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Improvements on a Reliable Oak Seed Trap

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Abstract

The need for seed trap longevity, capture of heavy seed, and protection from predation in several forest types for long-term studies of seed production prompted seed trap design improvements. Critical improvements were achieved by painting the trap with a latex exterior gloss house paint, raising traps above water lines in areas tbat flooded, