer to raise their young in nests built more in the open, but still protected from the elements. These birds establish nests deep within tree branches, on ledges and under roof eaves, or on beams in barns. Typical open-nesting birds include the cardinal, robin, mourning dove, blue jay, Eastern phoebe, and barn swallow. For these birds, a birdhouse like the one in the previous chapter would hold no interest, but a simple protected nesting shelf would be attractive.

These structures really need be nothing more than a bare shelf—those barn beams don't offer much more than that—but open-nesters do try to build in a protected areas, so they'll appreciate a nesting shelf with a roof.

As with birdhouses, different species have varying preferences as to shelf size, and you'll find some of these listed in the chart on **PAGE 53**. However, just like cavity-nesters, these birds aren't fussy—if the nest fits, welcome home.

I made the shelf in this project for the Eastern phoebes that live in my area, but the 6½" x 7" shelf will also appeal to barn swallows and other small open-nesters. Make it about an inch wider and longer and you'll still attract phoebes, plus local robins, doves, cardinals, and jays may also take an interest.

I've made this nesting shelf in cedar, so remember that cedar thickness can vary. If the cedar you get is thicker than the nominal ¾", you may need to make the shelf front piece a bit longer, and the back a bit wider.

Building the Nesting Shelf

Begin by cutting the nest shelf sides to size, then transfer the side pattern onto the workpieces. Cut out this pattern using a band saw or scroll saw, or with a jig saw as shown in **PHOTO 1**. As with the Basic Birdhouse project (**PAGE 50**), I've used a 10-degree angle at the tops of the sides for the roof slope. You can adjust this if you'd like a shallower or steeper roof.

Attach the sides to the main shelf with glue and nails and measure the exact width of the assembly. Cut the back to match the width you just measured, since the width noted in the Cut List is for standard ¾" material. Bevel the top edge 10 degrees to accommodate the roof slope, then glue and screw it to the main shelf/side assembly. Note in **PHOTO 2** that I've measured and marked the location of the shelf for accurate screw placement.

Cut the shelf front to length to match the width of the main assembly, then flip the assembly on its back and attach the shelf front with 1½" brads or 4d finish nails, as shown in **PHOTO 3**.

Complete the nest shelf assembly by attaching the top with glue and nails. In **PHOTO 4**, you can see a trick I often use with a power nailer. I've locked my table saw fence so the assembly is near the edge of the saw's extension table. This puts a solid support behind the assembly to keep it in place while I work. You can do the same trick even if you don't have a table saw—just clamp a piece of scrap to your workbench to support the project.

With the nest shelf complete, flip the structure upside down and drill some ¼" to 5⁄16" drainage holes into the main shelf, **PHOTO 5**. Finally, drill a pair of mounting holes: one through the back inside the structure, and another in through the back extension at the bottom.

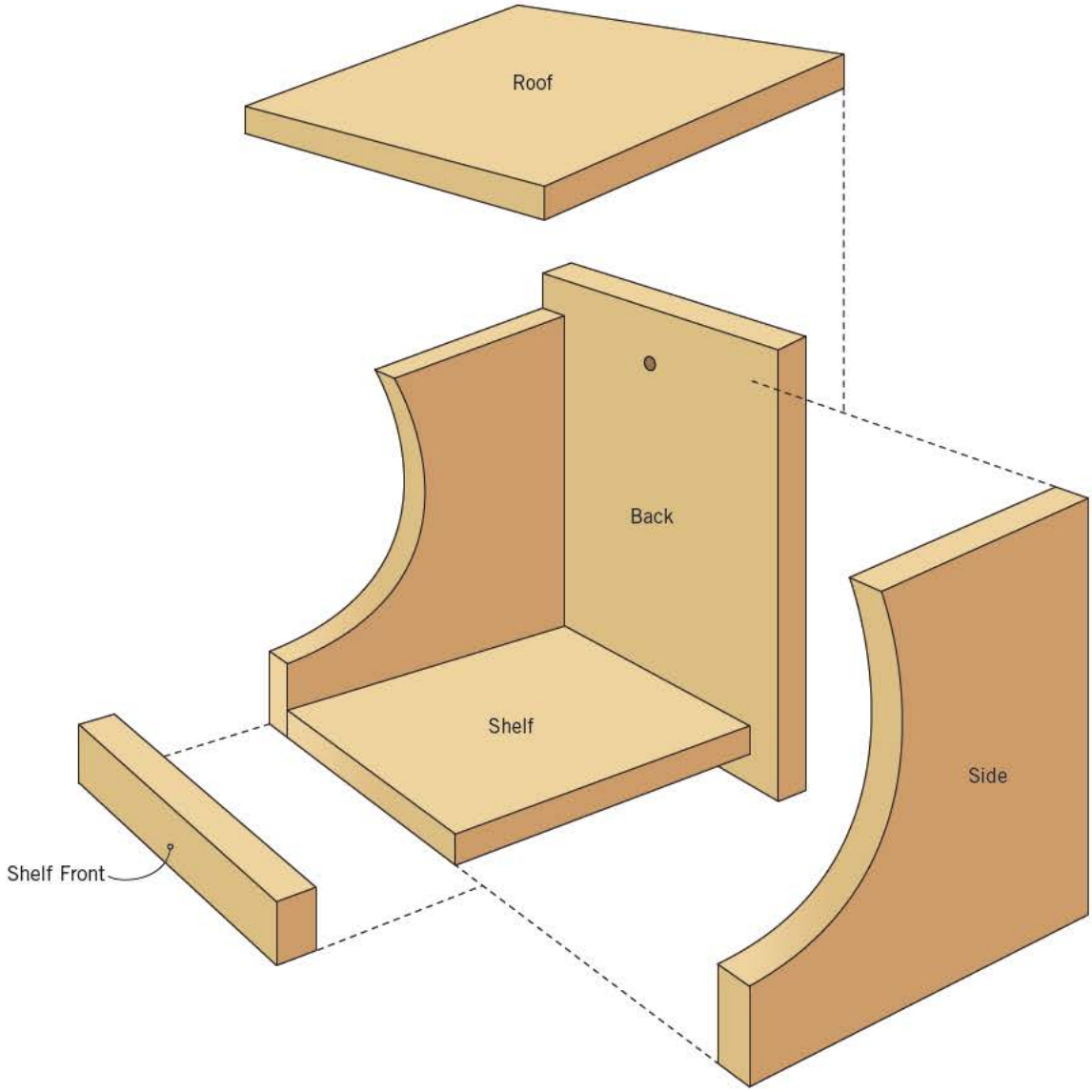
Eastern phoebes, mourning doves and robins aren't timid around people, so you might try mounting your nest shelf near one of your home's windows. If you keep quick movements to a minimum (partially close the blinds on that window), you may be able to watch the mother and nestlings.

That won't work with barn swallows, however, because they prefer nesting high off the ground, such as under the roof eaves of a house, garage, shed or other structure. A tree or other isolated location is best for jays and cardinals, who like more open spaces around their nests.

PHOTO 1 Saw the side pieces to follow the pattern on **PAGE 59**.

PHOTO 2 Attach the back piece to the sides with glue and screws.

Nesting Shelf



NESTING SHELF CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	1	Back	Cedar	¾"	8"	10½"	Adjust width of back and length of shelf front to fit actual cedar thickness.
B	2	Sides	Cedar	¾"	7"	9"	
C	1	Shelf	Cedar	¾"	6½"	7"	
D	1	Shelf Front	Cedar	¾"	1½"	8"	Adjust width of back and length of shelf front to fit actual cedar thickness.
E	1	Roof	Cedar	¾"	7"	10"	

Overall Dimensions: 11¼" high x 10" wide x 8½" deep

Pattern for shelf side (1" squares)

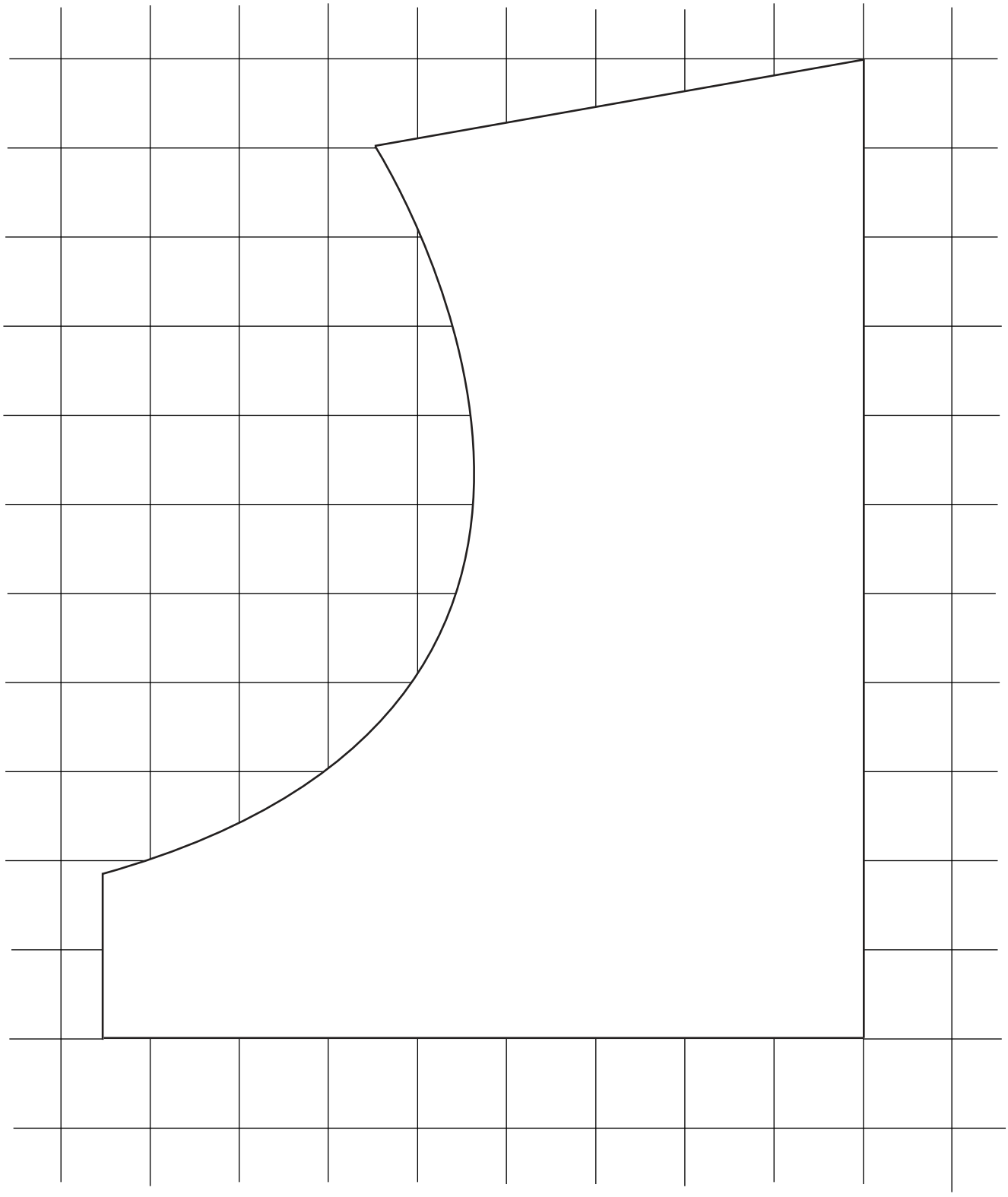


PHOTO 3 Attach the shelf front with glue and brads or finishing nails.

PHOTO 4 Brace the assembly against something solid while you attach the top using glue and nails.

PHOTO 5 Drill a couple of ¼" or ⅜" drainage holes through the bottom.

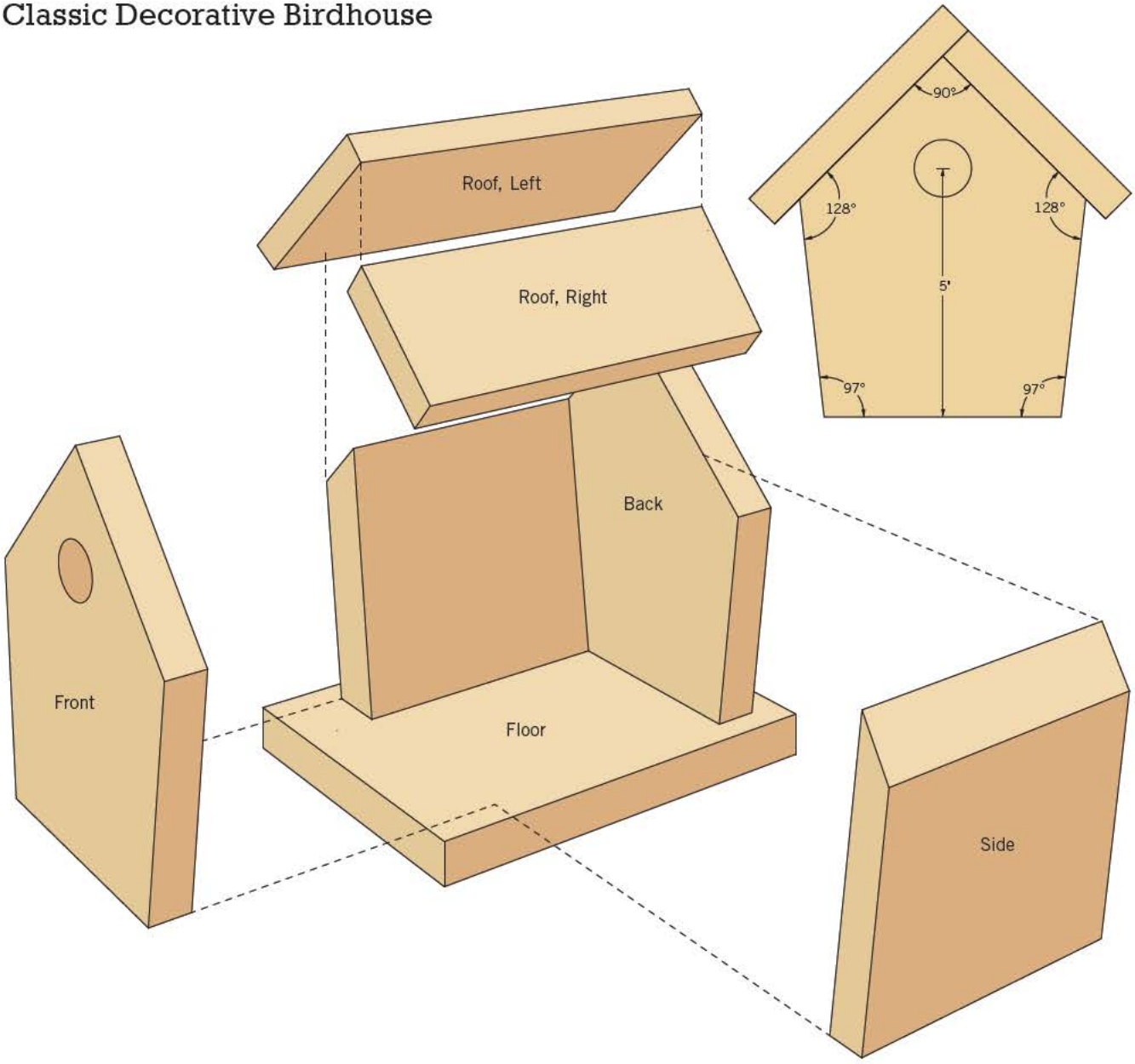
Classic Decorative Birdhouse

I'm willing to bet that this birdhouse looks more than a little familiar. It's the classic birdhouse design with an overhanging roof and slanted sides, attached to a square base. The look is so common that it's iconic. If you've ever used a piece of clip art of a birdhouse for a spring newsletter, that birdhouse probably looked just like this one. Watch a cartoon with your kids featuring Sylvester and Tweetie Pie of the old Warner Brothers cartoons, and if there's a birdhouse in it, this will be the one.

The only thing missing from that birdhouse design as it's presented here is the ubiquitous perch under the entrance hole. No bird species needs a perch on the outside of the house; their sharp claws allow them to cling to the wood just fine. What's more, perches can attract the wrong birds—house sparrows like them, for example—and can inadvertently help predators like cats and raccoons hang onto the house while reaching inside. Still, if you make this birdhouse for decoration rather than actual use, feel free to add a short perch about an inch below the entrance.

I've sized the project house for wrens, but this birdhouse will actually work for any cavity-nesting bird as long as you tailor it to the preferences of your target birds. I've used cedar for the construction, but feel free to use any wood. Likewise, I've left the wood plain here, but paint and decorate the house however you'd like. If it's not

Classic Decorative Birdhouse



CLASSIC DECORATIVE BIRDHOUSE CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	2	Sides	Cedar	¾"	5"	5"	
B	2	Front/Back	Cedar	¾"	5¾"	7¼"	
C	1	Roof, Left Side	Cedar	¾"	5½"	7¾"	
D	1	Roof, Right Side	Cedar	¾"	4⅝"	7¾"	
E	1	Floor	Cedar	¾"	5¾"	7¾"	

Overall Dimensions: 7⅝" wide x 7¾" deep x 9⅛" tall

purely decorative and you're hoping birds might move in, don't get any paint or finish anywhere on the inside.

Building the Classic Birdhouse

Cut your workpieces to size per the Cut List on **PAGE 62**. The slanted sides of this house form a pentagon, so you'll need to do a bit of beveling to make everything work (**PHOTO 1**). The roof angle is easy; it's just a butt joint that's 90 degrees, no special cutting. As you can see in the Pattern on **PAGE 62**, however, the upper angles on the sides form 128-degree angles, while the lower ones where the house rests on the floor form 97-degree angles. To achieve these, tilt your saw blade to 52 degrees for the upper angle, and 83 degrees for the lower one. It might be helpful to copy and print out the Pattern, and use it to check your angles as shown in **PHOTO 2**.

Transfer the Pattern to workpieces large enough for the house front and back. Stack the two pieces and attach them together with nails driven through the waste areas around the pattern. In **PHOTO 3**, I'm cutting the pieces out on the band saw, but a jig saw or scroll saw would also work well.

You may have noticed in the previous photo that I also drove a screw right where the entrance hole is going to go. That's because I want to sand both pieces at the same time after cutting, and this single screw holds the two pieces tightly together while I sand the saw marks off the edges (**PHOTO 4**). The screw does no damage to the house front because that's where we'll drill the entrance hole, and if you arrange the two workpieces so that both inside surfaces face inward, the house back will be marred only at one small spot on the inside. There's no visible evidence of the screw on the outside.

Separate the two pieces, and then cut about ¼" off the top of the back piece. This notch will create a ventilation opening once assembled (**PHOTO 7**).

Drill the entrance hole on your mark in the house front, and sand the hole edges. For a wren, a hole of 1⅛" will accommodate the most common wren species found in North America.

Attach the two roof pieces together in a right angle with waterproof glue and nails, then assemble the house the same way (**PHOTO 5**). For tight, attractive joints, align the angles and bevels carefully on the edges of the front and back pieces before nailing.

Put a bit of glue on the top edges of the assembled house and drop the roof into position, centered front-to-back, and nail it into place (**PHOTO 6**). I'm using a nailer with 1½" brads, but a hammer and 4d or 6d galvanized

PHOTO 1 The house sides require a bevel on both the top and bottom edges.

PHOTO 2 Use the Pattern to check the tricky angles and bevels

PHOTO 3 Nails in the waste plus a screw in the entrance hole location keep the front and back sandwiched together for sawing.

finishing nails is a good alternative. Note in **PHOTO 7**, how that notch at the top of the back piece creates a small triangular opening. Working with the drainage holes in the floor as well as the front entrance, it'll give your wrens plenty of fresh air on the hottest days. Speaking of those drainage holes, now's a good time to drill a pair of ¼" to ⅜" holes through the bottom.

This design doesn't lend itself well to having a pivoting door, so we'll screw the floor into place after drilling countersunk holes on all four sides (**PHOTO 8**). Whenever the house needs to be cleaned, just unscrew the floor to remove the old nest and debris, and replace the screws. Measure carefully to ensure you get those screws centered in the house walls, and remember that the screws on the sides must be angled slightly to match the slant of the side walls.

You can mount the house on a pole or post, as shown with other projects in this book, but I've decided to hang this house. Twist a pair of screw eyes into the ridge line of the roof, and then thread a cord or wire through the holes.

PHOTO 4 Sand all the edges to remove saw marks, then separate the two workpieces.

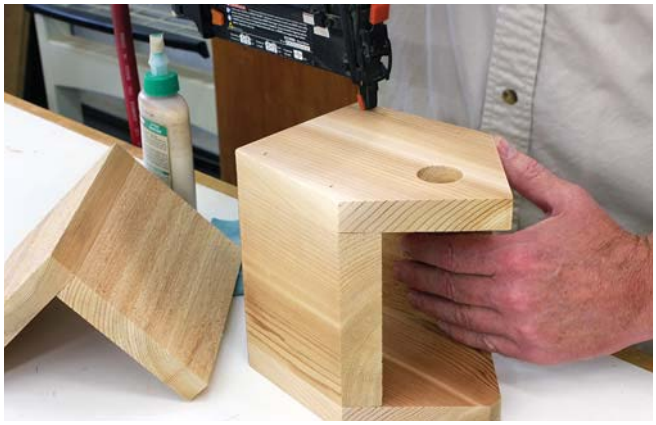


PHOTO 5 Sandwich the side walls between the house front and back, taking care to line up the wall bevels, then glue and nail the pieces together.

PHOTO 6 Attach the roof with waterproof glue and nails.

PHOTO 7 Notching the house back at the top creates welcome ventilation for its occupants.

PHOTO 8 Remember that the screws holding the floor must be angled up into the two side walls.

Bee Hotel

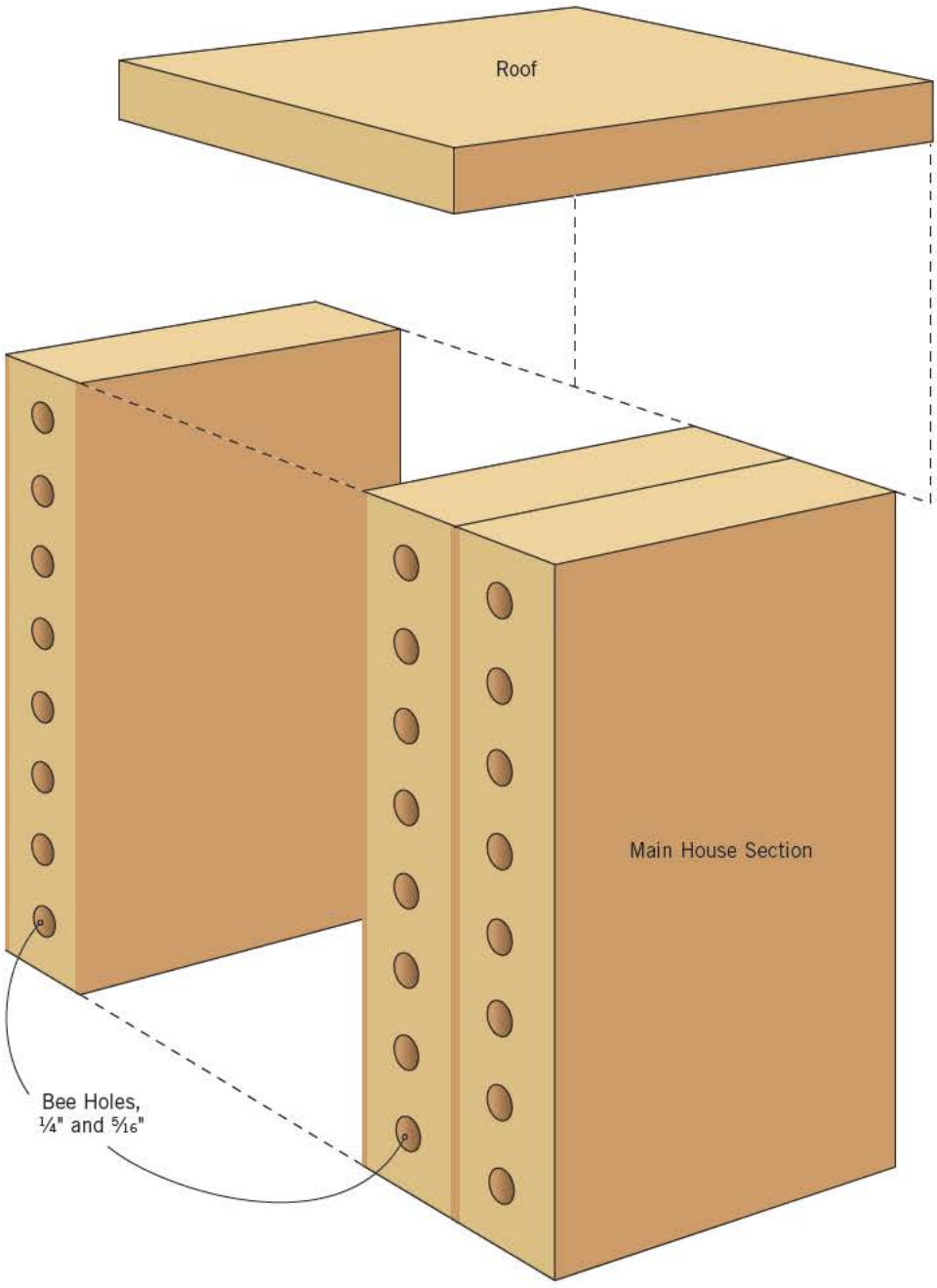
If you've picked this book up, then it's clear you love the outdoors. But I'm guessing your enjoyment of nature extends beyond animal life. Chances are good that you also spend time nurturing a garden or potted plants, or perhaps a container garden on your deck or patio.

Pollination is essential to your plants, and the number one pollinator is the bee. Now, not everyone has an interest in a beehive full of honeybees—I sure don't—because beehives require a lot of work to maintain. Plus, a beehive near your home means many bees flying around your yard, deck, patio, and family. And while experienced beekeepers love them, honeybees can be aggressive.

But there are other bees that don't mass in huge numbers and are easy to manage. These are called "solitary bees," and they require no management whatsoever. As the name suggests they don't form hives, but rather nest on their own. You won't be getting any honey from these guys—that's not their thing—but they'll help pollinate your plants with a smile.

They don't require a difficult-to-maintain hive of any sort, but prefer to nest in small holes in any surface. Some create their own holes, like carpenter bees, but others will take advantage of whatever holes they find. The best part is that most solitary bees aren't aggressive. About the only way you'll get stung by one of these cavity-nesting bees is if you handle or step on them. (Tip: Don't handle or step

Bee Hotel



BEE HOTEL CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	3	Main House Section	Pine	1½"	5½"	8½"	Main house sections (part A) are standard untreated 2x6.
B	1	Roof	Cedar	¾"	5½"	7"	

Overall Dimensions: 5½" wide x 7" deep x 9¼" tall

on them.)

Solitary bee varieties include carpenter bees, mason bees, leafcutters, and sweat bees. Instead of a honeycomb, solitary bees burrow into holes and, starting at the back of the hole, lay an egg that it seals off into its own little cell. Then it adds another and then another until it's filled the hole.

You can attract these beneficial insects to your garden with a bee hotel. There are several styles and I'll present two of the most common types. On **PAGE 69** we'll build a more elaborate bee hotel out of materials like bamboo and tree limbs, but first let's start with one that's really basic. It's just wood with holes drilled in it, topped off with a protective roof. Each species has a preference for hole size, but the two most common solitary bees, mason bees and leafcutters, prefer holes from ¼" to 5⁄16" in diameter.

Building the Bee Hotel

This house is made from three pieces of standard untreated 2x6 lumber, available at any home center, that you'll glue together into a single large block. Begin by cutting the three pieces to length, as shown in **PHOTO 1**. I'm using a hand saw here, but use any saw you prefer.

Apply waterproof glue to the inside faces of the three sections and clamp the assembly together until the glue dries (**PHOTO 2**). If any glue squeezes out while clamping—it will—wipe it off with a damp cloth.

Use a pencil to lay out the hole locations. In the wild, solitary bees don't much care about hole layout but when making these structures a spacing of ¾" to 1" works well. That means you can put eight holes into each of the three house pieces for a total of 24 holes. Pick the type of bee you want to attract, and drill a series of either ¼" or 5⁄16" holes on your marks, as shown in **PHOTO 3**. Don't know what kind of bees you have apartment-hunting in your area? That's OK, just drill a mix of ¼" and 5⁄16" holes, and whoever flies along is covered. For leafcutter bees, drill holes about 4" deep; for mason bees, up to 6". However, although they do have their preferences, these bees aren't particularly fussy about the exact hole depth, so anything in that range will work fine.

Now prepare the roof, a simple 5½" x 7" rectangle of ¾" red cedar (**PHOTO 4**). Nail the roof to the main assembly (**PHOTO 5**). I'm using a power nailer here, but regular nails are fine. Be careful with nail placement to ensure that you don't nail down through one of the bee holes.

You'll notice that I didn't angle the roof for this bee hotel. You can angle the roof if you like by cutting an angle at the top of each of the three main house sections—a slope of 10 degrees would work well. However, I designed

This leafcutter bee (Megachile) looks perfectly contented after roosting for the night in a bee hotel.

Photo by Nigel Jones

PHOTO 1 Crosscut three pieces of 2x6 for the main house sections.

this hotel with a flat top so I could stack several hotels one right atop the other.

For a taller hotel, it's a simple matter to make the three 2x6 pieces longer. Likewise, instead of just three sections, use as many as you like. Just remember that this is 2x6 construction lumber, so the bigger you make the hotel the heavier it will be.

Mount your bee hotel anywhere you want—on a tree, building, fence post or a pole driven into the ground in your garden. It's best to place it facing the east or south-east to catch the morning sun, and to protect it from the worst heat of the later afternoon.

PHOTO 2 Glue and clamp the three main house sections to form a solid block.

PHOTO 3 Drill ¼" and 5/16" holes. Some bees like one size, some like the other. Drill at least 4" deep.

PHOTO 4 Saw the roof from 1x6 cedar.

PHOTO 5 Nail the roof to the main assembly.

Bamboo Bee Hotel

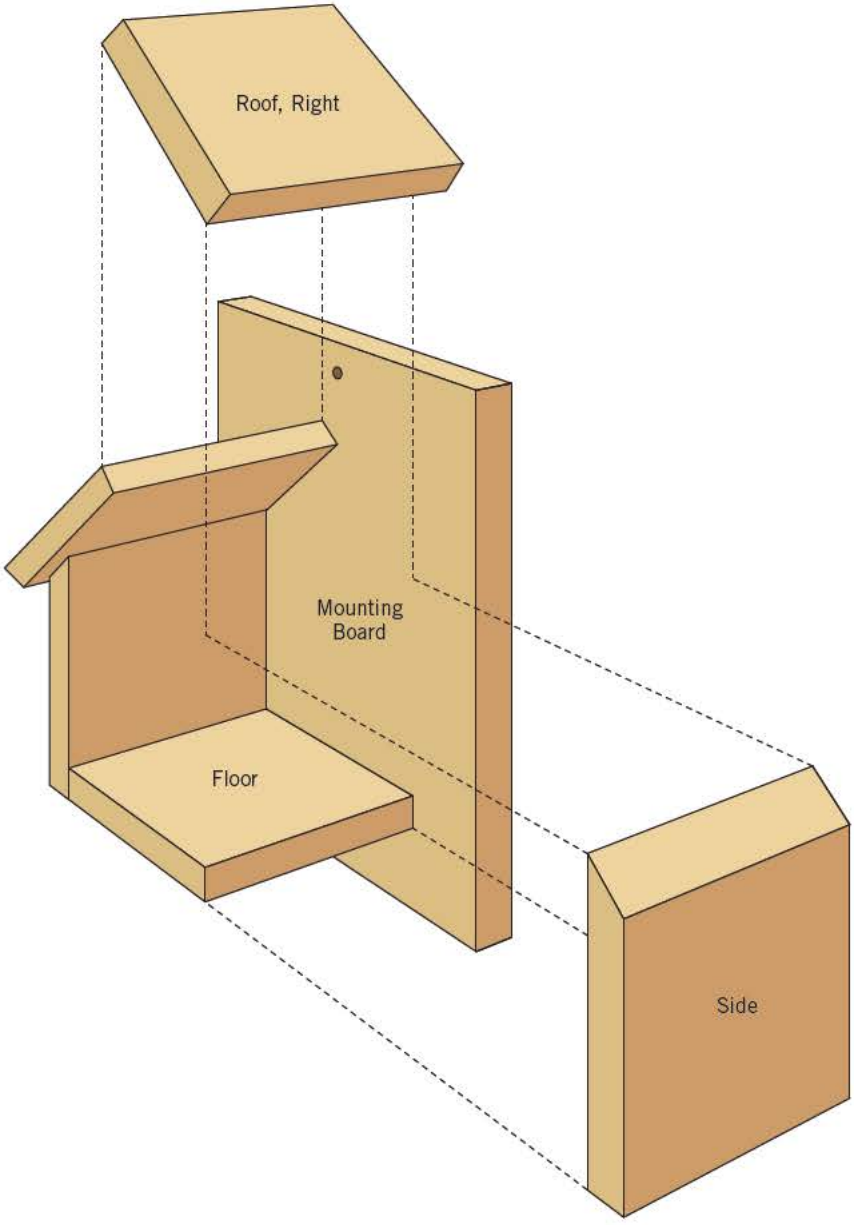
Solitary bees will nest in just about any series of holes that meets their size preferences—drilled holes, the inside of hollow twigs, holes created in trees by other animals, drainage and ventilation holes in buildings. Let's make a fancy hotel that will appeal to visiting bees, and will add a decorative flair to your yard or garden.

In this project the main material for nesting is bamboo. When it's cut so the open ends present a deep tube, bamboo is a favorite of solitary bees. It helps (more or less) if the openings are in the bees' preferred hole size, but it really doesn't matter. Solitary bees are quite adaptable, so having a variety of hole sizes in the same hotel ensures that whatever species you have nearby will find housing to their liking.

We'll also use some cut sections of tree limbs—actually, sections from an old Christmas tree trunk I saved for shop use—drilled and placed in among the bamboo cuttings.

You can make these bee hotels any shape at all, and of any size. They are extremely popular in Europe, with some reaching enormous proportions. In some places, entire gardens have been planned around large bee hotels. You'll find many of these in French wine regions, where the busy hotel inhabitants pollinate acres of vineyards. We'll build a small one here, but you can enlarge the project as you wish.

Bamboo Bee Hotel



BAMBOO BEE HOTEL CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	2	Sides	Cedar	¾"	4½"	6"	
B	1	Floor	Cedar	¾"	4½"	4½"	
C	1	Roof, Left Side	Cedar	¾"	5½"	4½"	
D	1	Roof, Right Side	Cedar	¾"	5½"	5¼"	
E	1	Mounting Board	Cedar	¾"	8"	12"	Size of mounting board may be adjusted.

Overall Dimensions (excluding Mounting Board): 7¼" wide x 5½" deep x 9½" tall

Building the Bamboo Bee Hotel

Begin by cutting the materials for the outside structure that will contain the bamboo and drilled tree limb sections. Cut each of the pieces to length and width (**PHOTO 1**). Then cut a 45-degree bevel at the top of each hotel side. I'm cutting these bevels on the table saw in **PHOTO 2**, but you could also do these with a miter saw, jig saw with adjustable base, or by hand.

Begin assembly by gluing and nailing the roof together; note that the longer right side of the roof overlaps the shorter left side to create a right angle. Now, assemble the lower portion of the hotel by attaching the two sides to the floor section with glue and nails, as shown in **PHOTO 3**. Be sure to orient the sides so the bevels face to the outside. Finally, attach the roof assembly to the completed lower portion with glue and nails. Use a nail set to put the nails just below the wood surface.

With the main body of the hotel complete, prepare the nest material. You can use any kind of bamboo you can find, or heavy reeds of the type found growing around lakes and ponds. You'll need narrow pieces, with internal openings ideally from ¼" to 5⁄16", but it's fine to mix in some smaller and larger ones in the finished hotel. In fact, you'll definitely want some smaller ones to use as filler, as I'll describe later. If you have trouble locating bamboo, try your local fabric or craft store, as they usually carry bamboo in a variety of sizes for crafts and decorating (**PHOTO 4**).

The bamboo I found was 9" in length; cutting each piece in half gave me 4½" sections, right in the 4" to 6" range that bees prefer (**PHOTO 5**). With your bamboo or reeds sized, put them aside and move to the cut tree sections.

I strip the thin branches off old Christmas trees and save the trunks for shop projects. My bamboo sections are 4½" long, so I cut the tree sections to the same length as shown in **PHOTO 6**. The bark was falling off my wood so I peeled off all the loose material, but stripping bark isn't necessary if it's firmly attached. The number of tree pieces you'll need depends on their diameter—I needed three to adequately fill the hotel with them and the bamboo—so experiment a bit.

With your hotel assembly flat on a work surface with its front opening facing up, put in your tree sections first, and then fill in all the open spaces with the bamboo tubes. The bamboo will vary in diameter and shape, but it's best to begin with the larger pieces first, and then fill in the gaps with narrower pieces. As the hotel fills up, the tree sections and bamboo will tighten up. Tap the very smallest tubes into place with a wooden block to avoid damaging

PHOTO 1 Cut each piece of wood to length and width according to the Cut List.

PHOTO 2 Saw a 45-degree bevel on the top of each side piece.

PHOTO 3 Glue and nail the two roof parts together (left), assemble the two sides to the floor (right), and attach the two subassemblies together.

the ends, as shown in **PHOTO 7**. Keep filling the hotel until the tree sections and bamboo tubes are all held snugly in place. You can fill any remaining gaps between loose tubes with twigs grabbed from outdoors.

As things get tight, pick up the hotel to see if everything stays in place (**PHOTO 8**). Once everything is tight, you should be able to pick up the hotel and flip it over, and all the sticks will stay in place. Put a dot of waterproof glue on the ends of the tubes where they touch each other—not a lot, just a dot to help hold everything in place.

Place the hotel on your mounting board and lightly trace around it in pencil, then drill four countersunk pilot holes through the back of the mounting board. Upend the hotel assembly and drive screws through the mounting board and into the hotel sides and roof to secure it (**PHOTO 9**).

Finally, scatter a series of drilled nest holes down into each tree section, as shown in **PHOTO 10**. Since the bamboo has a variety of opening sizes, I drilled both ¼" and 5⁄16" holes to make this hotel readily accessible to both mason bees and leafcutters.

Alter the measurements of this project any way you like, but try to keep the length of the nest holes in that 4" to 6" range. Otherwise, make it as tall, wide and massive as you like, and use any variety of solid wood, tree sections, bamboo, reeds and other items that strikes your fancy. Before you know it, your bee hotel will be getting five-star reviews.

PHOTO 4 This bamboo is from the craft supply store. It's OK to mix large and small pieces.

PHOTO 5 Saw the bamboo to lengths in the 4" to 6" range.

PHOTO 6 Saw small log sections to the same length as the bamboo. Be sure to clamp the wood securely onto the miter gauge so the blade can't catch.

PHOTO 7 As the hotel fills up, use a wooden block to tap the last pieces into place.

PHOTO 8 When it's full and tight, you should be able to lift the hotel up without anything falling out.

PHOTO 9 To mount the hotel, drive screws through the mounting board into the hotel sides and roof.

PHOTO 10 Drill ¼" and 5/16" holes into the tree sections.

Big House

Some bee hotels—like this fence-mounted example at the Michigan State University Horticulture Garden in East Lansing, Michigan, (bottom), and this free-standing unit at Lake Merritt recreation area in Oakland, California, can get quite large. Both structures mix several types and sizes of materials and hole openings to accommodate a variety of bee species.

Photo by Dr. Art Cameron, Director, MSU Horticulture Garden

Photo by Constance Taylor, Wild Oakland

Bat House

They don't have much of a reputation what with all those vampire stories and old wives' tales about flying into frightened women's hair, but bats are beneficial to have around. They don't sing enjoyable songs, and they aren't attractive or entertaining to watch like birds—in fact, they don't even come out in the daytime—but they're among the hardest working pest eaters you could have around your yard.

Depending on its species and size, a single bat consumes several hundred insects every hour of the night, with mosquitoes being among their favorites. Even the little brown bat, which weighs in at half an ounce or less, can eat up to 20 bugs a minute. Do the math on that and it's easy to see that these little guys earn their keep. Bats also are good pollinators, especially the small species, meaning they can offer a double benefit to your flowers and garden.

Bats will roost in this house by clinging to its inner surfaces, so orient the rough side of the cedar inward on the front, back and both sides to give them a climbable surface throughout. The little brown is the most common bat found throughout North America, so I've sized the opening at the bottom for these little guys.

It may come up short on looks, but the little brown bat atones for it with a voracious appetite for insect pests, often consuming as many as 1,000 mosquitoes per hour.

Photo by Geoffrey Kuchera/Shutterstock.com

Building the Bat House

Cut the house parts to size, keeping in mind that because the roof slopes at 5 degrees several other parts need to reflect this angle. Both sides are mitered at 5 degrees at the top, so mark them accurately before cutting (**PHOTO 1**). Once marked, cut the sides by your preferred method—miter saw, hand saw, jig saw. Likewise, the top edge of the house front and the rear edge of the roof are beveled at 5 degrees to match the house sides. Again, you can use any cutting tool for this, but I find that a table saw makes the most accurate bevels. Be sure to set the blade angle correctly; I like digital gauges better than trusting the angle scale on the front of the saw (**PHOTO 2**). When cutting all these angles and bevels, make sure the rough surface of the cedar will face inward.

Begin construction by laying out the position of each of the house sides on the back piece, as shown in **PHOTO 3**. For just about all the houses in this book that mount onto a vertical surface I've included an inch or two of bare wood extending both top and bottom. For this house, however, allow considerably more at the bottom—I've set the house sides 6" from the bottom edge and marked the position in pencil. Bats like to land here and then crawl up into the house when turning in for the day. Likewise, at night they'll use this surface when crawling out of the house and launching themselves into the air.

Run a bead of waterproof glue on the bottom edge of each side, then clamp the sides into place on those lower marks at the 6" point as in **PHOTOS 4** and **5**. When the glue has dried, reinforce the back with brads or nails (**PHOTO 6**).

Flip the assembly over and attach the house front—rough side of the cedar facing in, remember—with glue and nails (**PHOTO 7**). If you're using hammer and nails and not a power nailer, use a nail set to drive the nail heads just below the surface.

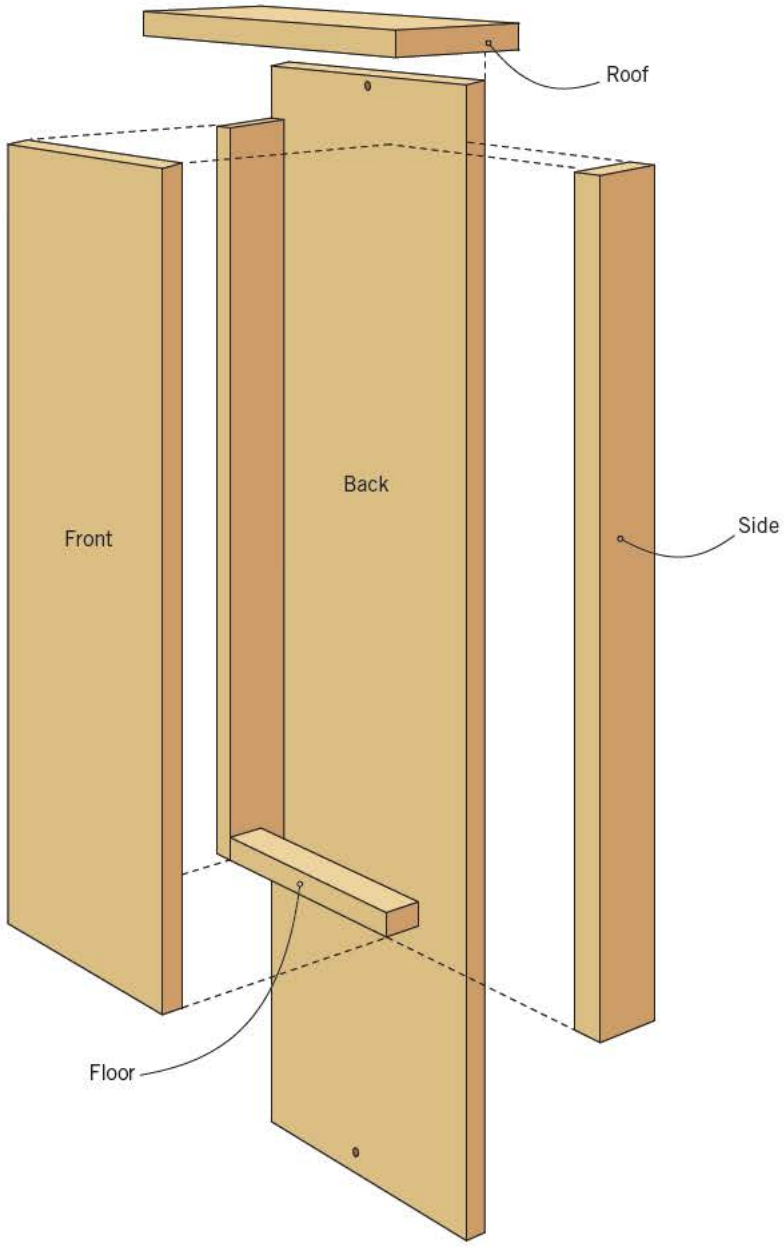
The interior of the house is large enough to accommodate most species of bats, and while bats don't care if their homes are extra roomy, they are particular about opening crawl spaces. The little brown bat likes an opening of about 1" or a bit less, so I've sized the house floor at 1½" in width to create a gap of 1". If you have other bat species in your area you can enlarge the opening by altering the floor width.

PHOTO 1 Mark, then cut, the tops of each side to 5 degrees. A digital angle gauge is handy to have.

PHOTO 2 Bevel the rear edge of the roof and top edge of the house front at 5 degrees to match the sides.

PHOTO 3 Mark the house back to set the height of the sides 6" above the bottom edge.

Bat House



BAT HOUSE CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	2	Sides	Cedar	¾"	2½"	23"	Measure the bottom opening for the floor piece before cutting. If the cedar sides are thicker than ¾" this piece will be correspondingly shorter.
B	1	Back	Cedar	¾"	11¼"	32"	
C	1	Front	Cedar	¾"	11¼"	22¾"	
D	1	Floor	Cedar	¾"	1½"	9¾"	
E	1	Roof	Cedar	¾"	5"	11¼"	

Overall Dimensions: 11¼" wide x 4" deep x 32" tall

Birds are fairly clean when nesting and frequently remove their droppings, but bats aren't nearly so tidy. The house will need to be cleaned out on occasion or you'll find yourself in the guano business. For that reason, and to allow you the option to change the opening size, it's best to attach the floor with screws only, no glue or nails, allowing for easy removal.

The length of the floor is listed as 9¾" in the Cut List, which is based on the house sides being exactly ¾" thick. However, cedar is often milled a bit thicker so it's best to measure the exact length of the opening and cut the floor to length accordingly; the floor width remains the same. Clamp the floor in place, drill countersunk pilot holes through each side and into the floor, then secure the floor with 1⅝" exterior-grade screws as in **PHOTO 8**.

With the floor in place, attach the roof with brads or nails (**PHOTO 9**) and use a sanding block to smooth all sharp edges. Finally, drill a ¼" to ⅜" ventilation hole near the top on each side, angling the holes upward so rainwater won't run in during storms (**PHOTO 10**).

Mount the bat house as high as you can on the side of a house, barn or other building, preferably out of the weather under the eaves. Tall poles such as wooden telephone or utility poles are excellent choices, especially if they also sport a light that will attract lots of bugs for a nightly bat feast. An east-facing location is best, so the sun will warm the house nicely as the bats return in the morning, but will keep the house out of the direct sun during the hot afternoons.

Depending on your local bat population, you can alter the dimensions to make the house as large as you like. You can make the house deeper by increasing the width of the sides. You also could add interior dividers running from side-to-side, making multiple chambers with more wall surfaces for the bats to cling to.

PHOTO 4 Apply waterproof glue, taking care to orient the rough surface of the cedar inward.

PHOTO 5 Clamp the sides onto the house back until the glue has dried.

PHOTO 6 Reinforce the house joints with galvanized finishing nails. Countersink the heads.

PHOTO 7 Glue and nail the house front into place with the rough side inward.

PHOTO 8 Attach the house floor with screws so it can be removed for cleaning.

PHOTO 9 Nail the roof into place, and then give all edges a good sanding.

PHOTO 10 Angle the ventilation holes upward as you drill so rainwater won't get in.

Butterfly House

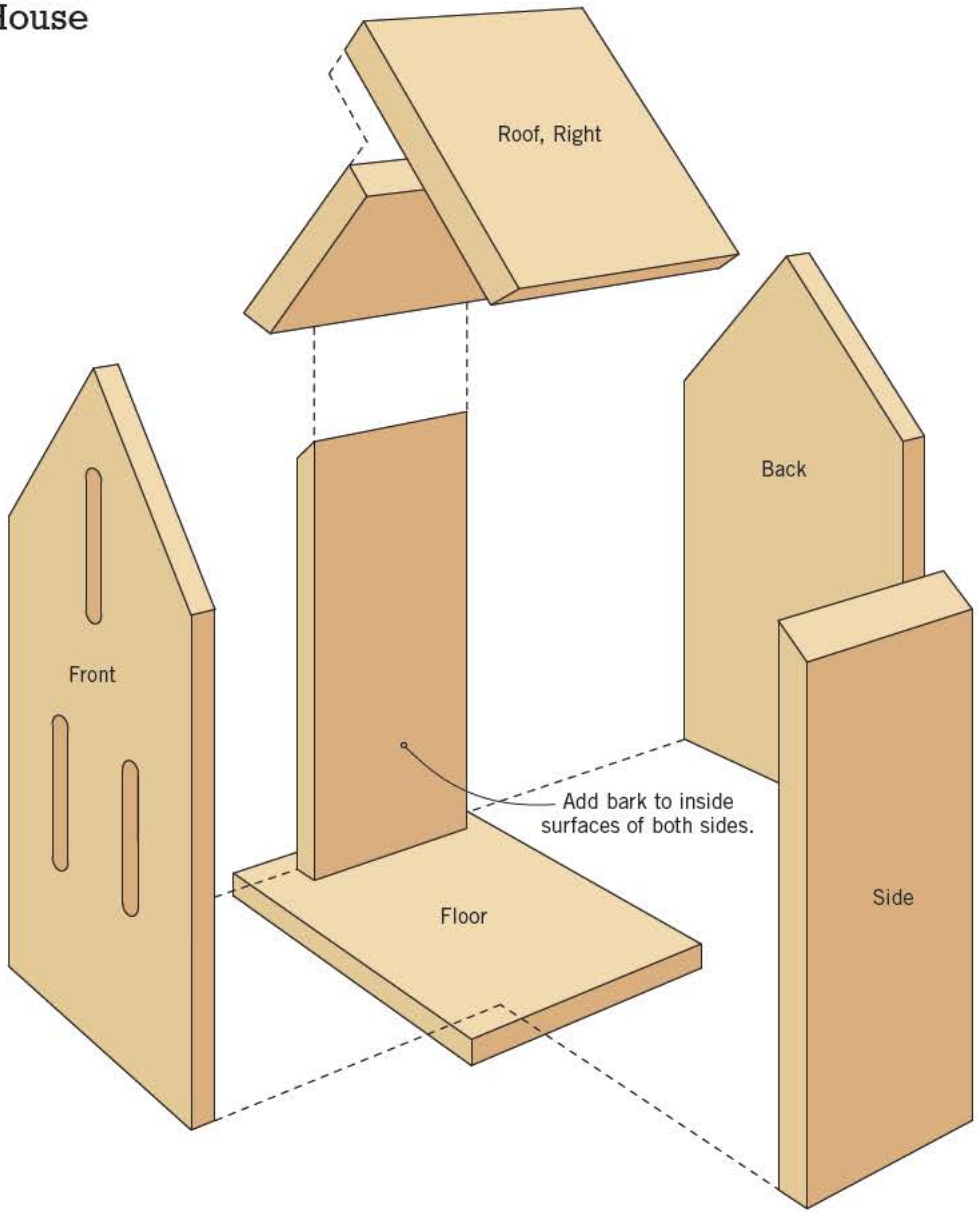
A lot of folks think that all butterflies, like many other insects, live only a short time. While that's true of some, a number of the most beautiful and plentiful butterflies not only last through the summer but some can live up to a year. Because they have longer life spans they address the changing of the seasons in a couple ways. Some migrate to warmer parts of the country, while others hibernate. In both cases, these hardy insects seek shelter from both bad weather and cold temperatures. Even butterflies with shorter life spans welcome a place to hunker down on chilly summer nights.

Like cavity-nesting birds they'll take advantage of any opening they can crawl into—rock fissures, open spaces in damaged trees, beneath broad leaves, inside hollow logs, etc. They'll also use man-made structures and can sometimes be found roosting behind window shutters or up under house eaves. Wherever they roost, you can usually bet a ready supply of food, usually flowers and other nectar-bearing plants, will be nearby.

You can combine two of their most important needs by making a butterfly house and locating it in your garden among the flowers. Not only does it satisfy these colorful fliers, but because they'll be feeding on your flowers they'll also be earning their keep by pollinating every flower they encounter.

Unlike birds, butterflies have no specific needs when it comes to the size and shape of a house. They'll also roost together, and on a cold night it's not unusual to find several

Butterfly House



BUTTERFLY HOUSE CUT LIST

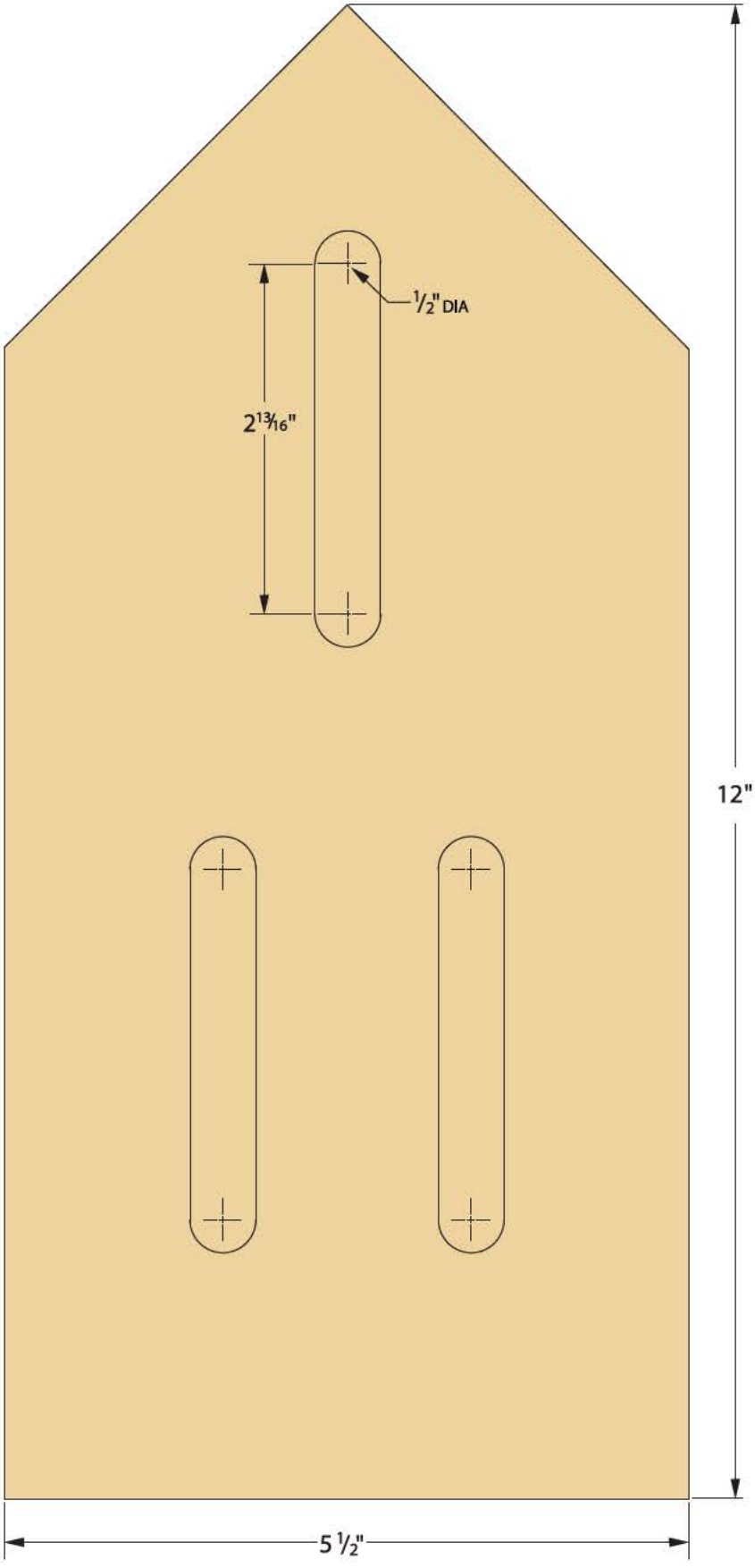
REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	2	Front/Back	Pine	½"	5½"	12"	
B	2	Sides	Pine	½"	3½"	9¾"	
C	1	Roof, Left Side	Cedar	¾"	4½"	5½"	
D	1	Roof, Right Side	Cedar	¾"	5½"	5½"	
E	1	Floor	Pine	½"	5½"	6½"	If you prefer, use ¾" cedar to match the roof.

Overall Dimensions: 7¾" wide x 5½" deep x 13¼" tall

ADDITIONAL MATERIALS

Tree bark

Pattern for Front (Part A) (1" squares)



Spicebush Swallowtail.
Photo by Bud Knecht, 2013.

dozen huddled inside a house. With this in mind you can make your house just about as large as you'd like. To accommodate the wings of most species, however, a house 3" square on the inside is about as small as you'd want to go.

Building the Butterfly House

For the project house I've used ½" pine for the walls and floor, and topped the house with a roof of ¾" cedar, but you can chose any wood like. I've sized the project house to use off-the-shelf ½" lumber in standard nominal widths of 4" and 6" (actual widths are 3½" and 5½", respectively). This means you don't have to cut most of the workpieces to width, just length (**PHOTO 1**). When the project is complete, you can leave the wood unfinished to weather naturally or, since it's going into a sea of color among your flowers, paint it any way you like.

With the front and rear of the house cut to size, use the layout pattern on **PAGE 81** to pencil in the locations of the ½" x 3¼" entrance openings to the house front, as in **PHOTO 2**. This is also a good time to go ahead and mark the 45-degree roof slope.

Drill ½" holes on each end of your marks. In **PHOTO 3** I'm using a drill press, but a handheld drill is fine. Note here that I've inset a mark ¼" from each end of my openings; centering the ½" drill bit on these will have the outer edges of the holes exactly on your 3¼"-long opening marks.

Pencil in connecting lines between each set of holes, and then use these to cut out the full elongated openings (**PHOTO 4**). I'm using a jig saw here, but a scroll saw or coping saw will also work fine. If your shop is equipped with a router table, you can also make these openings using a ½" straight router bit.

Sand the finished openings smooth by wrapping sandpaper around a short piece of flat scrap (**PHOTO 5**). If you have a broken ruler or yardstick, a piece of that will work fine to create your makeshift sanding tool. In this photo I'm starting out with coarse sandpaper, and will finish with medium.

With the openings cut and sanded, cut the top roof slope on both the front and back of the house. You may wish to stack these two parts and temporarily attach them together so you can cut both at the same time. Now prepare the house sides by cutting a 45-degree bevel on the top edges by your preferred method.

When butterflies roost or hibernate, they typically cling to a rough surface. If you opt to make the house out of cedar, orienting the rough face inward is fine. However, because butterflies like clinging to trees I've chosen to attach thin strips of bark to the inner surface of the two sides (**PHOTO 6**). The best way to secure these is with a stapler, driving a few staples at each end and on the sides, and maybe a couple in the middle.

Begin the house assembly by setting one of the house sides in place with waterproof glue on one of the edges of the house back, and then clamping it up as shown in **PHOTO 7**. Doesn't matter which side you start with, but be sure to orient both bark and the top bevel inward. Glue the opposite side into place in the same way.

When the glue has set remove the clamps and then attach the house front with glue and nails (**PHOTO 8**). Now, flip the house over and drive a few nails into the back edges to reinforce the glue-up on that side.

I want to paint this house, and a smooth front with no nail holes will give the best appearance. Nails are easy to hide on painted surfaces by first filling the holes with a good woodworking wood filler, as shown in **PHOTO 9**. When the filler has dried, sand it smooth with the surrounding wood. Once painted, those nails will completely disappear. You won't even see the filler.

Unlike most other animals, butterflies don't make much of a mess. You'll still want to clean the house out from time to time, because small leaves and debris can blow in through the multiple openings. Also, with time some of the bark on the inner side walls can flake off and collect at the bottom. To give access for cleaning, mount the floor with screws only (**PHOTO 10**). Drill countersunk pilot holes, one going up into each house side, and attach with 1" weatherproof screws. In this photo I'm attaching a floor of ½" pine that matches the rest of the house. For a different look, however, you can use the same ¾" cedar as the roof, as shown in opening photo at the beginning of the chapter.

Cut the two roof halves to size, then attach them together at a right angle with glue and nails, then secure to the top of the house (**PHOTO 11**). Be sure to measure carefully for nail placement, marking the locations lightly in pencil to act as a guide.

It's perfectly fine to leave the wood natural and allow it to age and weather to an earthy patina. If you do decide to paint your house, it's easier to do so before attaching the roof. To complement the yellow paint I used on the finished house, you'll notice in the lead photo that I've darkened the cedar a bit. I brushed a bit of boiled linseed oil onto all the exposed areas—never apply paint or finish to the inside surfaces of any wildlife structure. Cedar doesn't really need much protection from the weather, but the linseed oil darkens the color to a golden red tone that

goes perfectly with the house's bright exterior.

Mount the house on a slender post located near your flowers, which is where the butterfly action is going to be. Keep the house about the same height as the surrounding flowers during summer months. When it gets cold, move the house to a more sheltered area of the garden or among shrubbery and reset it lower to the ground, no more than a foot or two high.

PHOTO 1 Cut the workpieces to overall length on the table saw or your preferred cutting method.

PHOTO 2 Transfer the entrance openings from the pattern, noting the drilling locations ¼" from the end of each 3¼" line.

PHOTO 3 Drill ½" holes at the end of each mark, then connect the edges of the hole pairs with a cutting line.

PHOTO 4 Saw along the layout lines to connect the hole pairs, creating the opening slots.

PHOTO 5 Sandpaper wrapped around a thin piece of scrap makes an excellent tool for smoothing the slots.

PHOTO 6 Staple a piece of bark to the inside of the two house sides for butterflies to cling to.

PHOTO 7 Begin assembly by gluing and clamping the house sides into place.

PHOTO 8 Glue and nail the house front, then add reinforcing nails into the house back.

PHOTO 9 To hide the nails, apply a bit of filler to each. Sand smooth after the filler dries.

PHOTO 10 Attach the removable floor with screws to allow for occasional cleaning.

PHOTO 11 Secure the roof assembly with glue and nails.

Toad House

In Kenneth Grahame's delightful 1908 book "The Wind in the Willows," the character that's brought the most joy to countless children (and adults) over the last century has to be Mr. Toad. Never at a loss to find a way to get into trouble, Toad lives in the finest home in the village.

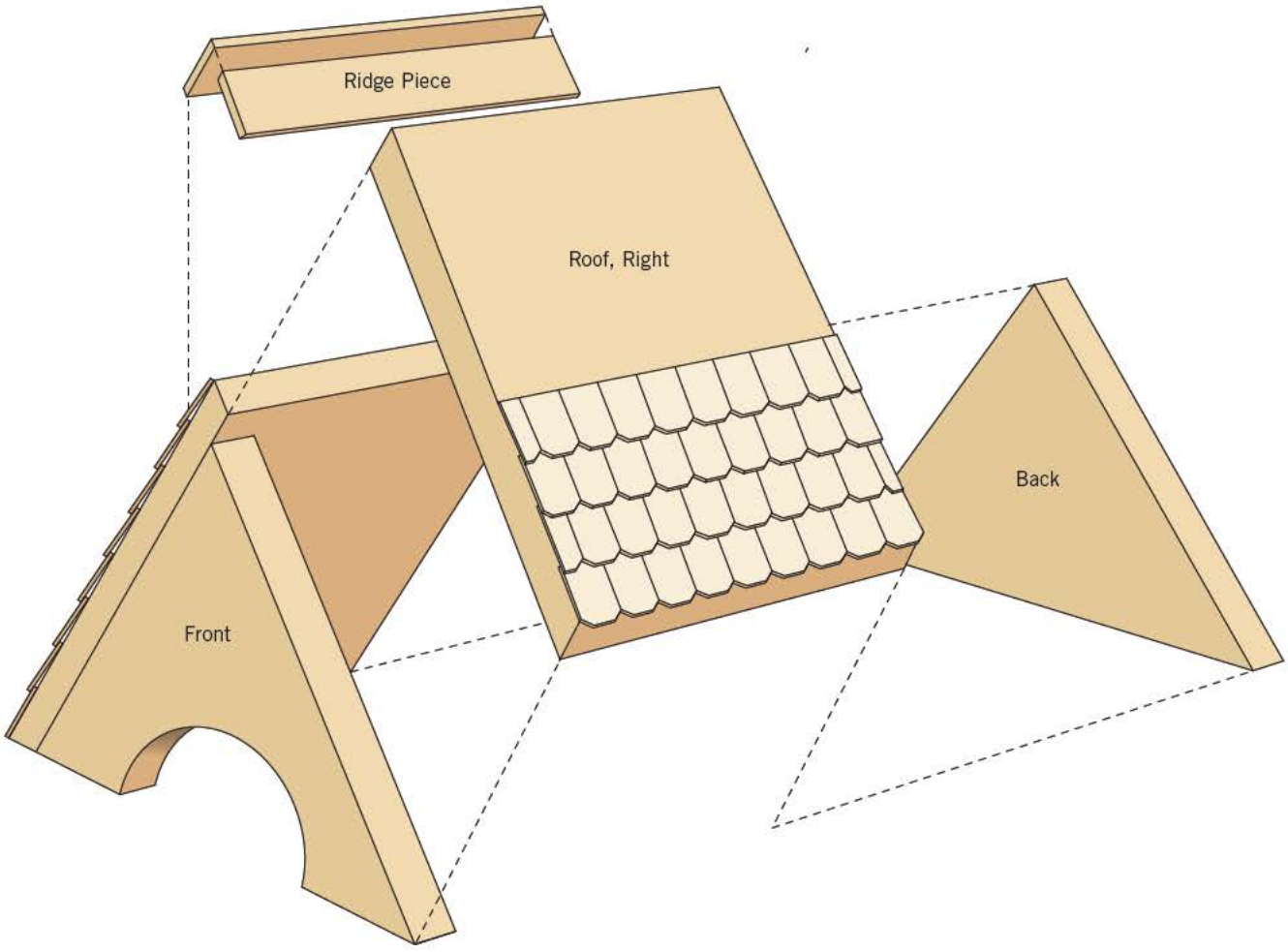
Toad describes his elaborate house thusly: "Toad Hall is an eligible self-contained gentleman's residence very unique; dating in part from the fourteenth century, but replete with every modern convenience. Up-to-date sanitation. Five minutes from church, post-office, and golf-links."

Toad, a lazy fellow living on a huge inheritance, does nothing to earn such a fine home. In fact, he's never worked a day in his life. Mr. Toad is nothing like his real-life counterparts.

Toads are among the most beneficial animals that can live in your garden. They'll eat pretty much anything that moves, and they're always hungry. A typical toad can eat a hundred bugs a day, depending on the size of the toad and the size of the bugs of course, and up to 10,000 bugs per toad during the full growing season. And it's not just insect pests they enjoy, because they'll also happily consume destructive slugs and snails. If any wildlife deserves an opulent Toad Hall it's these guys. They may not be pretty, but they'll certainly earn their keep.

Toads are most active at night and like to tuck into cool, shady spots during the day. You might find them lodged in spaces beneath landscaping rocks, or nestled beneath a shard of broken pottery. But they'll readily move into an appropriate home that you provide, like the one presented here. For this project I've chosen cedar, but any wood will do as long as it's weather-worthy.

Toad House



TOAD HOUSE CUT LIST

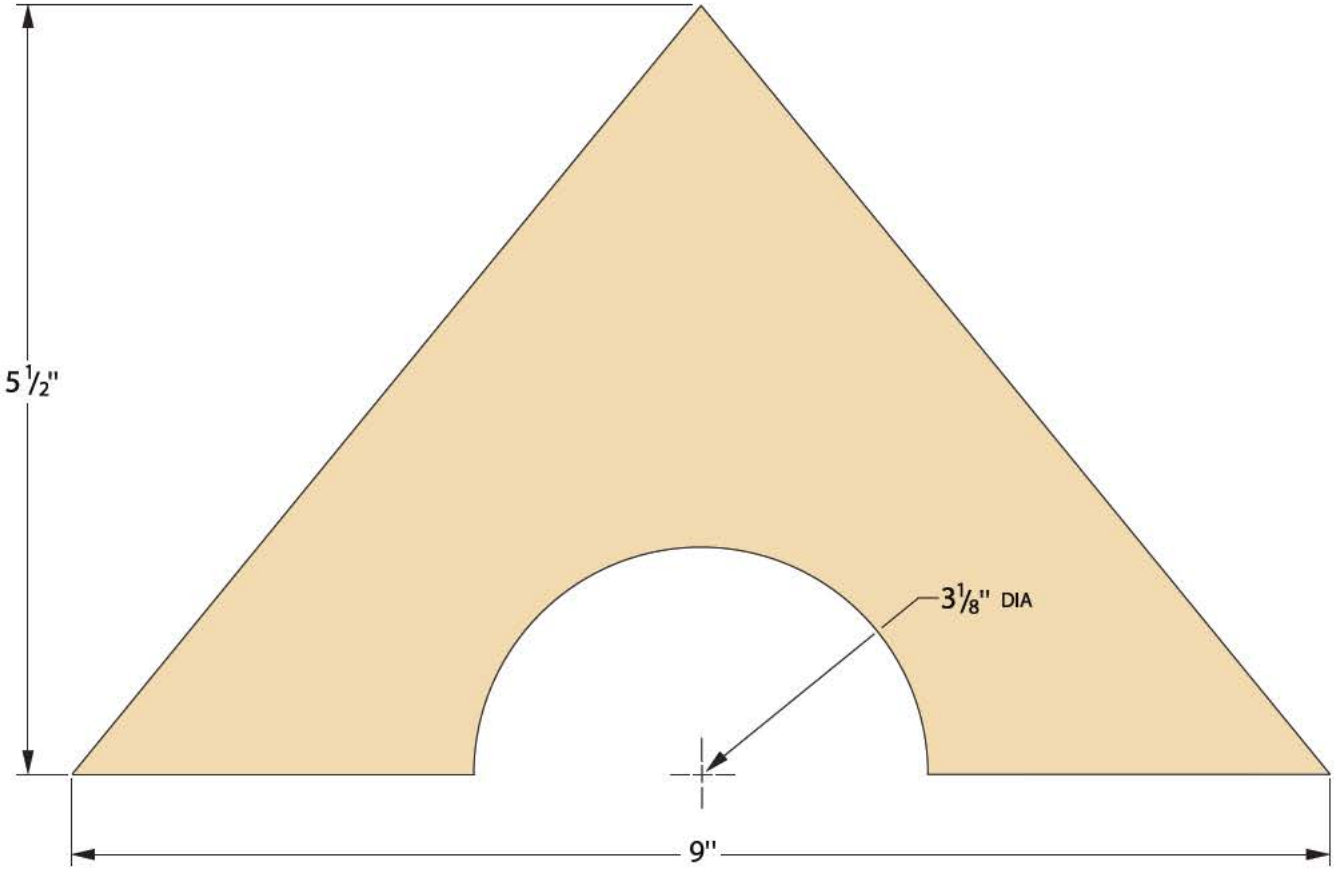
REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	2	Front/Back	Cedar	¾"	5½"	9"	
B	1	Roof, Left Side	Cedar	¾"	6¾"	8⅛"	
C	1	Roof, Right Side	Cedar	¾"	6¾"	7¼"	

Overall Dimensions: 10½" (includes shingles) wide x 6¾" deep 7" tall

OTHER MATERIALS

Cedar doll house shingles (1 bag)

Pattern for Front (Part A) (1" squares)



In addition to insects, toads help keep your garden clear of damaging slugs and snails.

Photo by Tom Reichner/Shutterstock.com

Building the Toad House

To cut the identical front/back parts to size, I doubled up the pieces by driving a few finish nails into waste areas and transferred the pattern to the stack, and then cut both at the same time (**PHOTO 1**). I'm using the band saw here, but any saw, powered or hand, works just as well.

With the front/back parts sawn to size and shape, cut out the entrance opening in the front per the pattern (**PHOTO 2**). Once cut, sand the opening smooth with hand sanding or on a spindle sander.

Follow this up by cutting the two roof halves to size, beveling the top edge of each to 11.5 degrees. This will match the 78.5-degree roof slope for a flush fit when you overlap the two roof halves. By the way, these angles weren't intentional and aren't critical. My goal was to make the house front and back using easy measurements of 9" wide by 5½" tall; the angles occurred naturally once I had laid out the workpieces. So if you resize the house, use whatever angles come out for you.

Begin assembly by gluing the front/back pieces of the shorter roof half, aligning the crown of the two pieces with the beveled roof edge as in **PHOTO 3**. Glue the other roof half to the assembly. Allow the glue to set up a bit, then place the assembly upright on your workbench or table and secure the roof with galvanized 4d or 6d finish nails (**PHOTO 4**). If you're using a pneumatic nailer, 1½" brads will work well.

At this point the house is complete, and with just a light sanding of any sharp edges you could put it in your garden and hang out the For Rent sign for your hard-working future tenants. However, let's add a bit of class befitting Mr. Toad by shingling the roof. Doll house shingles are perfect for this and you can get a bag of several hundred at any hobby outlet that handles doll house supplies. These shingles come in a couple different shapes; I've chosen the hexagonal cut called "fish scale," but you'll also find them rounded or square. They're also available in a couple different wood species, but cedar is best for outdoor use.

Your shingles will include a recommended spacing of the rows for optimum placement; for the ones shown here the proper spacing is 1". Pencil in a placement grid on the house roof starting at the bottom edges, drawing a line at every recommended increment toward the top, as in **PHOTO 5**. Use a square for accurate placement. It's OK if you don't have a full increment at the top; you can just cut the shingles for that last row to the needed length.

Now glue the shingles on, beginning at the bottom (**PHOTO 6**). You can use a regular waterproof woodworking glue for a permanent attachment, but I recommend hot-melt glue for a couple of reasons. First, hot-melt glue cures in seconds, meaning you only need to hold the shingle briefly in place and it's good to go, as opposed to waiting a long time for regular glue to cure. Hot-melt glue is also more reversible than regular woodworking glue. If you ever need to replace broken shingles you'll find them much easier to remove.

Stagger every other row by alternating how the rows start—one row begins with a full shingle, the next with a half shingle, then a full shingle, and so on.

By the way, you'll notice in the photos that the first row of shingles along the bottom—and every other row—is an exact fit of nine shingles. That's why I made the roof 6¾" long, to accommodate a full row of nine ¾" shingles. With this in mind, it's best to buy your shingles first, and then size the roof halves to a row of full-size shingles.

With all the shingles in place, you may want to cut a couple of trim strips to form a more formal ridge at the top of the roof. These are simply two 6¾" pieces of ⅛" scrap cedar, butted up against each other and glued into place.

The last step is to use a sanding block to smooth the front and rear edges of the shingles, as in **PHOTO 7**. There will be a lot of sharp edges, plus cutting those half shingles will likely leave several overhanging a bit or slightly out-of-line with the others. A sanding block brings everything into the same plane and removes any sharp edges or shingle points.

Place your new toad house in your garden or landscaping wherever you want your hardworking toads to feel at home. Try to locate the house underneath overhanging plants or shrubs so it's in shade throughout the day. If you place the house on mulch, as I have in the lead photo, add a small handful of dirt to make a comfortable floor for the toads to settle into while they get ready for a night of foraging.

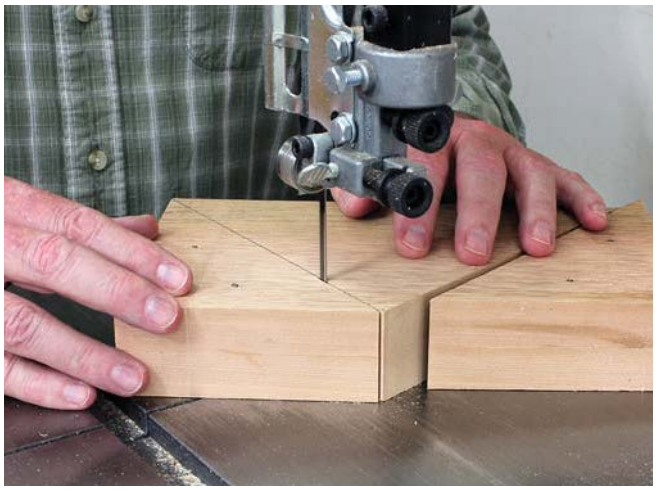


PHOTO 1 Doubling up duplicate parts speeds cutting and ensures they're exactly the same.

PHOTO 2 When using a coping saw, always secure the stock firmly. Here, I'm using a bench vise to hold the workpiece vertical while cutting.

PHOTO 3 Inset the house front and back about ¼" from the roof edges for an attractive overhang.

PHOTO 4 Nail the roof halves in place, and then use a nail set to drive the nails slightly below the surface.

PHOTO 5 Before attaching shingles, lay out placement lines on the roof surface.

PHOTO 6 Hot-melt glue allows you to work quickly, and is easy to remove for repairs.

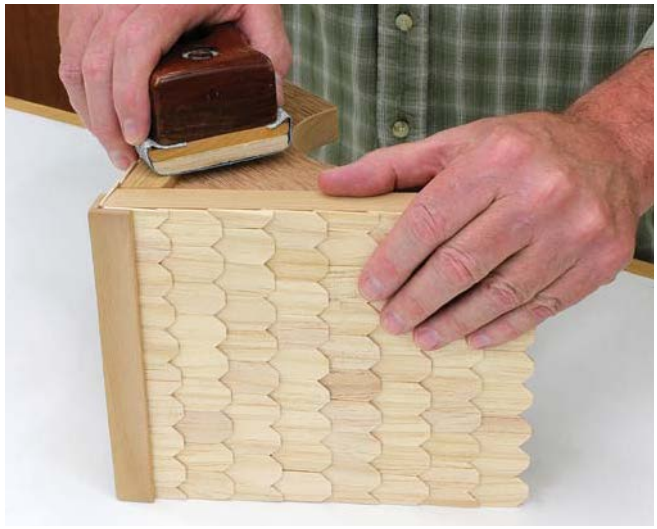
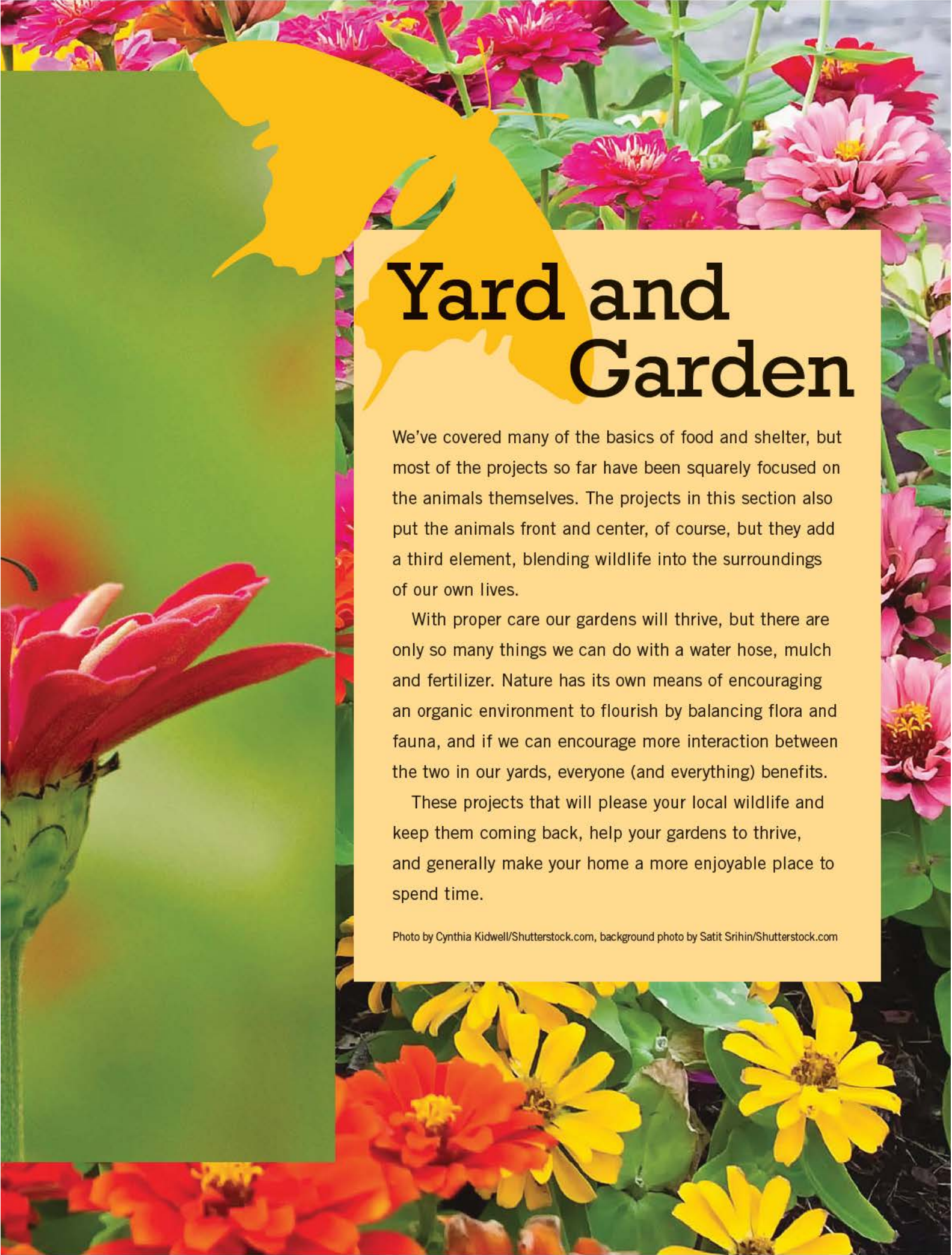


PHOTO 7 Use a sanding block to even up the shingles and to remove all sharp edges.



Yard and Garden

We've covered many of the basics of food and shelter, but most of the projects so far have been squarely focused on the animals themselves. The projects in this section also put the animals front and center, of course, but they add a third element, blending wildlife into the surroundings of our own lives.

With proper care our gardens will thrive, but there are only so many things we can do with a water hose, mulch and fertilizer. Nature has its own means of encouraging an organic environment to flourish by balancing flora and fauna, and if we can encourage more interaction between the two in our yards, everyone (and everything) benefits.

These projects that will please your local wildlife and keep them coming back, help your gardens to thrive, and generally make your home a more enjoyable place to spend time.

Photo by Cynthia Kidwell/Shutterstock.com, background photo by Satit Srihin/Shutterstock.com

Nest Material Dispenser

When birds are nesting in the spring (or, depending on the species, multiple times during a season) they're always on the lookout for nest materials. If you've ever examined a nest you've seen that while some birds make them entirely from one material, such as dry grass, most birds will use almost anything. It isn't surprising to find string, hair, thread, twigs, grass, weeds, even bits of discarded paper or strips of plastic all in the same nest.

You probably already have birdhouses in your yard, so do your local birds a favor and also offer a variety of nest materials that they'll have right at hand. A nest material dispenser is easy to make; the one presented here has only two components. You'll find that watching birds access the dispenser is just as enjoyable as watching them at your feeders.

Photo by Mark Bridger/Shutterstock.com

Building the Nest Material Dispenser

The key component is a small cage or basket which, once filled with materials, can easily be mounted near birdhouses or nesting areas. I've made several of these, and I've found that grilling baskets like the one shown in **PHOTO 1** work very well. These come in a host of shapes and sizes, but a flat style like this one seems to work best and takes up less space when mounted. I think I paid less than $3 for it.

The woodworking portion of this project is minimal. In fact, trimming a piece of 2x4 to a length of 6" for the mounting block is pretty much it. Cut the block to length now, and keep it handy. We'll need it in a moment.

Disassemble the grill basket into its two halves and, with a pair of diagonal pliers or other cutters, clip the handle wires to a length of about 4" (**PHOTO 2**). This may leave the ends of the wires a bit sharp from the cutters, so dull the tips a bit with a file or sanding block to avoid scratches.

Center the freshly cut end of one of the basket sections against the top of the mounting block and mark where the tips fall, as shown in **PHOTO 3**. Continue your marks across the top of the block to note the drilling locations. Now, drill two holes on your marks to a depth of about 3" to hold the handle wires (**PHOTO 4**). For the grilling basket I got, ¼" holes worked perfectly to hold the handle wires, but you may want to drill some test holes in a piece of scrap to determine the right size for your basket. The idea is that when you reassemble the basket and slide the handle wires into the holes as shown in **PHOTO 5**, it should be a snug fit, but still easy for you to remove to refill the basket with nest material.

Lastly, center and drill a pair of countersunk mounting holes through the block. Mount the dispenser in any accessible spot with a pair of exterior-grade screws once you've filled the basket with nesting supplies.

Speaking of which, you can use quite a few things from around the house as nesting, and you can see some of these in **PHOTO 6**. I've cut 4" to 6" lengths of manila rope and unraveled them into thinner cords, cut some old sheet fabric into narrow strips, and cut lengths of string. Rounding everything out, I picked up a bag of pillow stuffing at the fabric store that I know from past experience the birds will love.

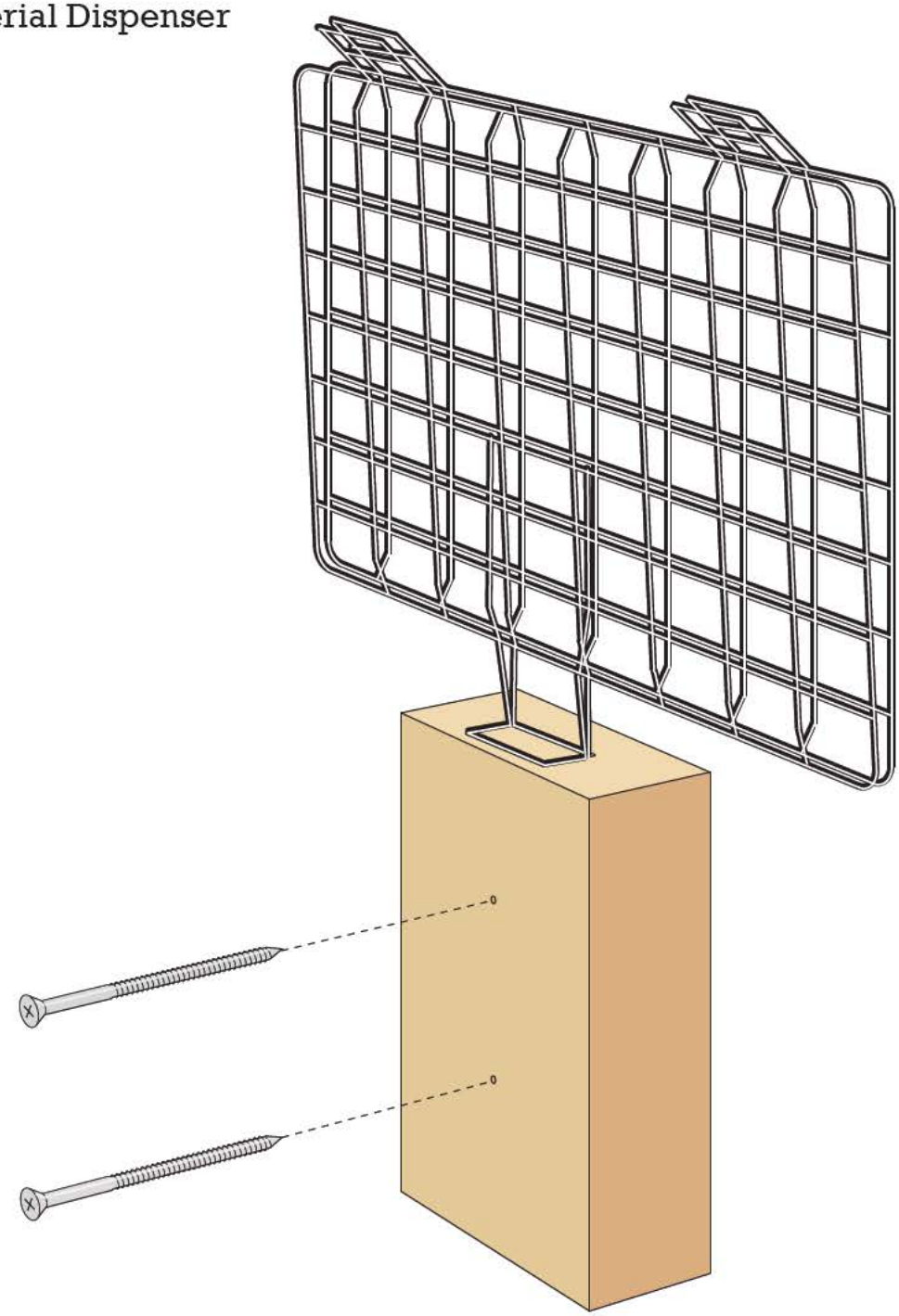
To fill the dispenser, just open the two halves of the

PHOTO 1 An inexpensive grilling basket will hold the materials birds need for building nests.

PHOTO 2 Take the basket apart and clip the handles to about 4".

PHOTO 3 Hold the block up to the handles and mark where the tips land.

Nest Material Dispenser



NEST MATERIAL DISPENSER CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	1	Mounting Block	Pine	1½"	3½"	6"	Any wood; adjust length of block for mounting

Overall Dimensions: 1½" deep x 8" wide x 15½" tall

grill basket and put everything inside in no particular arrangement. Don't worry about overfilling the dispenser—that's not really possible—so feel free to shove in as much as you can and still snap the basket closed. Once filled, slip the handle wires into the mounting block and then just stand back and watch the nest gathering frenzy.

The grilling basket we've used here does a great job, but you might also use a suet basket like the one in the Suet Feeder on **PAGE 23**. Just fasten it to a mounting board or block so the door faces forward for easy access. Vegetable bags of heavy plastic mesh hung from tree limbs also work, as will plastic baskets of the type strawberries come in. Just be sure when you mount whatever you use that it's easy to access and refill as needed, and your birds will be happy ones.

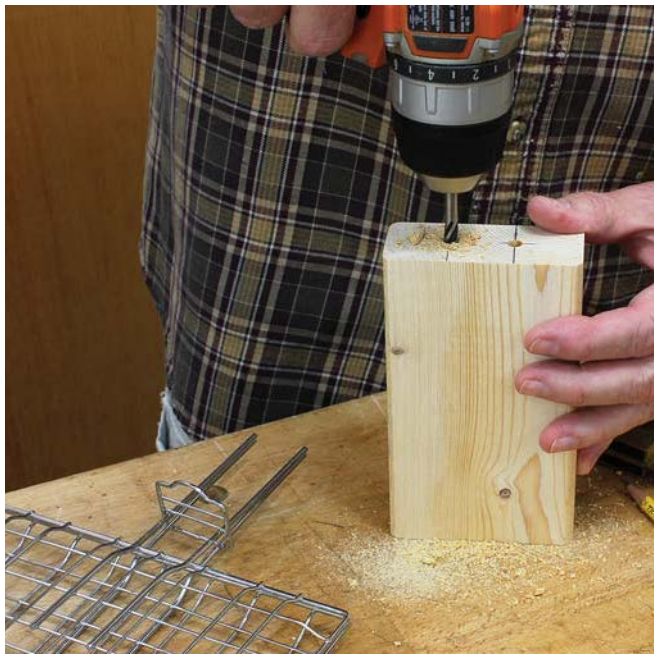


PHOTO 4 Extend the marks across the block and drill a hole in the center of each line. Size the hole to fit your basket handles; ¼" worked for me.

PHOTO 5 The assembled basket should mount snugly in the holes, but loose enough for you to remove and refill.

PHOTO 6 Here's a small sampling of materials birds will use for building nests. Cut string and break rope into strands, then pack your dispenser full.

Hanging Birdbath

Watching birds enjoy a birdbath is delightful, but birdbaths can be a real pain to maintain and keep clean. Likewise, if you're the one in charge of yard care around your home, you'll grow very tired of mowing and trimming around a stationary birdbath. And if you back into one while mowing, they're very easy to tip over. Don't ask me how I know this.

A great solution is a hanging birdbath that's completely portable, with a removable bathtub that's easy to clean. You can move it around the yard to take advantage of prime bathing spots for the birds, and when winter comes just take the bath down, wrap up the chain, and stow it away until spring.

The birdbath featured here is based on a saucer of the type used beneath potted plants, which nestles into a circular cutout in a frame made of two layers of cedar. These saucers come in a huge range of sizes, from teacup-size to jumbo pizza. Plastic ones come in a rainbow of colors, but you can use a heavier terra-cotta saucer if you prefer. This project is based on a saucer measuring about 12" in diameter, but be sure to buy your saucer before starting and adjust the project dimensions to suit.

Prepping the parts is easy—everything amounts pretty much to simply cutting some off-the-shelf 1x3 and 1x6 cedar to lengths of 17". Note that the actual widths of these materials are 2½" and 5½", respectively. You'll arrange the parts as a sandwich with the wider bottom pieces going one direction, and the narrower top ones the other.

Building the Hanging Birdbath

Start by laying out the three wide pieces for the frame, equally spaced so the total width is 17". A carpenter's square will help tremendously with this – orienting the rough faces in the same direction. Now glue and clamp one narrow piece on each end of the laid-out wider pieces, as in **PHOTO 1**. Cross-grain gluing is normally considered to be a weak joint because of wood's seasonal contraction and expansion, even with waterproof glue. However, we'll be cutting a good deal of the wood away in a later step, so that won't be an issue here. We'll also reinforce the frame a bit farther along, but for now add a nail or brad to each corner of the glue-up to hold the frame rigidly square as you work (**PHOTO 2**). These corners will be trimmed off when you cut the frame, so exact placement isn't important.

Now, lay out the locations of the remaining cross pieces as shown in **PHOTO 3**. The gap between pieces will be a bit less than ¼", but the exact measurement isn't critical. What's more important is that they be laid out square to the frame. Glue and clamp everything in place.

When the assembly has dried, remove the clamps and turn the frame upside down. Find the center of the assembly by laying a straightedge corner-to-corner and mark it, then draw a circle to the edge of the assembly. You'll need a compass that can expand to an 8½" radius to get a 17" circle, but lacking that (as I did) you can make do with a short length of scrap made into a quick compass, as shown in **PHOTO 4**. This is just one of the thousands of uses for the scrap wood that I never throw out.

Scribe a second circle inside the first for the opening that will hold the saucer. I wanted a ¼" overhang all around, so for my 12" saucer an inner circle of 11½" was about right.

You'll cut the birdbath frame on both of these circles, but start with the inner one. This allows you to use the uncut corners to clamp the assembly to a workbench or table. With the workpiece secure, slip the blade of a jig saw into the gap closest to the inner circle and cut out the center portion to create the opening (**PHOTO 5**). Unclamp and reposition the workpiece as needed to allow you to cut the full opening.

To cut the outer circle you can use the jig saw as before, but I chose to move over to the band saw, as in **PHOTO 6**. With all the cutouts complete, give the now-circular frame a good sanding all around. A disc sander is perfect to sand the surface of the outside curve, while a spindle sander makes fast work of the inside, but a sanding block also works just fine (**PHOTO 7**). While sanding, go ahead and smooth all the edge corners, as well as the edges of each gap between pieces.

Flip the frame upside down again and add some reinforcing nails, one or two per section. A brad nailer makes this a quick task (**PHOTO 8**), but a hammer and finish nails is fine. Note here that I'm using 1½" brads (or you could use 4d finish nails), as the slightly thicker-than-¾" cedar ensures the nails won't come through on the doubled-up assembly. Also, by nailing from the underside, none of the nails will be visible in the finished project.

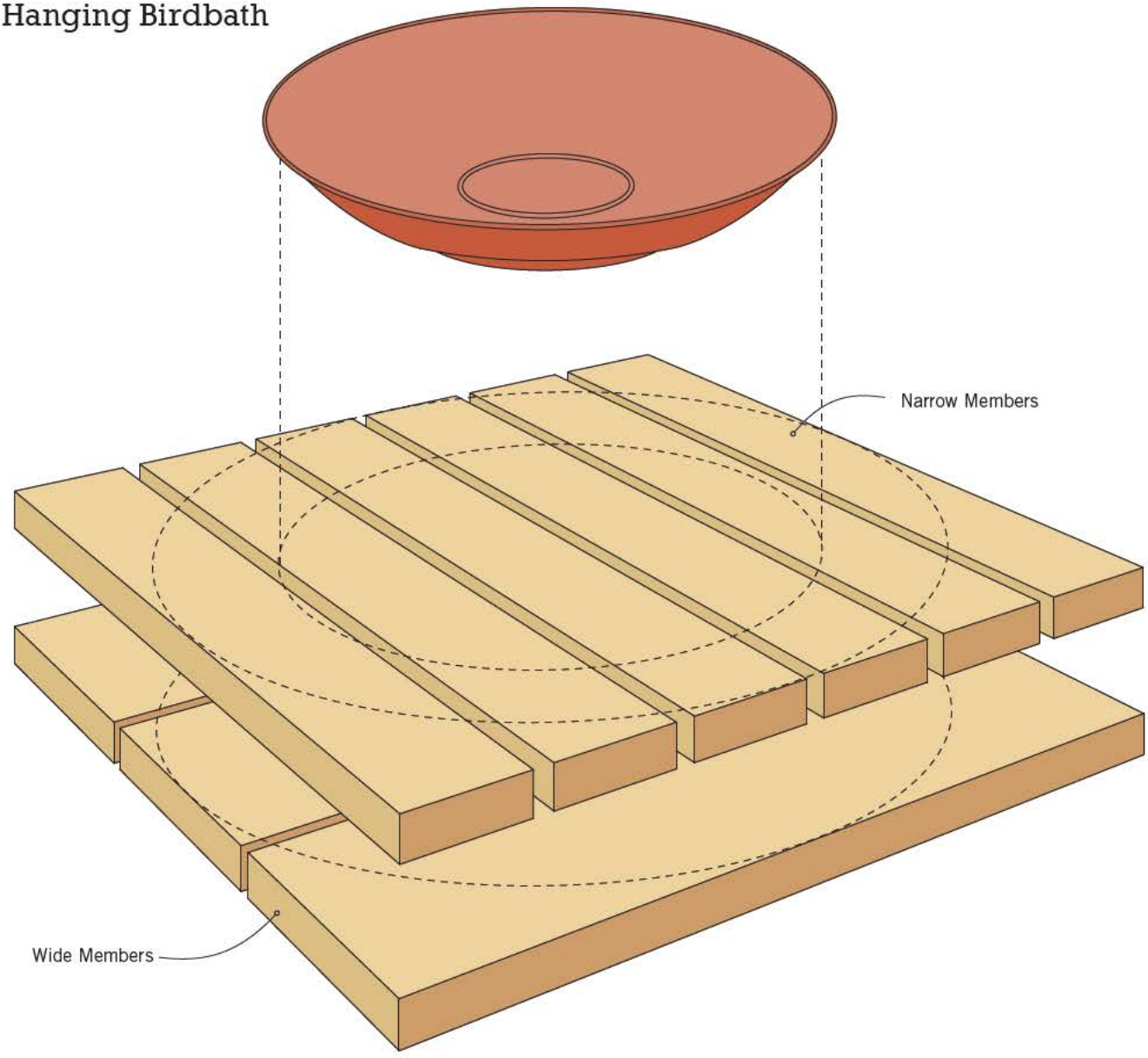
Drill pilot holes around the outside edge of the frame for three equally spaced screw eyes as shown in **PHOTO 9**. Inset all three screw eyes ¾" to 1" from the edge, twisting them into place until the eye is level with the wood.

Attach the chain to the screw eyes with S-hooks threaded through the eyes and the end links of the chain (**PHOTO 10**). When squeezing the S-hooks closed, keep from scratching through the protective zinc coating by wrapping a bit of tape around the jaws of your pliers. You might want to adjust the length of the chain you use, but for a birdbath sized the same as this one, I found that 20" per side worked well. You can join three separate 20" lengths at the top if you like, but I attached a single 40" chain to two of the screw eyes and a 20" one to the third, then joined that shorter chain to the exact center of the longer one to make a hanging tripod.

Depending on where and how you want to hang your finished birdbath, you can put a hanging hook right at the junction of the three 20" chains, or attach additional chain to reach a high branch or other hanging location.

PHOTO 1 When putting together the initial assembly, use a carpenter's square to ensure accurate placement.

Hanging Birdbath



HANGING BIRDBATH CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	3	Wide Members	Cedar	¾"	5½"	17"	
B	6	Narrow Members	Cedar	¾"	2½"	17"	

Overall Dimensions: 17" wide x 17" long x 2" tall (not including chain)

ADDITIONAL MATERIALS

- #14 zinc-plated jack chain (usually comes in 15' package)
- 1⅜" zinc-plated screw eyes (3)
- 5/64" S-hooks (3)
- Saucer, of type used under potted plants, 12" diameter

PHOTO 2 A brad or nail in the corners of the glue-up keeps everything solid during assembly. These nails will be eliminated when you round the frame.

PHOTO 3 Lay out the remaining pieces with gaps of uniform size, drawing in guidelines that will aid in the gluing process.

PHOTO 4 You can make a simple compass by driving a nail into one end of a piece of scrap, with a hole for a pencil at the other.

PHOTO 5 Cut the opening in the center of the frame first, using the outside corners and edges for clamping.

PHOTO 6 You can cut the frame shape with jig saw, scroll saw or coping saw, but a band saw gives superior results.

PHOTO 7 Always remove the sharp edges from a project like this before it's put into service. A sanding block is an essential tool in every shop.

There's No Such Thing as Scrap

Most people call what's left over "scrap." I call it, "small pieces of wood I haven't found a use for yet." Whenever I work on projects, no matter how small or odd the leftovers, I never throw them out. You just never know when they'll be useful.

A good example is the circular cutout from the center of the birdbath. If you cut carefully, you'll end up with a disc of Western red cedar that you'll find useful around your yard or garden. It will make a great coaster placed underneath a potted plant or as a base that raises pots off the ground or deck.

As shown in the photo here, you can even use it as a hot pad or trivet with the grill. It does a great job corralling a couple steaming-hot ears of corn-on-the-cob.

PHOTO 8 A few reinforcing brads or nails team perfectly with waterproof glue for a long-lasting project.

PHOTO 9 Drill pilot holes before installing screw eyes to prevent splitting the soft cedar so close to the edges.

PHOTO 10 Wrap tape around your pliers to prevent scratching through the weatherproof zinc coating on the chain and fitting.

Butterfly/Hummingbird Planter

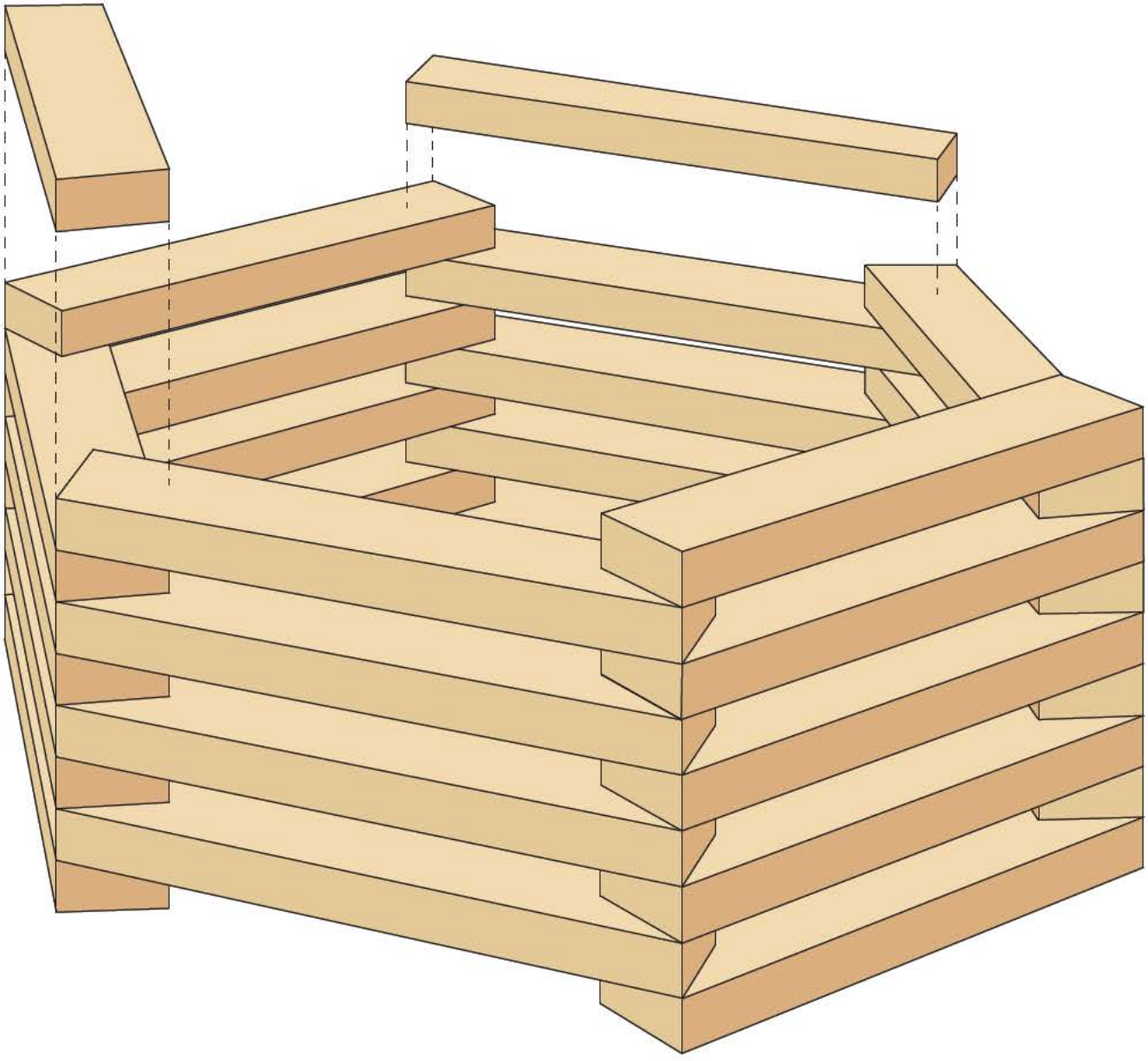
Nothing attracts butterflies and hummingbirds like a garden overflowing with nectar-filled flowers. Not everyone has the space or open landscape to cultivate a flower garden, but a planter stocked with the right kinds of flowers will work just as well to keep hummingbirds and butterflies happy in your backyard wildlife habitat. You'll find a list of suggested flowers in the sidebar Flower Favorites on **PAGE 104**. Once you choose your varieties, all you'll need is the planter to put them in.

Strictly speaking, this planter isn't actually a planter because you don't fill it with dirt and start digging. Instead, it's a useful cover for any old pot you already have—even the cheap plastic ones you bought the flowers in—that instantly beautifies your porch, patio, or deck. All you have to do is set the pot down inside, and all anyone sees is the beautiful cedar.

I've already written just how useful I find scrap wood in my shop. To prove it, I made this project almost entirely of the plentiful cedar scrap produced by other projects in this book. I had several lengths of leftover 1½" cedar, so I decided that would be the base width of the parts for this planter. If you don't have enough 1½" scrap, it's simple to rip some more, or just use regular 1x2 cedar as it comes from the home center, which is already 1½" wide.

Based on the amount of my available scrap I sized this hexagonal planter to accept pots up to 11" in diameter, but you easily could resize the parts for a larger or smaller one.

Butterfly/Hummingbird Planter



BUTTERFLY/HUMMINGBIRD CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	1	Planter Rails	Cedar	¾"	1½"	8½"	Height accounts for cedar slightly thicker than ¾"; stock exactly ¾" thick would total about 7½" tall.

Overall Dimensions: 14" wide x 16¾" long x 8½" tall

Building the Planter

The construction is simple: You just stack a series of 1½" x 8½" cedar rails atop each other, gluing and nailing each one into place as you ascend. There are five rails per side, meaning you'll need to cut 30 of them. In **PHOTO 1**, I'm crosscutting the rails on the table saw, but cutting the soft, narrow strips of cedar is a quick job whatever cutting method you use.

You'll find that assembling the hexagon is much easier if you first outline the shape on paper, as in **PHOTO 2**. Measure the angles carefully and draw lines that are straight, dark, and easy to see. Now, use masking tape to secure the first three rails directly to the paper, to keep them from moving as you start the assembly. Once you have the first and second tiers secure everything will be fine, but the first tier will move all over the place if you don't tape it down.

Put a bit of glue at each end of the three taped-down rails and place another across each opening, as shown in **PHOTO 3**. Drive a single nail or brad into each corner, and then work your way up to the top (**PHOTO 4**). Slightly offset the nails on each tier; there's not much chance that you'll inadvertently nail down exactly on the head of the nail below—I've never had it happen—but offsetting them just a tiny bit on each tier will certainly prevent that.

Once you've reached the top, use a sanding block to smooth all the sharp edges (**PHOTO 5**) Don't forget to do the bottom edges to prevent splintering if you scoot the planter across concrete or brick.

The most obvious variation on this project is to alter the size of the planter by lengthening or shortening the rails, or to change the height by adding or deleting tiers. If you like, you can also experiment with other shapes. A pentagon or octagon, or even a simple square would work just as well and be just as attractive.

Of course, the real attraction is the beautiful hummingbirds and butterflies that will make the planter their favorite backyard dining spot.

PHOTO 1 Cut all of the planter rails to the exact same length. You'll need 30 of them for this project.

PHOTO 2 Lay out a hexagon on heavy paper to use as an assembly guide, checking the angles and side lengths carefully.

Flower Favorites

When looking for nectar, every hummingbird and butterfly hopefully checks out every flower it encounters. However, just like us humans they do have their favorites. The best part is that the preferred varieties overlap considerably, so there's no hard choice about which flower to use. Most will attract both butterflies and hummingbirds to the same planter. Hummingbirds do favor the color red, but otherwise all the flowers on this list are good choices for these colorful visitors.

Aster
Bee balm
Butterfly Weed/Bush
Columbine
Foxglove
Hibiscus
Hollyhock
Impatiens
Lantana (shown on page 101)
Pansy
Petunias
Phlox
Purple Coneflower
Zinnia

Butterflies like this silvery checkerspot will welcome the ready source of nectar offered by flower gardens and planters.
Photo by Bud Knecht, 2013

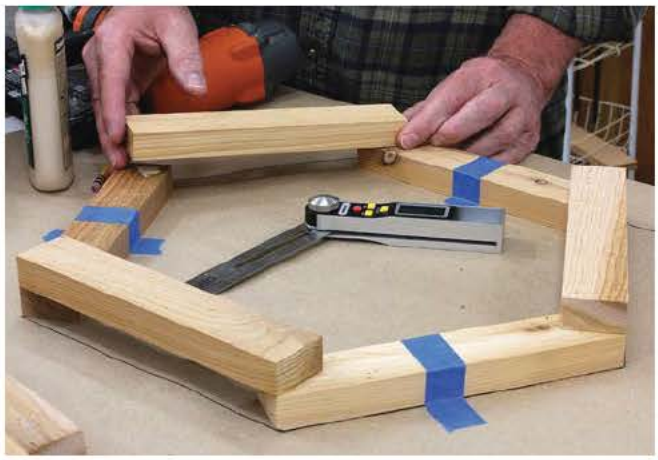


PHOTO 3 Masking tape keeps the first pieces from moving as you assemble the tiers of rails. You can remove it once the first two tiers are done.

PHOTO 4 Waterproof glue and a single nail in each corner is all you need for a sturdy structure.

PHOTO 5 Cedar edges can splinter easily, so round them a bit on the finished planter with a sanding block.

Ladybug Attractor

Ladybugs are among the most-loved insects. Songs and nursery rhymes have been written about them, they're often thought of as a sign of good luck and good fortune, they pop up frequently as a favorite subject in arts-and-crafts projects and in coloring books. In fact, they're one of the few bugs that children (and many adults) don't fear or find, well, icky. They're brightly colored, comical to watch, and among the most attractive of wildlife.

The truth about these cute little bugs—actually, they're beetles, not really bugs or insects—is a bit darker: They're voracious carnivores that happily eat a host of other species. That may not be enjoyable to watch, but it does make them among the most beneficial bugs around. The favorite foods of ladybugs are plant-damaging aphids. Depending on the species, an adult ladybug can eat several dozen in a day, and up to 5,000 in a lifetime. They also readily devour a wide range of other pests including mealybugs, spider mites, whiteflies and leafhoppers, as well as larger pests like cabbage moths and tomato hornworms. Having ladybugs around the garden is definitely a good thing.

You can attract ladybugs by giving them a comfortable place to hang out (you could call this project a ladybug lounge), with an appropriate bait to get their attention. With only two parts—a short length of bamboo and a wire to hang it—this certainly is the easiest project in the book, but one that can have a big impact on your garden.

You can use well-seasoned bamboo if you buy it that way, or you can cut your own fresh bamboo if you have

Ladybug Attractor

LADYBUG ATTRACTOR CUT LIST

REFERENCE	QUANTITY	PART	STOCK	DIAMETER	LENGTH	NOTES
A	1	Bamboo Section	Bamboo	2"	10"	PVC pipe may be substituted
B	1	Hanger	Brass	3/32"	24"	

Overall Dimensions: 10" wide x 13" tall

a local source. Bamboo is a type of grass, and with more than 1,500 varieties of bamboo that grow in just about all climates, there's a good chance you have some near you. You'll need a short section, anywhere from 8" to 12", that's between 1½" and 2½" in diameter. The piece I came up with here measures 2" by 10", a good size.

Building the Ladybug Attractor

Cut a section of bamboo just outside the joints, called "nodes," as shown in **PHOTO 1**. As with round PVC pipe, it's safest to cut the bamboo by hand. You cut outside those nodes because they are the strongest parts of the plant, and intact nodes on each end will help prevent the bamboo section from splitting, which it's liable to do quite easily.

There is a solid wall at each node, but it is easy to remove. Usually, you can just break most of it out with a screwdriver as I'm doing in **PHOTO 2**. With most of the wall removed, trim the resulting opening with a sharp utility knife and smooth it with a rolled up piece of sandpaper.

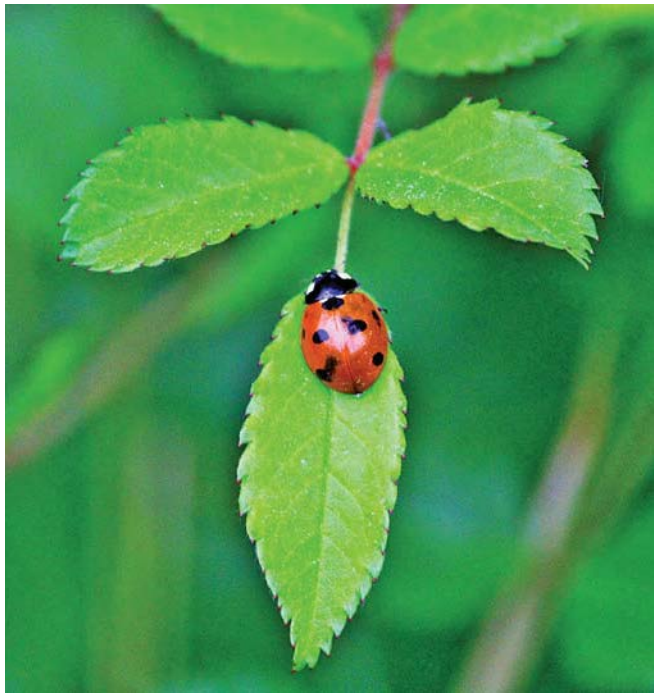
We'll hang the structure with wire—actually, a narrow 3⁄32" brass rod—so drill ⅛" hanging holes at each end (**PHOTO 3**). Drill just inside the nodes, angling the holes slightly down toward the opening.

Cut a 24" length of brass rod and mark it in the center, then bend the rod sharply on the mark, as shown in **PHOTO 4**. You'll want a steep bend angle that will allow you to insert both free ends through the holes you drilled in the previous photo. A little trial and error will get the angle right.

Insert the wire into the drilled holes. Grasp one end of the wire with needle-nose pliers and bend the last ½" inward to act as a hanging hook, as in **PHOTO 5**. The angle of this bend isn't critical, it only needs to be sharp enough to support the bamboo without slipping free. Repeat the process with the other end.

Hang your ladybug attractor anywhere in the garden. You can make and hang several, if you like. Ladybugs are carnivorous, but they also like a few other things that will attract them. A few raisins tossed into the middle of the bamboo works magic—ladybugs seem able to detect the raisins from a large distance.

As an alternative lure that's a bit stronger, try a commercial product called "wheast." A blend of wheat and yeast, many garden centers carry it for the express purpose of attracting ladybugs. Wheast can come as a powder, or in a liquid form that can be sprayed. If you can't find it, you can make a serviceable substitute by mixing equal parts sugar and yeast. Add enough water to form a thick paste and dab it on the inside of the bamboo tube.



An aphid's worst enemy: A ladybug can eat as many as 5,000 aphids in a lifetime.

Photo by Bud Knecht, 2013

PHOTO 1 Free a section of bamboo by cutting just outside the nodes.

PHOTO 2 The solid portion inside the node is easy to break out with any sturdy tool.

PHOTO 3 Drill ⅛" holes just inside the nodes for the hanging wire on each end.

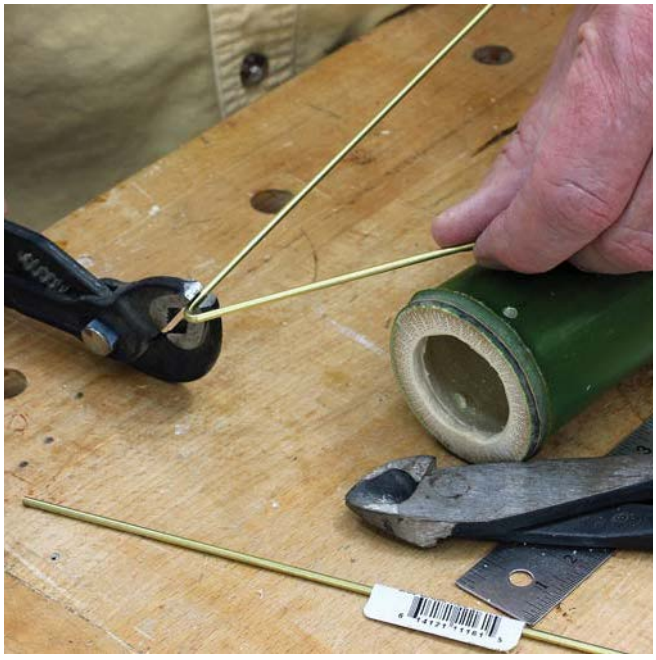


PHOTO 4 Bend the brass hanging wire at a sharp angle that allows both ends to easily fit in the drilled holes.

PHOTO 5 Use needle-nose pliers to bend the last ½" of wire inward to support the bamboo section.

Roosting Box

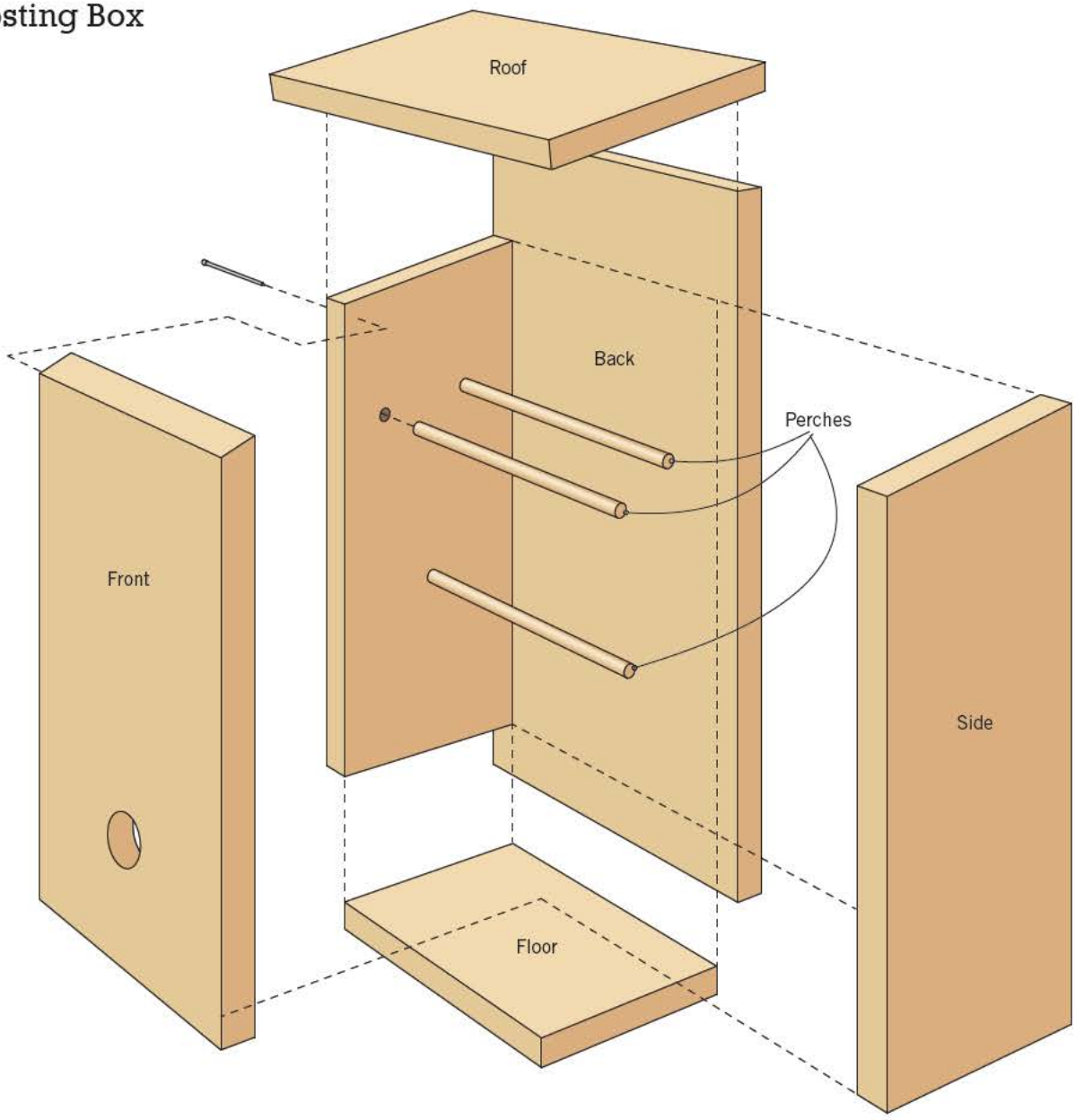
Birdhouses don't see a lot of use in the winter… or do they? If you leave your houses up all winter, should you open one on a cold, blustery morning you might be surprised to find signs that it's been occupied overnight. Cavity nesters don't breed in the winter, nor do they build nests out-of-season, but those that don't migrate appreciate a comfortable place to spend the night for the same reason we do: They need to stay warm.

While birds will happily spend a cold night in one of your regular houses if you leave it up all year, one built just for winter use can be even more accommodating by making a few key changes. First, you can ignore nesting requirements and make it larger. Nesting birds follow a one-family-at-a-time rule with birdhouses, but in winter they know that they'll stay warmer with more bodies huddling together. Depending on house size and local populations, a dozen or more birds of the same species may snuggle up together.

You'll need to make the entry hole the correct size for the intended species, of course, but locate the hole as low as you can to help trap warm air in the upper interior of the box. Likewise, you want no cold drafts at all in the roost, so don't make drainage or ventilation openings.

Finally, even though birds in the wild are content just to pile into a warm spot pretty much on top of each other, adding a series of perches allows them to stay higher up inside the box where the warm air will rise, and helps them navigate around inside by climbing the perches like

Roosting Box



ROOSTING BOX CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	2	Sides	Cedar	¾"	5½"	12½"	
B	1	Floor	Cedar	¾"	4¾"	7¼"	
C	1	Back	Cedar	¾"	8¾"	16½"	
D	1	Front	Cedar	¾"	7¼"	13⅛"	
E	1	Roof	Cedar	¾"	7"	10½"	
F	3	Perches	Oak	⅜"	n/a	5¾"	

Overall Dimensions: 8¾" wide x 7¾" deep x 16½" tall

ladders. Likewise, you'll want rough interior surfaces they can climb on, so orient the rough side of the wood inward. If you're using smooth wood, consider scoring it to create a climbable surface.

In winter, when you've also placed additional feeders close to your house, adding a roost box of this type is a great way to accommodate your visitors and enhance your immediate yard and garden areas.

Building the Roosting Box

To begin, cut your workpieces to size. This project has a roof that's slanted at 10 degrees. While a slanted roof helps to shed rain in warmer months, that roof tilt becomes even more important in winter to allow snow to more easily slide off as it melts.

Bevel the top edge of the house front, and the rear edge of the roof. In **PHOTO 1**, I'm using a scroll saw to cut these bevels, but you can use your table saw, jig saw or miter saw, or even a hand saw. To match the angle of these bevels, also cut the tops of each side to 10 degrees by your preferred method. You can stack these two identical pieces and cut them simultaneously as long as you're careful to orient the rough faces of the cedar inward.

Drill the entrance hole at the bottom of the front piece, close to where the finished floor will be, to keep warm air trapped in the upper parts of the structure. In **PHOTO 2**, I'm setting the hole so it will be about ¾" above the floor. Note here that I'm using a piece of scrap as a backer to prevent wood from splintering on the other side and to protect my workbench. Use the Birdhouse Chart on **PAGE 53** to match the hole size to your desired local species. I have a lot of chickadees and nuthatches where I live, so I've made the hole 1¼", which will accommodate both of these species as well as any wrens who may have hung around through the cold months.

Use the pattern to locate and drill ½"-deep holes in one of the two sides to accept the ⅜" dowel perches—doesn't matter which side—and then glue them into place as shown in **PHOTO 3**. These perches don't go all the way across, but leave about 2" of open space on the opposite wall for the birds to climb. I've used oak dowels here because that's what I had on hand, but any wood species will do. You don't need a lot of glue here, just a dab or two.

Assemble the house by starting with the floor, using waterproof glue and nails to set it into place between the two sides. Note in **PHOTO 4** how I've used a piece of scrap the same width as the floor as a temporary brace to keep everything level while I drive in 1½" brads. You could instead use a hammer and 4d or 6d galvanized finish nails.

Flip the assembly over and drill countersunk pilot holes, then attach the roost box back with glue and 1⅝" exterior-grade screws (**PHOTO 5**). Two screws on each side and one at the bottom will work well.

For access, the front side pivots on two carefully placed nails, like the lifting side in the Basic Birdhouse project on **PAGE 50**. Slip the front into place to test the fit; it should be snug, but still easy to move. If it's too tight, sand the edges to loosen the fit. With the front piece in place and flush with the top edge—remember, no ventilation gap this time—measure and mark the nail locations at 2" down from the top, and exactly ⅜" from the front edge so the door pivots properly. Drive a 6d galvanized nail into your marks on each side, as shown in **PHOTO 6**. Use a nail set to drive the head of the nail just below the surface.

Attach the roof with waterproof glue and nails driven down through the top and into each side (**PHOTO 7**). No nails in the front, of course, because the door needs to be free to open. Once the roof has been nailed into place from the top, flip the box over and drill countersunk pilot holes through the back for a pair of 1⅝" screws. Normally we'd just nail this from the back, but the screws work with the glue to ensure that the back edge of the roof stays very tightly in place to prevent water from leaking in. You'll need to drill and drive the screws at an angle from the back to match the slope of the roof.

Finally, secure the front. You could use a twist latch like the one on the Basic Birdhouse (**PAGE 52**), but I've chosen the security of driving a screw on each side near the bottom (**PHOTO 8**). These fasteners aren't structural, so short screws are fine and there's no need to drive them really tight. You just want to ensure that the front remains solidly closed with a minimum of air gaps, with no danger of wind accidentally blowing it open.

Mount the roost in an area that's protected from the wind; if you can locate it so your house helps protect the roost box, so much the better. Check the box periodically over the winter, and clean it out as necessary. Wood chips or shavings at the bottom can help minimize drafts, while adding a bit of insulation to the floor.

PHOTO 1 Bevel the top edge of the box front, as well as the back edge of the roof. I'm using a scroll saw here, but make the cut with your preferred method.

PHOTO 2 Unlike regular birdhouses, the entrance for a winter roosting box is drilled at the bottom.

PHOTO 3 Glue the dowels into holes arranged on the inside face of one of the sides.

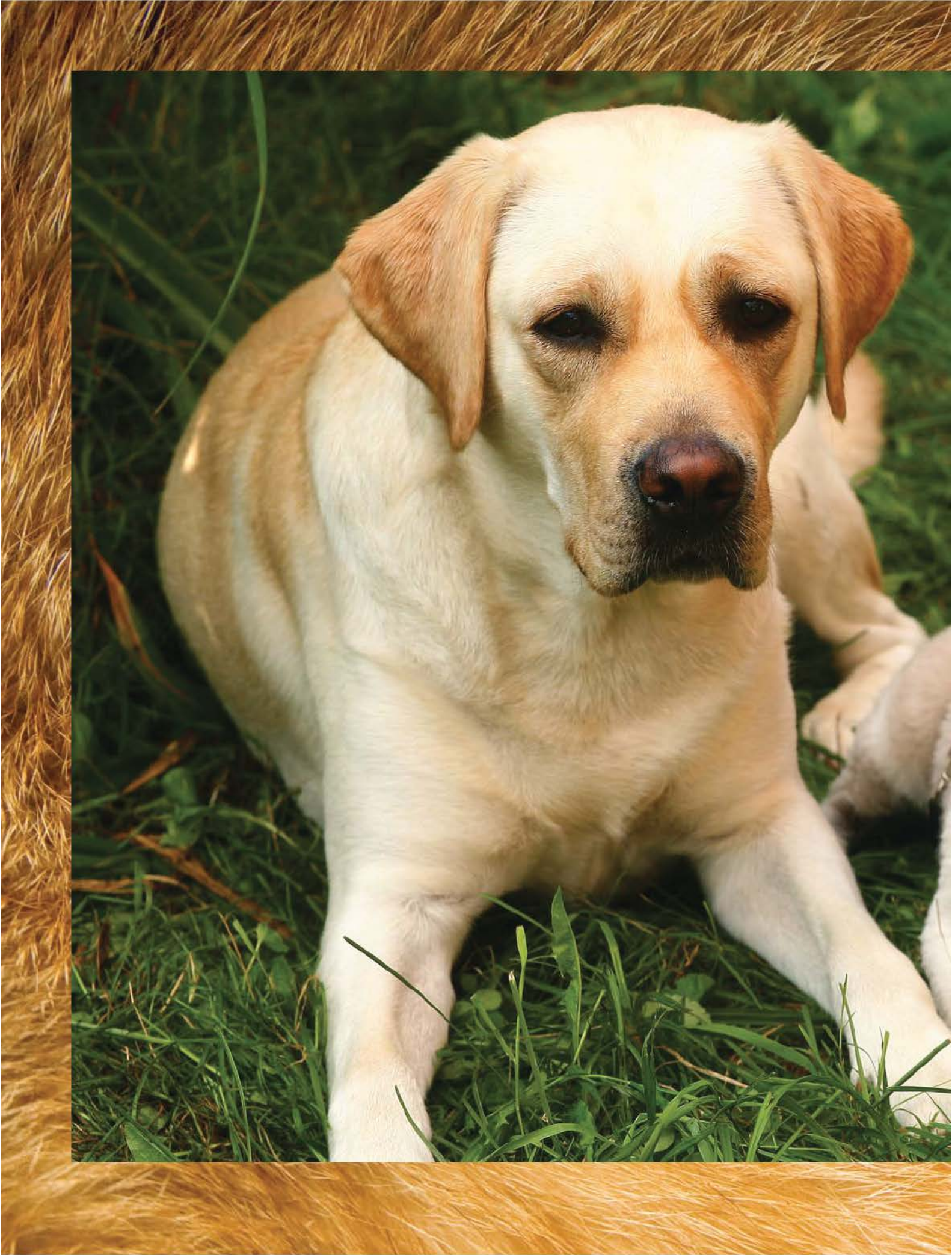
PHOTO 4 Assemble the house with the rough side of the cedar facing inward to provide a climbable surface.

PHOTO 5 Mount the roosting box back with waterproof glue and screws.

PHOTO 6 Measure carefully when setting the two pivot nails to ensure they're exactly opposite each other.

PHOTO 7 Glue and nail the roof in place from the top, then add two reinforcing screws from the back.

PHOTO 8 Keep the door closed with a short screw on each side of the box.



Domestic Wildlife

If you love the wildlife outdoors, there's no question that you enjoy the special pleasure that animals bring to our lives. And if that's the case you probably love indoor wildlife as much as the out-of-doors variety.

Dogs, cats, birds, tropical fish and more exotic wildlife like ferrets or reptiles share most of the traits of their outdoor cousins, but they also give us one thing the wildlife outdoors doesn't: their love and devotion. Well, maybe not fish. But show me a dog that's not thrilled when his people come home, or a cat that isn't in heaven purring on a warm lap. My parrotlet knows just what do to get my attention and even tells me when to quit working by making beer-can sounds at 5 pm, but when the sudden boom of thunder on a stormy day frightens him, he makes a beeline for my shoulder to snuggle into the protection of my collar.

So now that we've lavished our time and efforts on our animal friends outside, let's turn our attention to the ones closer at hand. These animals, after all, are family.

Photo by Artem Kursin/Shutterstock.com,
background photo by Nadezhda Bolotina/Shutterstock.com

Scratching Post

Once upon a time it was common to have indoor cats declawed to prevent the furniture from looking like shredded wheat. The practice is less common now, but along with having a cat with claws comes the cat's need to scratch those claws somewhere. You don't want it to be your furniture.

As it turns out, cats will readily scratch something they can call their own, and it's not all that difficult to get them to do it. The scratcher must be as sturdy as possible—you don't want it turning to shredded wheat anymore than you do your sofa—because it has to stand up to some serious abuse. This rope-clad scratching post will do the trick.

You can use just about anything for the main post—a short section of round wooden fence post, a length of wood 4x4, a heavy-duty cardboard tube like the ones used for shipping rolled carpet, or the length of 3" PVC pipe I've use here. Any of these will work, but you'll probably find that winding the rope goes faster and easier with a round post.

Building the Scratching Post

Cut the base to size from ¾" plywood or particleboard. To make wrapping carpet around the base easier and to keep sharp edges from wearing through, use a sanding block and some coarse paper to thoroughly sand all the edges (**PHOTO 1**). If you have one, an electric sander will make this a quick task.

Lay the base on your carpet, then cut a section with 2"

or 3" extra on all sides to wrap around and under the base, as shown in **PHOTO 2**. You can use any kind of carpet, but a thin carpet makes for easier wrapping. I'm using a section of runner-style carpet that is thin, but holds up well to lots of use.

Wrap the carpet up over each edge, pulling as tightly as you can, and staple it in place. In **PHOTO 3**, I'm using a regular staple gun, but a pneumatic stapler—which you'll see shortly—is considerably faster. Have a hammer handy to drive any staples that don't go in all the way. Note here how I've stapled right up to the corners, leaving the excess standing up in flaps. Once everything is secure, trim these flaps off.

To prepare the post, cut a pair of plugs the exact size of the inside of the PVC. The best way to ensure an exact fit is to trace the inside of a short piece of the same PVC right onto the stock, which in this case is a regular 2x4 (**PHOTO 4**). Cut these two plugs out with a band saw, jig saw, coping saw, or scroll saw.

For a topper on the scratching post I purchased a 5" bun foot. You'll find these in any home center in the same department where you'll find table legs. They come in various wood species, though nearly always hardwood; the one I got is poplar, but any wood is fine. These bun feet typically come with a threaded post on one side so they can be screwed onto furniture, and this will work in our favor (**PHOTO 5**).

Drill a ¼" hole dead-center in one of the plugs. Now, put a bit of glue on the plug and simply twist the plug onto the bun foot as tightly as you can and allow it to dry, no clamping necessary.

Test-fit the topper (**PHOTO 6**). Because we traced the exact opening from the PVC itself it should be a good fit, but if it's a bit tight a little sanding should ease the fit. If it's a bit loose, that won't be a problem.

Use clamps to hold the plugs in place, and then drill countersunk pilot holes through the PVC and into the plugs as shown in **PHOTO 7**. The top won't experience a lot of stress so you'll need only two screws. For the bottom where the post mounts to the base, drill three evenly spaced holes. Secure the plugs with 1" or 1¼" screws.

Prepare the base by first locating the center of the underside with lines drawn from opposite corners. Now, take that same short piece you used for tracing the plugs, center it on the intersection of your lines, and trace its outline onto the bottom to act as a drilling guide. Drill a pair of ¾" wide counterbores about an inch apart and ⅜" deep. These will accommodate the washers and heads of the lag screws so they don't protrude from the bottom. Then drill ¼" holes through the center of each counterbore and right out through the carpet on the other side, as shown in **PHOTO 8**. Note here that I have the base clamped to my worktable so it extends over the side, allowing me to drill straight through.

Drill a single pilot hole in the plug at the bottom of the post, about ½" from the plug's center. You'll need pilot holes for both lag screws, which are pretty beefy, but only drill one now. You could drill both, and with some exact measuring you might get them to match those holes you already drilled in the base. However, it's faster and easier to just do one, attach the post with a lag screw, and then, with the post in place, drill the other pilot hole right through the existing base hole. Tighten both lag screws down securely (**PHOTO 9**).

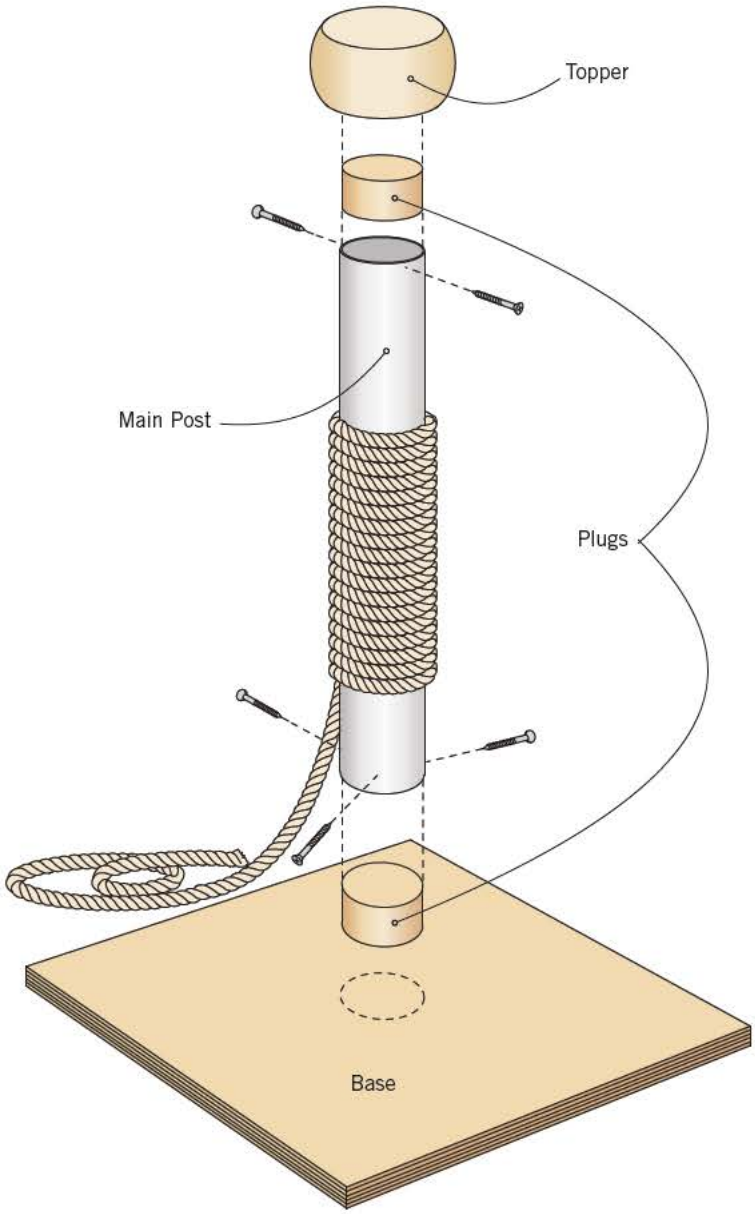
I'll use ⅜" rope for the scratching post, but ½" also would work well. With ⅜" rope, a roll of 50' should be sufficient; you'll need a bit less length if you use ½" rope. Anchor the rope at the bottom with a few staples (**PHOTO 10**). A pneumatic staple gun is the best tool for this, but you can make do with a regular staple gun. Use staples of at least ½" or longer; if you can go through rope, PVC and right into the plug on the inside, that rope will be very well anchored.

Now start winding rope around the post, as shown in **PHOTO 11**. Manila and sisal rope are extremely rough to work with and can be hard on your hands when you're pulling and stretching it during the winding process, so if you have gloves this a good time to grab them.

The winding task can get tedious, but if you have a smooth surface where you can work, like the laminate top of my worktable you see here, you can just spin the whole thing as you wind. Keep tension on the rope at all times, or it'll want to loosen. Keep a roll of duct tape handy, and if you need to take a break just slap a piece on the rope to hold it. Every few inches as you work your way up the post, press the windings down toward the base to keep everything tight.

Continue winding until you reach the topper. Check everything to be sure there are no gaps and that the rope is as tight as you can pull it, and anchor the rope with a

Scratching Post



SCRATCHING POST CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	1	Base	Plywood	¾"	17"	17"	
B	2	Plugs	Pine	1½"	3" dia.		
C	1	Main Post	PVC	n/a	3" dia.	19"	Width is nominal diameter.
D	1	Topper	Poplar	2½"	5" dia.		

Overall Dimensions: 17" wide x 17" deep x 22–12" tall

OTHER MATERIALS

⅜" or ½" manila or sisal rope (about 50')

3" lag screws with washers (2)

few staples as in **PHOTO 12**. If you use the same materials I did in all the same sizes, and wind everything tight, you should end up with just a small amount of your 50' roll of rope left to trim off.

At this point, you can put the scratching post in place and call the kitties, but you might want to add a finish to the top. I applied a couple coats of polyurethane varnish. Shellac also works well, or you could paint the topper in a color that goes well with the sofa those cats will no longer be shredding.

PHOTO 1 Sand all the base's sharp edges with coarse-grit sandpaper.

PHOTO 2 Trim carpet to a usable size, allowing a couple extra inches to wrap around the base edges.

PHOTO 3 A staple gun or pneumatic stapler makes quick work of attaching the carpet to the base.

PHOTO 4 The best way to get exact-sized plugs is to trace around the inside of a short piece of PVC.

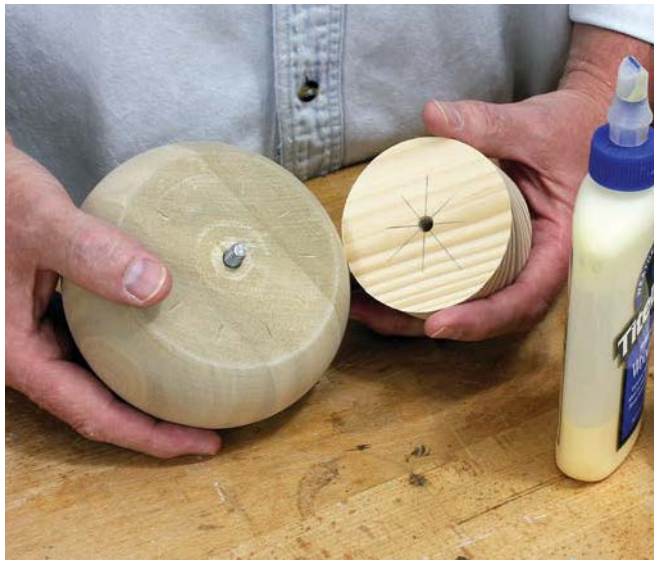


PHOTO 5 Drill a ¼" hole in the upper plug to accommodate the threaded bun foot.

PHOTO 6 Insert the top assembly into the main tube, and then screw into place.

PHOTO 7 Drill countersunk pilot holes before driving screws to secure the plugs.

PHOTO 8 First counterbore the base to accommodate the heads of the large lag screws, then drill ¼" holes for the body of the screws.

PHOTO 9 Be sure to use washers with the lag screws for the strongest attachment.

PHOTO 10 Anchor the rope securely at the bottom before winding around the scratching post.

PHOTO 11 Rope can be rough on hands; you'll appreciate gloves when doing the winding.

PHOTO 12 Anchor the top end of the rope, and then trim off the excess.

Cat Condo

Cats love cat condos (so do ferrets, by the way), but there's no reason you have to buy one. Most commercially available condos are ridiculously overpriced, and you can make one or several for only a few dollars.

The cat condos you see at the pet store are based on a stiff cardboard tube you can easily find at your home center, called a concrete form. These are nominally sold in 12" diameters. However, the manufacturers make them in a range of diameters that allow them to ship the tubes inserted inside one another. That means that the actual diameters will vary nearly an inch either way, so you'll need to adjust the diameter of the wooden top and floor pieces to match the tube you purchase.

Building the Cat Condo

Mark a cut line on the tube. This is most easily done by measuring and marking the length at several spots around the circumference, and then connecting the marks with a flexible straightedge. In **PHOTO 1**, I'm wrapping a piece of manila file folder around the tube and using that as a guide.

Clamp the tube to a work surface and drill a hole on the waste side of the cut line for your saw blade, and then saw the tube on your mark (**PHOTO 2**). You'll need to reposition the clamps and rotate the tube as you work. I strongly recommend a jig saw for this, or use a sharp utility knife. The back-and-forth action of a hand saw will wiggle this tube all over the place, even clamped. It can be

done, but it's slow going.

Cut out a pair of circles sized to fit inside your tube. One will become the condo floor, and the other the top (**PHOTO 3**). You can use any ¾" material you like for these, but heavier stock such as plywood or the particleboard I'm cutting here is best for the bottom piece to keep the center of gravity low. Lighter material, like pine, is more suitable for the top one.

Use one of the circles to trace out a pair of carpet sections, as in **PHOTO 4**. One of these will go on the floor inside the condo, the other on the recessed top. Cut out both with scissors or a sharp utility knife.

Now, cut the carpet to width for the outside of the condo. You can use scissors, but you might find it faster and easier to cut a perfect line by using a sharp utility knife with a straightedge. While you can't see it in **PHOTO 5**, I've placed a thin piece of scrap underneath the carpet to prevent damaging my worktable. For this 13"-tall condo, a width of 14½" allows plenty to cover the sides and fold down over the top recess. Don't worry about the length for now; we'll trim the carpet to the appropriate length a bit later.

Slip the condo floor into place, flush with the bottom of the tube, and secure with four evenly spaced screws as shown in **PHOTO 6**. There are no real structure stresses here, so 1" or 1¼" screws are fine.

To make the 8" doorway opening set your compass to 4", and locate the circle so the opening starts about 1¾" from the bottom of the tube (**PHOTO 7**). Secure the tube to a steady work surface and cut out the opening with a jig saw or utility knife.

Insert the condo top into the tube, but unlike the floor we don't want this piece flush with the end of the tube. Instead, create a recessed top perfect for snoozing animals by insetting the top 1½" from the top edge (**PHOTO 8**). Secure into place with four screws, as you did the floor.

Prepare the carpet for attachment by wrapping it tightly around the tube and marking it for length as shown in **PHOTO 9**. You'll notice here that when I cut the carpet to width I made sure one finished edge would end up at the bottom. This is the only exposed carpet edge—all other edges are tucked or folded inside other portions of the condo—and the finished edge here will help prevent fraying. The carpet you get may not have a finished edge, but if it does try to make it end up at the bottom.

We'll use a combination of adhesive and double-stick carpet tape to attach the carpeting to the condo. Carpet tape works best on the outside due to the uniform shape of both condo and carpet, and the best tape is the type made for indoor/outdoor carpet on patios. Begin by wrapping tape around the circumference of the tube at the top and bottom edges, being careful not to accidentally peel off the backing (**PHOTO 10**). Now, cut shorter pieces and stick them vertically every 3" or 4" around the tube. To ensure it's stuck as tightly as possible, smooth all the tape down firmly with the edge of a small wooden block.

Peel off all the tape backing, but be wary of the exposed tape. This tape is very sticky. Don't drop the tube on your work surface or lean on the exposed tape, or you'll regret it. (Have I already said, "Don't ask me how I know this?") Position the tube so the carpet seam will be on the opposite side from the opening and carefully align the bottom edge of the tube with the bottom edge of the carpet, then press it down. Now just roll the carpet around the condo as shown in **PHOTO 11**. Go slow and steady, because the unforgiving carpet tape won't give you much in the way of second chances. If you measured the length correctly your seam should go together just right in the back. If it's a little too short the long nap of the shag carpet should hide it; if it's just a bit too long, trim it before sticking the last bit down.

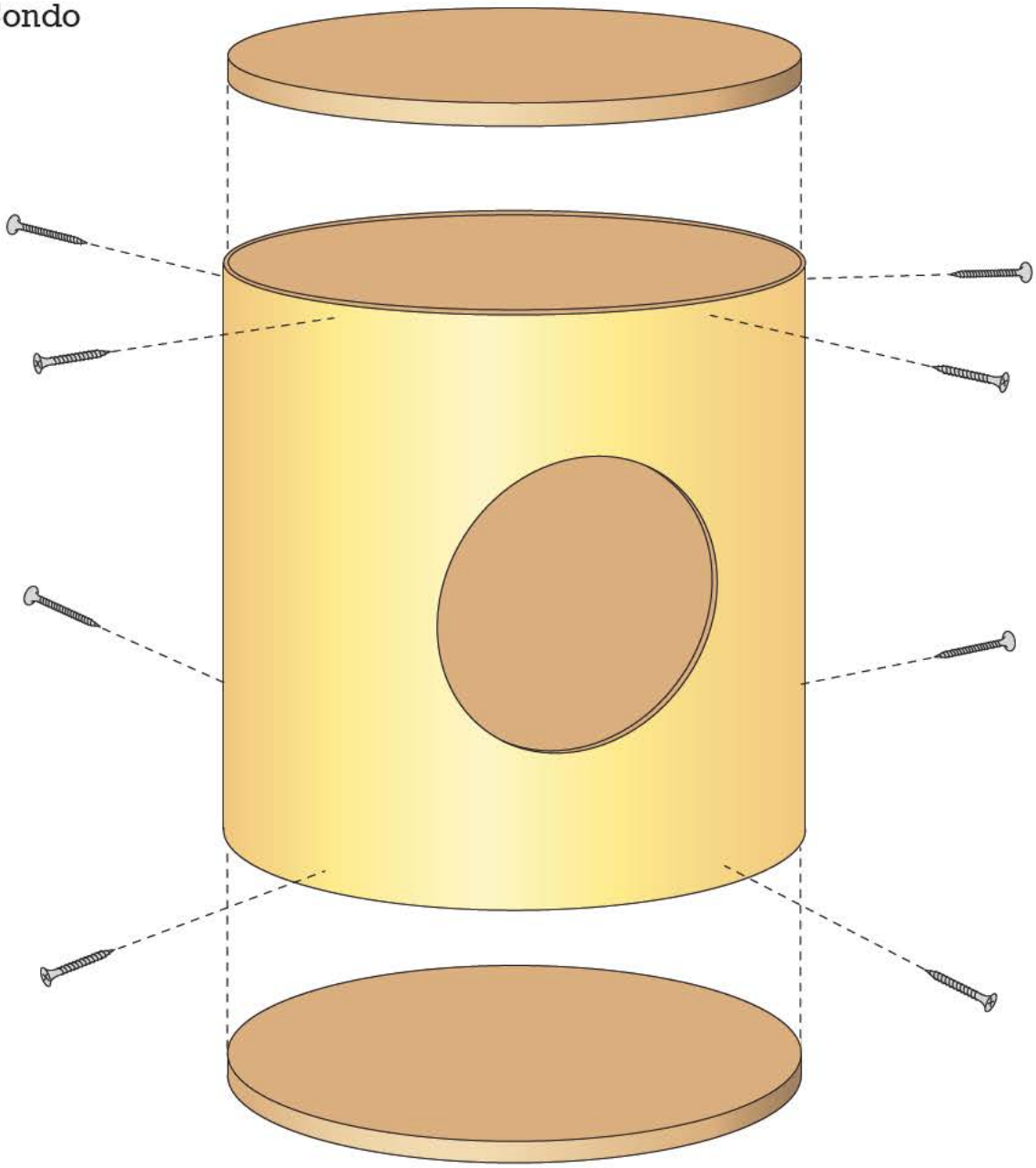
Apply tape to the inside edge of the condo top, then just fold and wrap the carpet down into place all the way around (**PHOTO 12**).

Test fit the top carpet circle. Depending on the thickness of your carpet, you may need to trim the circle to accommodate the thickness of the carpet you folded over at the top. Put a few circles of construction adhesive around the surface of the top, staying at least 1" away from the edges to avoid getting glue on the folded-over carpet (**PHOTO 13**). Now, just put the top carpet circle into place and press it down until secure.

At this point the condo is complete except for one thing: Where's the door? Oh yeah, we covered it up when we wrapped the carpet around the tube. No problem. Find the opening by pressing gently on the carpet—it's easy to feel the edges of the cut tube—then make a series of crosswise cuts to create narrow triangular flaps (**PHOTO 14**). Make several of these cuts, closely spaced enough that the widest portion of the flaps is 2" or less. Apply a bit of adhesive to the back of the triangular wedges, fold them inside the condo and stick them in place. You may want to add small spring clamps to hold them until the adhesive dries.

Once all the flaps have dried, remove the spring clamps if you've used them, then apply a few circles of adhesive to the floor inside the condo. As you did with the top, insert and press the remaining carpet circle into place.

Cat Condo



CAT CONDO CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	DIAMETER	HEIGHT	NOTES
A	1	Concrete Form	Cardboard	n/a	12"	13"	12" diameter is nominal; actual diameter will vary slightly.
B	2	Top/Floor	Pine/Particleboard	¾"	12"	n/a	

Overall Dimensions: 12" diameter x 13" tall

OTHER MATERIALS

Carpet

Construction adhesive and carpet tape

You can customize your condo in just about any way you like. I've made this one as a single unit, but if you prefer you can double the height and add a third wood circle to separate it into two halves with a second round opening at the top. This center piece can be a full circle that divides the condo into two separate floors, or a semicircle that allows your cats (or ferrets) to climb from one floor to the other when inside. If you want, you can make it even taller, but anything higher than two sections should be attached to a wider base similar to the one used in the Scratching Post project (**PAGE 116**).

Speaking of the Scratching Post, if you decide to make both projects you could alter the post to eliminate the round topper and instead attach a single condo to the top. Your cats will love jumping up into the raised condo after scratching their claws.

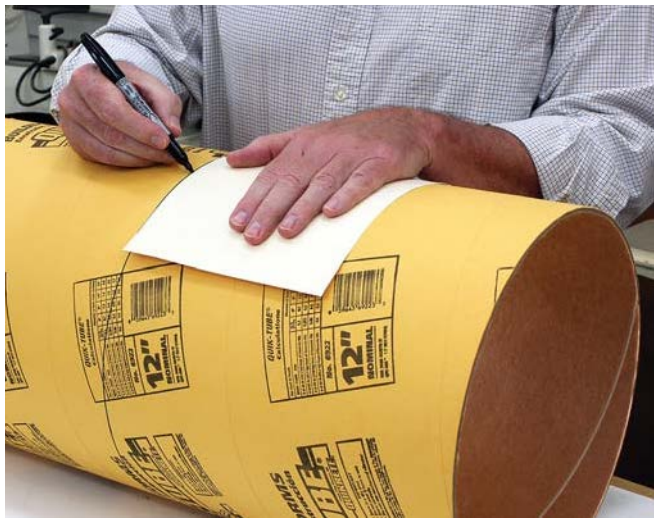


PHOTO 1 Mark the cut line on the concrete forming tube.

PHOTO 2 Cut the tube to length. Be sure to secure the tube for cutting by clamping it to your work surface.

PHOTO 3 Cut out the top and bottom pieces for the condo, then sand the edges as needed.

PHOTO 4 The easiest way to get the exact size for the carpet circles is to trace around one of the circular pieces you made earlier.

PHOTO 5 Cut the carpet for the outside of the condo to width with scissors or a sharp utility knife.

PHOTO 6 Drive four evenly spaced screws through the tube to hold the condo bottom in place.

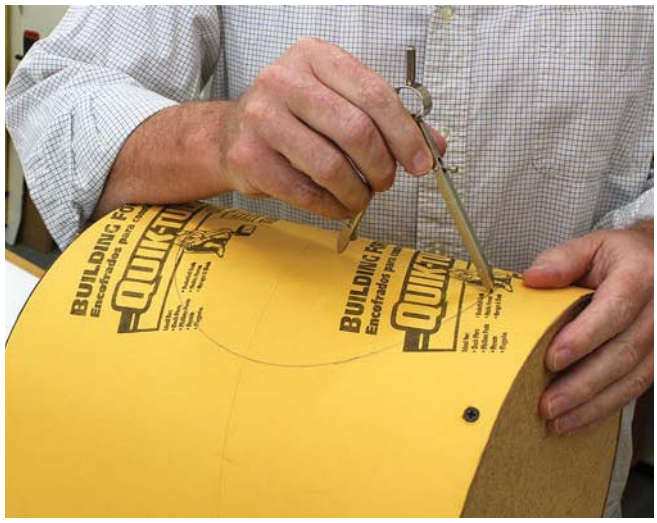


PHOTO 7 Scribe the condo opening on the tube with a compass, and then cut it out.

PHOTO 8 Slip the condo top into position 1½" below the top edge of the tube, then screw in place.

PHOTO 9 Wrap the carpet around the tube as tightly as you can and mark for length.

PHOTO 10 Apply carpet tape around the tube circumference at the top and bottom, and vertically every few inches.

PHOTO 11 Peel off the tape's protective backing and roll the carpet around the tube.

PHOTO 12 Put carpet tape around the inner surface of the tube top, then fold the upper portion of the carpet over the edge.

PHOTO 13 Apply a few rings of adhesive, then press the top carpet into place. Do the same inside the condo to attach the bottom carpet.

PHOTO 14 Cut the opening into narrow flaps, fold them inside the condo, and glue into place.

This condo I made for my cats a decade ago—which combines single- and double-height tubes with an integrated scratching post—has clearly seen better days.

Ceili, one of the two Hamler cats, enjoyed snoozing in the recessed top of her old condo. She likes the shag carpet on her new one even better.

Window Perch

A number of pet animals like window perches. A lot of small dogs enjoy keeping tabs on what's happening outside, while pet lizards relish basking in the warmth when the sun streams in. But no animal seems to love these things like cats do.

Every pet store carries a perch, but almost every one I've seen is somewhat permanently attached to a windowsill. While a few have to be screwed into place, most require you to apply a wide strip of self-adhesive Velcro to the sill that grabs a matching strip on the underside of the perch.

There are a couple of problems with that, with the most serious being potential damage your home. No matter how carefully you apply that sticky Velcro, eventually you'll peel it off and you can almost certainly expect it to take varnish or paint with it, necessitating a repair. If you don't have a formal windowsill but plain painted drywall framing the opening, you may have trouble getting the self-stick part to stay in place. Unless you apply a strip of Velcro to multiple windows in your house, you pretty much have to pick a single window where the perch will stay. And while it may not be an issue for you, the cat in my house who likes the window seat best is, being charitable, a tub of lard. I'm not sure Velcro would do it.

I've addressed all those issues with the perch presented here by using a pair of suction hooks—same kind as in the Window Feeder project on **PAGE 14**—onto which the shelf hangs. A pair of wooden supports under the shelf rest flush on the wall to keep the perch level and steady. This way you can easily remove the perch any time you want, to move it around the house to follow the sun, or to give your pets a window on the most interesting action. For that matter, this method allows you to hang the perch in rooms you might otherwise use for entertaining, like the dining room. When company comes, just take it down and stow it away.

Building the Window Perch

For the shelf you'll need a flat panel of ¾" material; you could use plywood, but you'll find that regular pine is lighter. Most commercial models range from 12" x 18" to 14" x 24". I've opted for one near the middle of the range at 13" x 22", perfect for my two cats.

Create this panel by gluing another strip of wood to one edge of a piece of standard 1x12 (really only 11¼" wide). Note in **PHOTO 1** how I've alternated the clamps to opposite sides. This is good practice whenever gluing up panels, and keeps the workpiece from warping under clamping pressure.

While the panel is drying, prepare the two L-brackets by rounding off the end that will be vertical once mounted to remove the sharp corners, as in **PHOTO 2**. You can do this with a small grinder or rotary tool, though a file works fine.

Lay the brackets on opposite corners of your panel and mark the screw holes, then drill pilot holes before attaching them. Pilot holes are always a good idea to prevent wood splitting, but especially so when you'll be driving screws near an edge (**PHOTO 3**). Since one of the legs of the L-bracket will be sticking up, you'll only need three of the four screws included with the bracket.

With the brackets in place, lay the shelf on your carpet to mark for trimming. It's easier to do this with the brackets pointing up, even though we'll flip it over later to attach the carpet. Essentially, you'll need about 3" to allow for wrapping around the shelf edges. We didn't worry much about the four corners when carpeting the Scratching Post on **PAGE 119**, but this time we need to work around those two brackets. With that in mind, lay out trim lines as in **PHOTO 4**, and cut the carpet on your marks. Now flip the shelf over so the underside is facing up, and place the brackets at the trimmed corners.

Fold up the long side of the carpet and cut a diagonal on the end at the front of the shelf and staple into place, as shown in **PHOTO 5**. Now, fold up the adjacent side and trim a diagonal to match (**PHOTO 6**). Staple in place, then repeat the process on the opposite bracket corner. The result should like the one shown in **PHOTO 7**. Finish off the carpeting by folding the opposite long edge and stapling it into place (**PHOTO 8**).

Now, let's prepare the support brackets, which are regular shelf brackets. The upper portion of the bracket will screw directly to the underside of the shelf, but the lower portion that meets the wall is attached to a piece of wood that will rest flat against the wall. You'll need to do this one of two ways. If your window does not have a protruding sill, a single piece of 1x2 will work fine. Just screw it to the front of the bracket and you're done. However, if the windowsill sticks out from the wall, you'll have to offset this support piece to accommodate the sill. In **PHOTO 9**, I've accomplished this by attaching a shorter piece of 1x2 to the first, allowing enough room at the top to clear the windowsill and any molding underneath. You can see how this works with the perch in place in **PHOTO 10**.

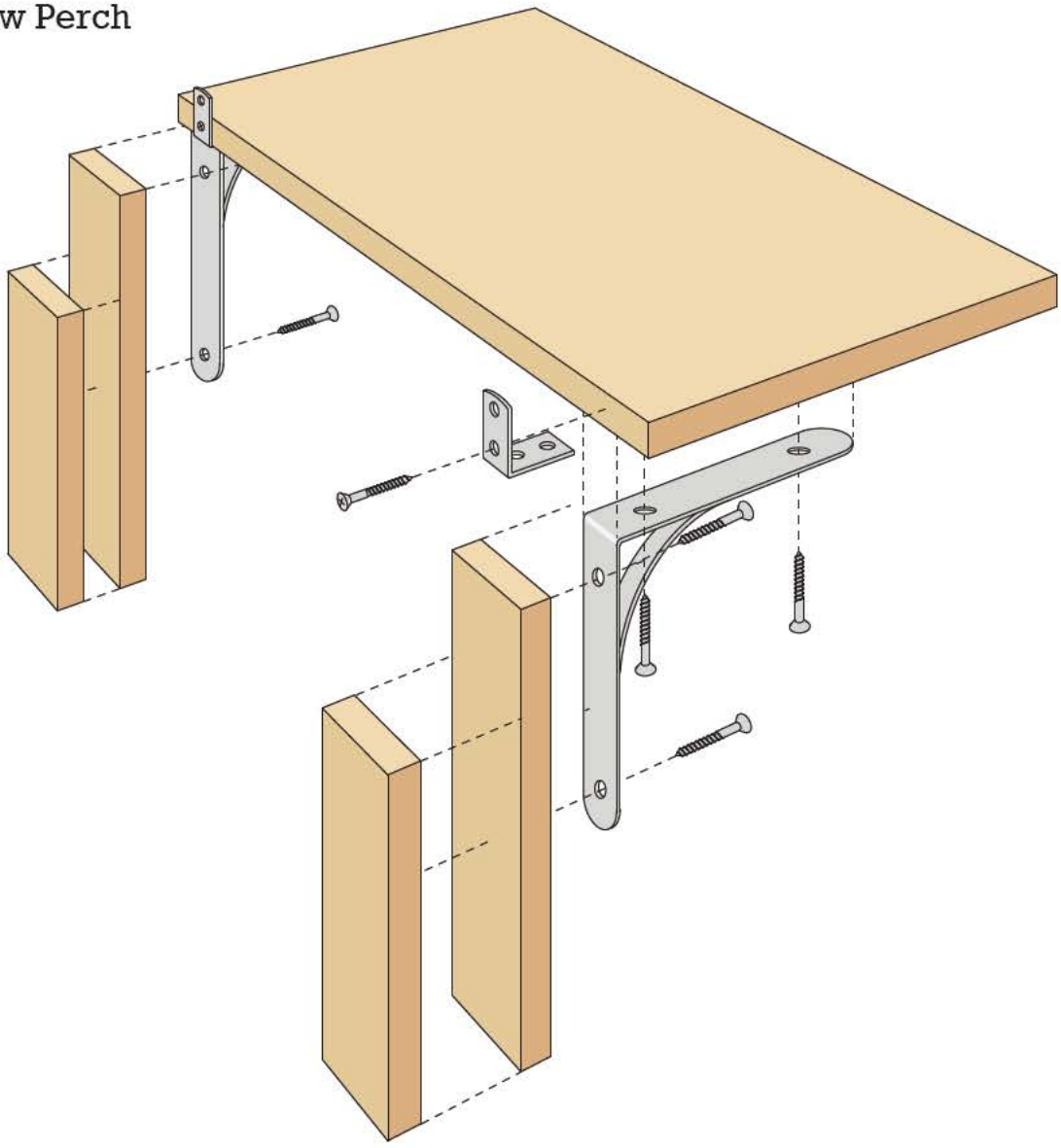
Determine the clearance you need by first measuring how far the windowsill sticks out from the wall. Now, hang the shelf in place and have a helper hold it level. Measure the distance from the underside of the shelf to a point on the wall where it clears the sill and any moldings underneath. This distance will vary depending on the thickness of the sill, the width of any molding, and the exact placement of the suction hooks. Be sure to allow a little bit extra to give some flexibility in hook placement. Getting this measurement is a bit tedious, but it's likely that all the windows in your home are the same so you'll probably have to do it only once.

Create the shelf supports as needed and screw them to the shelf brackets, and then attach both brackets to the underside of the perch, taking care to place them for accurate clearance (**PHOTO 11**). You may want to drive in only one of each screw pair and test the shelf before driving in both.

Finally, give your walls a bit of extra protection by applying a strip of self-stick felt to the front face of the wooden supports (**PHOTO 12**). You can find this peel-off felt at any fabric or craft supply store.

Suction hooks come in a wide range of styles, sizes and weight limits. The ones I've used here are rated for 12 lbs. each, so paired together they're more than adequate for our cats (even old Tub-O-Lard.) You might want to alter the hook to better secure the perch, and you can see how I did it in **PHOTO 13**. Right out of the package the hooks have a very shallow angle. I used a pair of pliers to bend the hook into a full U shape to better engage the brackets on the front of the perch.

Window Perch



WINDOW PERCH CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	1	Shelf	Pine	¾"	13"	22"	
B	1	Shelf Supports	Poplar	1½"	1½"	12"	

Overall Dimensions: 13" wide x 22" long x 12¾" tall

OTHER MATERIALS

- Suction hooks (2)
- 1½" x 1½" L-brackets (2)
- 7" x 9" shelf brackets (2)
- Carpet
- Self-stick felt

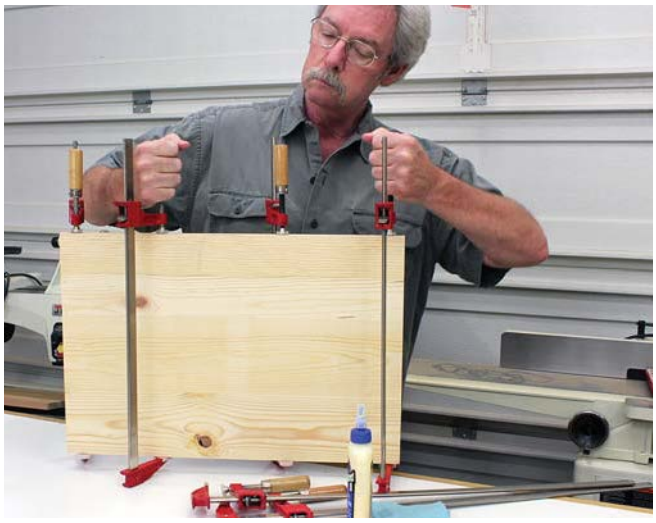


PHOTO 1 When clamping up large panels, alternate the clamps to evenly distribute pressure.

PHOTO 2 Round over the top edges of the hanging brackets to remove the sharp corners.

PHOTO 3 Attach the hanging brackets to the shelf corners, but be sure to drill pilot holes first.

PHOTO 4 Mark the carpet corners, and then trim off the excess material.

PHOTO 5 Trim the first flap at an angle that clears the bracket, then staple it into place.

PHOTO 6 Trim the second flap at the same angle so the carpet meets flush at the corner.

PHOTO 7 The finished corner covers everything, but leaves the hanging bracket open.

PHOTO 8 Pull the remainder of the carpet as taut as you can when stapling it into place.

PHOTO 9 If your window has an extended sill, create an offset opening at the top of the wall support.

PHOTO 10 The offset bridges the extended window sill.

PHOTO 11 Attach the metal shelf brackets with strong #10 x ¾" screws.

PHOTO 12 A strip of self-sticking felt will protect your walls.

PHOTO 13 On the left is a typical suction hook as it comes out of the package. Bend the hook so it forms a full U shape for more secure hanging

Pet Feeder

The Pet Feeder and Pet Bed (**PAGE 138**) are designed as a set. Both are made of red oak with matching sides, and are flexible as far as size and shape are concerned, so you can reconfigure them to suit whatever indoor wildlife you want to pamper. Although oak is a good hardwood for outdoor use, it's also a popular choice for furniture. As indoor projects, that seemed fitting.

Both projects also require purchasing a couple things from the store—a pair of lipped bowls for this one, a sleeping pad for the bed in the next chapter. Each project is sized specifically to accommodate the store-bought items, so it's essential to acquire these first so you can take accurate measurements before cutting project parts.

The bowls you select for this feeder project can be of any type, color or material—the stainless steel ones shown here actually came from a kitchen store—but for them to sit securely in the feeder they must have a lip on the top edge.

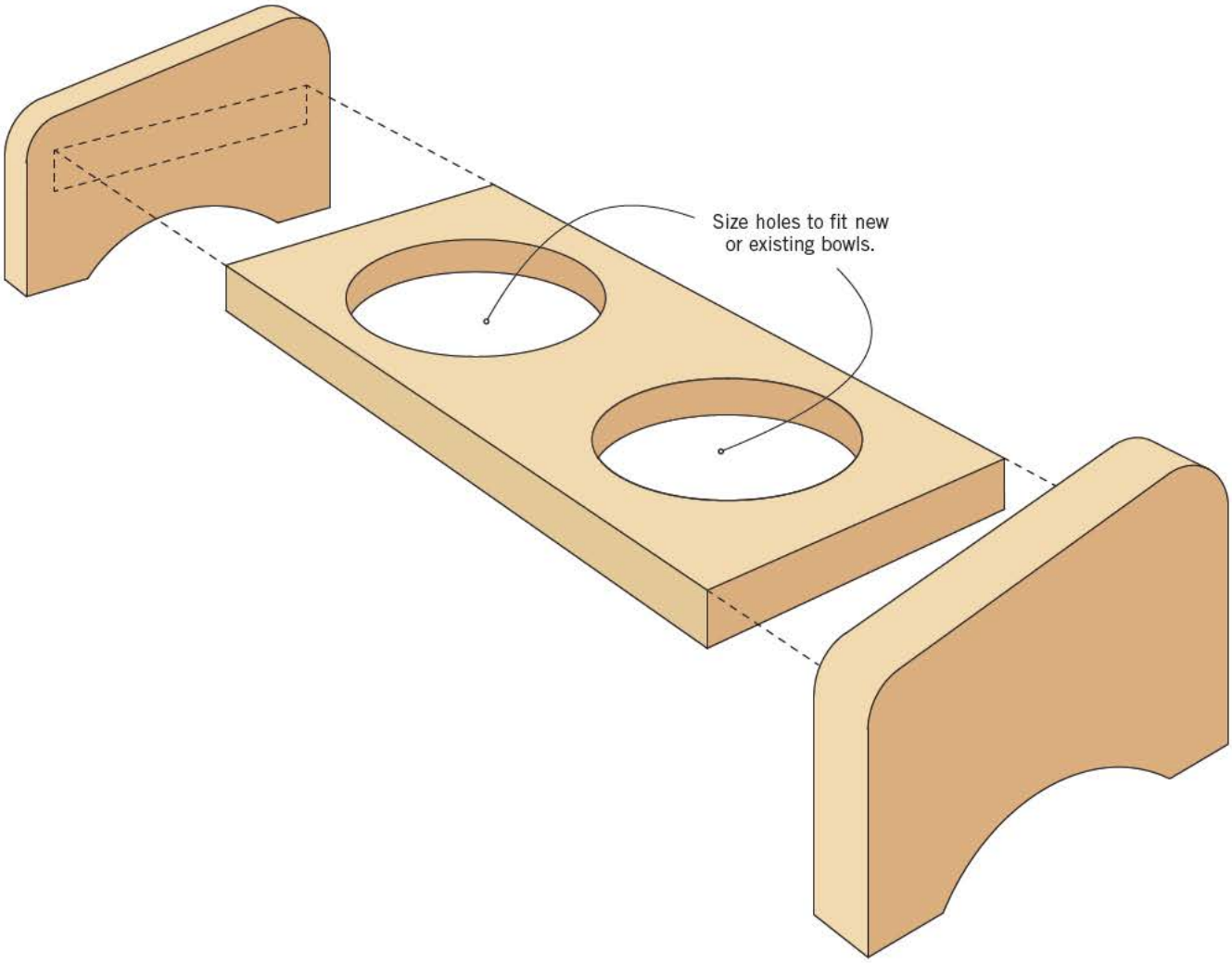
Building the Pet Feeder

When sizing your project parts, start with the shelf and make it about ¼" to ½" wider than the bowls on each side. Allow 1" to 1½" between the bowls, and about the same at each end. If you're making a big feeder with extra-large bowls you may want to increase these clearances to keep everything from looking too crowded. Also take the bowl height into consideration when sizing the sides, because you'll want them to be above the floor when they're set into the circular cutouts. My bowls were 5" in diameter and stood 2¼" high, so the dimensions of the parts in the Cut List on **PAGE 134** reflect that.

The last measurement to take is the diameter of the bowl body, most easily done with a caliper as in **PHOTO 1**. Using a compass, mark these diameters on the feeder shelf as guides for cutting out the bowl openings (**PHOTO 2**).

Whether you use a scroll saw, coping saw, or a jig saw

Pet Feeder



PET FEEDER CUT LIST

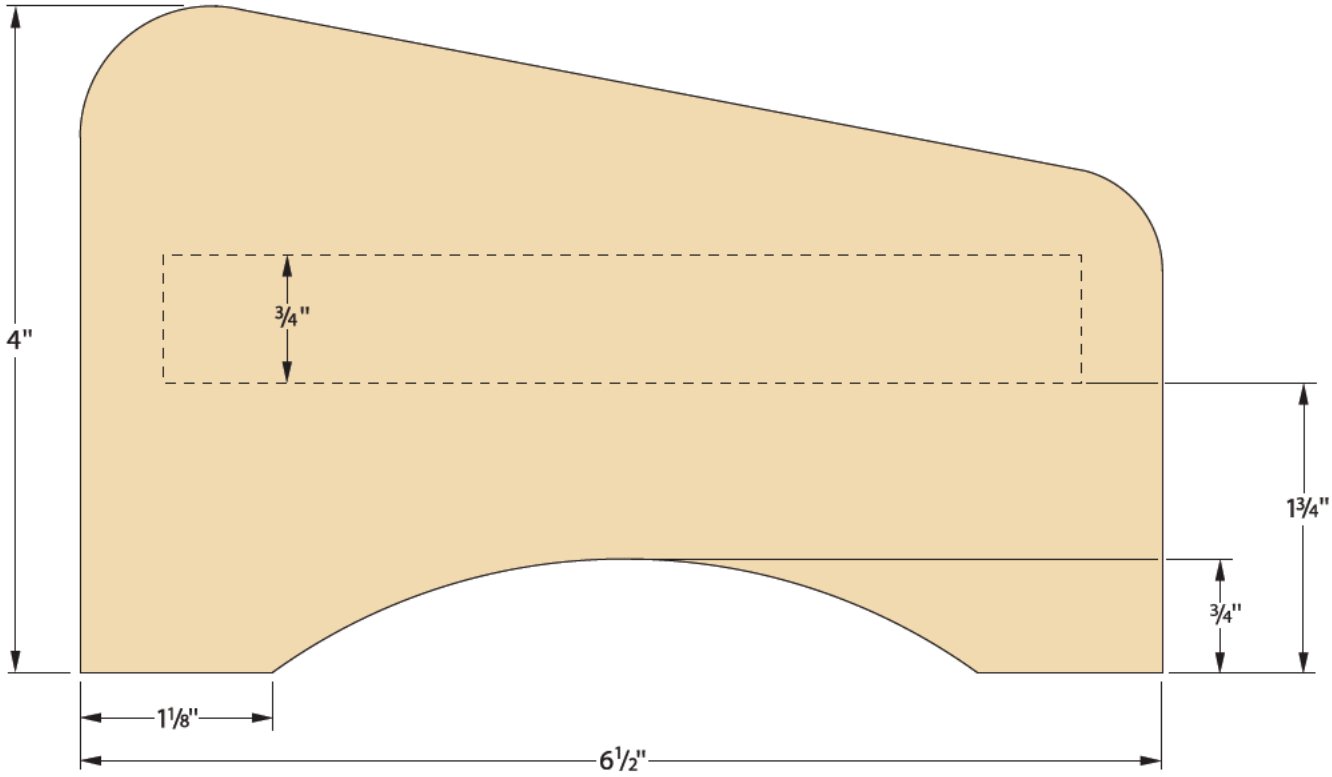
REFERENCE	QUANTITY	PART	STOCK	DIAMETER	LENGTH	NOTES
A	2	Sides	Oak	¾"	4"	6½"
B	1	Shelf	Oak	¾"	5½"	12½"

Overall Dimensions: 6½" wide x 14" long x 4" tall

OTHER MATERIALS

Feeding bowls with overhanging lip at top edge (2)

Pattern for Front (Part A) (1" squares)



as I did, drill a hole near the inside edge of each circle for starting the saw blade. Clamp the shelf workpiece to a secure surface, insert the blade into the hole and cut out the circles (**PHOTO 3**). Sand the inside of both cutouts smooth; I used a spindle sander, but a small sanding block or sandpaper wrapped around a short length of dowel would work well, too.

Trace the pattern onto one of the two sides, then attach them together with a few brads or nails driven into the waste area. Cut both pieces out at once, as in **PHOTO 4**. Note that I've circled the nail locations to make them easier to see. The line across the pattern in this photo is where the shelf will be located. With the sides cut out, smooth away any saw marks with a sanding block or power sander (**PHOTO 5**).

Prepare the sides for assembly by stacking them and drilling a pair of pilot holes where the shelf mounts. As you can see in **PHOTO 5**, I've penciled the end of the shelf onto the top piece to guide the drilling. Now, separate the two sides and countersink the pilot holes from the outside of each piece (**PHOTO 6**). We haven't worried too much about visible screws in other projects, but since this one is for inside your home, let's hide the screws with wooden plugs. Do this by countersinking the pilot holes as always, but drill them a bit deeper to create a counterbore about ⅛" to 3⁄16" deep for plugs (**PHOTO 7**).

Glue and clamp the shelf in place against one of the sides, then drill through the holes in the side to extend the pilot holes into the shelf edge. Drive a pair of screws to complete the assembly on this side, then repeat the process on the other side (**PHOTO 8**).

Wooden plugs are available from any woodworking supplier. These are short, tapered cylinders that come in a variety of wood species to match your work. Apply a small bit of glue to the inner edges of the counterbore—go sparingly here, it doesn't take much—then tap in a plug, as in **PHOTO 9**. You don't have to pound away; they're not structural, so just tap them in as far as it takes to seat firmly. Don't be tempted to beat them to death.

Wipe off any glue squeeze-out, and once the glue dries trim off the excess plug with a fine-tooth saw (**PHOTO 10**). You could also pare off the plug with a sharp chisel, or sand it down. However you do it, bring the plug flush with the surrounding wood, and then sand it smooth with a sanding block.

All that's left now is a general sanding, and then finish the wood any way you like. For oak like this, a couple coats of shellac or polyurethane varnish will look very nice. If you'd like, you can stain the oak to better match the woodwork in your home before applying a clear topcoat.

PHOTO 1 Use calipers to determine the diameter of the bowls.

PHOTO 2 Transfer the diameter you measured with the calipers to a compass to mark in the outlines of the two circular openings.

PHOTO 3 Always clamp the workpiece to a secure bench or other working surface when using the jig saw. Reset clamps as needed for saw clearance.

PHOTO 4 For identical workpieces, cut out both sides at the same time whenever possible.

PHOTO 5 It's easier to sand the two sides before assembly. Sand both faces and all around the edges.

PHOTO 6 As with cutting, drilling the pilot holes in the identical side pieces is more efficient and accurate when you stack them.

PHOTO 7 Create counterbores for wooden plugs by driving the countersink bit below the wood surface.

PHOTO 8 Working one side at a time, glue and clamp the assembly together, and then screw the shelf into place.

PHOTO 9 Plugs aren't structural, so they don't need a lot of glue or require a lot of hammering to set them securely.

PHOTO 10 Trim the plug with a fine-tooth saw, then sand it smooth with the surrounding wood surface.

Finish Washers

I like the flush, all-wood appearance of using wood plugs to hide screws, but there's a faster alternative that can be quite attractive. Instead of hiding the screws, make them an integral part of a project's final look with finish washers. These are designed to fit beneath flat-head screws and, although slightly raised over the wood surface, still keep the screw heads flush. They come in a variety of metal finishes, including shiny steel and elegant brass. Painted finish washers are also available.

Pet Bed

As a companion piece to the Pet Feeder (**PAGE 133**), you'll find that this bed not only shares the feeder's basic appearance, but also most of the construction details. In most respects this is a larger version of the feeder, but with a couple additional components that allow it to form a frame to hold the sleeping pad or cushion. Since many of the steps will duplicate those from the previous project, I won't repeat everything in full detail here.

The main difference here is that I didn't make this project entirely of oak. Because the shelf is never seen—it's covered by the sleeping cushion on top, while its edges are hidden between the oak front and back pieces—I used a piece of plain pine instead. This not only trims the material costs, but also reduces the overall weight of the finished project. This could be important should you decide to make this bed for a St. Bernard.

Building the Pet Bed

As with the feeder project, the final sizes of the parts are dictated by the size of the cushion. For that reason the first step is to measure the cushion you buy—which will be of a size appropriate for the lucky pet who'll be snoozing on it—and adjust the dimensions presented in the Cut List on **PAGE 140** accordingly (**PHOTO 1**).

As always, it's efficient to cut the identical side pieces at the same time, so transfer the side pattern to one of the workpieces, then join them with nails or brads through the waste areas. With the earlier project we cut the entire sides out before sanding, but the sides of the bed are considerable larger (especially for that St. Bernard), so this time cut out all of the pattern except for the last straight end. With the two pieces still attached at that one end, sand all the edges to remove saw marks and refine the curves as necessary, as shown in **PHOTO 2**. A sanding block is fine,

but a powered sander really shines for a large sanding task like this. With the edges smooth and clear of all saw marks, make that last cut on the end to complete the pattern. With the pieces separated you can sand those freshly cut ends individually, followed by giving the faces a good sanding as well.

With the sides sanded, transfer the shelf location from the pattern on **PAGE 141** to the workpieces and temporarily restack them using masking tape so you can drill the pilot holes (**PHOTO 3**). Next, remove the tape and countersink the pilot holes from the outside faces. Drill deep enough to create a counterbore of about ⅛" to 3⁄16" to accommodate wooden plugs.

Construct the shelf assembly by gluing the shelf front and back pieces into place, then clamp everything up until the glue dries (**PHOTO 4**). These face-to-edge glue joints will be very strong, so they don't need reinforcing screws or nails.

Apply glue to the ends of the shelf assembly and position it on the bed sides, aligning it carefully with your layout lines from the pattern as shown in **PHOTO 5**. Clamp the assembly together, but don't cover the pilot holes on the sides with the clamps.

Using the pilot holes in the bed sides to guide your drill, extend the pilot holes into the edges of the shelf assembly, and then drive screws into all the pilot holes (**PHOTO 6**). No need to wait for the glue to dry. In fact, once you've driven all the screws you can remove the clamps because those screws will provide plenty of clamping action. Now you can glue plugs into place over the screws, then trim and sand them smooth.

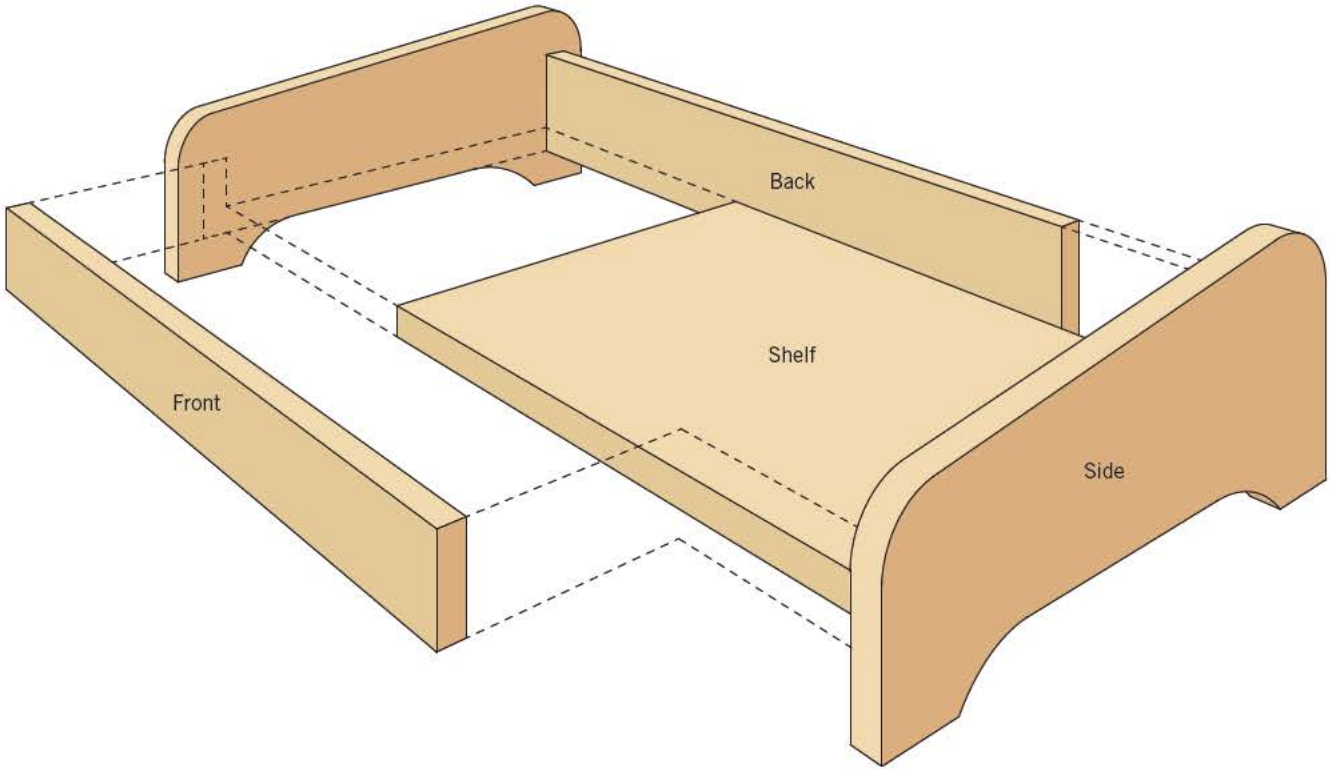
Give the completed bed any final sanding it needs, then apply the finish of your choice (**PHOTO 7**). I chose to finish the bed exactly like the feeder, and so applied a few coats of polyurethane varnish. If you'd like a darker appearance or wish to add tone or color, stain the bed before applying your topcoat.

PHOTO 1 Measure the sleeping pad accurately, because all other project components are sized to accommodate it.

PHOTO 2 Cut out all but the last straight portion of the sides, and sand the edges while the two pieces are still fastened together.

PHOTO 3 Temporarily tape the two sides together to drill the pilot holes for attaching the shelf.

Pet Bed



PET BED CUT LIST

REFERENCE	QUANTITY	PART	STOCK	THICKNESS	WIDTH	LENGTH	NOTES
A	2	Sides	Oak	¾"	5½"	14¾"	
B	1	Shelf	Pine	¾"	11¾"	17"	
C	1	Front	Oak	¾"	2¾"	17"	
D	1	Back	Oak	¾"	3¾"	17"	

Overall Dimensions: 14¾" wide x 18½" long x 5½" tall

Pattern for Front (Part A) (1" squares)

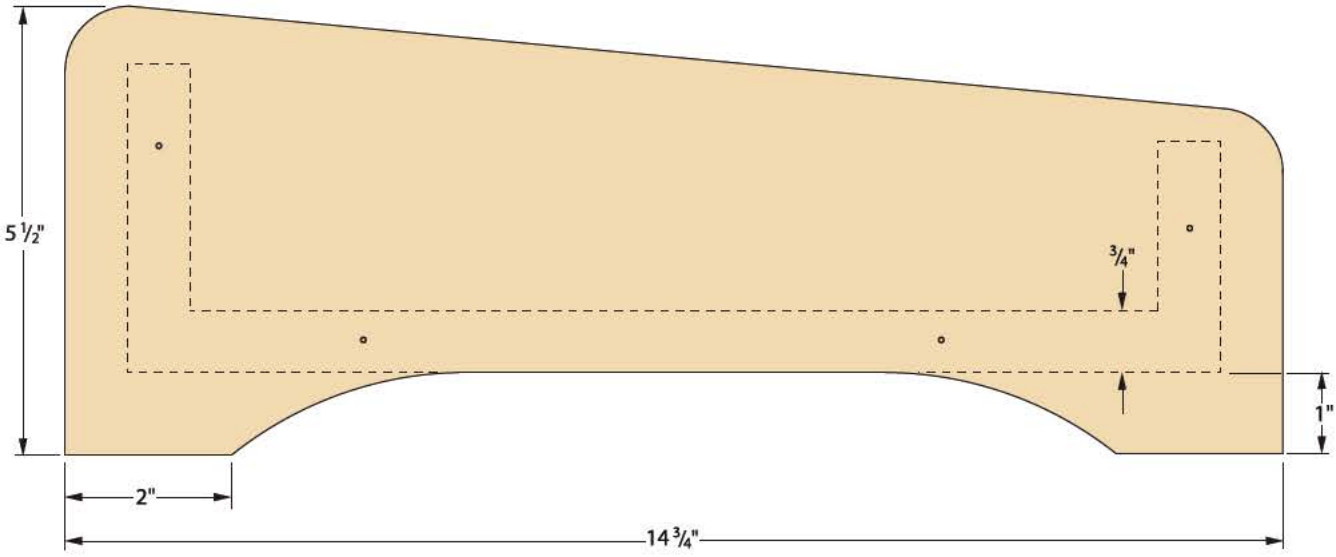


PHOTO 4 Glue and clamp the shelf front and back pieces into place on the shelf edges.

PHOTO 5 Mount the sides to the shelf assembly with glue, aligning the assembly carefully on your guide marks.

PHOTO 6 You can screw the bed sides into place while the assembly is still clamped up. Once securely screwed together, remove the clamps.

PHOTO 7 Apply a couple coats of your chosen finish, and allow to dry thoroughly before putting the bed into use.

About the Author

A.J. Hamler is the former editor of *Woodshop News* and was the founding editor of *Woodcraft Magazine*. As a freelance writer, A.J.'s woodworking articles have appeared in most of the publications in the field, and he served as senior editor for *The Collins Complete Woodworker*, published by HarperCollins/Smithsonian. His most recent woodworking title is *The Box Builder's Handbook* from Popular Woodworking Books. When not in his workshop, his other interests include science fiction (writing as A.J. Austin he's published two novels and numerous short stories), gourmet cooking, and Civil War re-enacting.

Dedication

To my grandson Jed, the newest wildlife lover in the family. He just doesn't know it yet.

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Birdhouses & More

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TO CONVERT	TO	MULTIPLY BY
Inches	Centimeters	2.54
Centimeters	Inches	0.4
Feet	Centimeters	30.5
Centimeters	Feet	0.03
Yards	Meters	0.9
Meters	Yards	1.1

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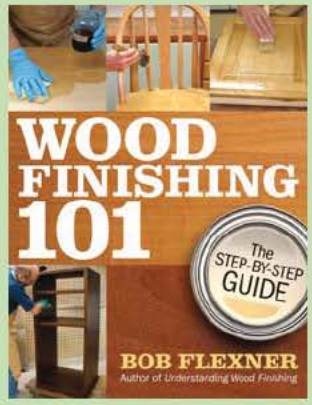

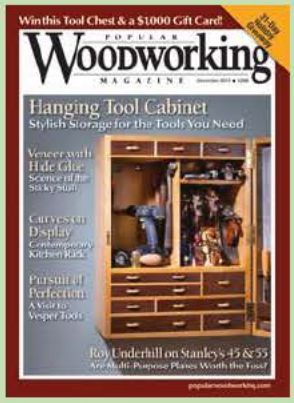

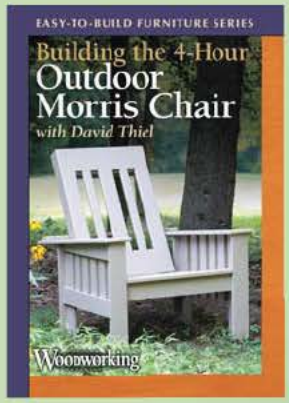

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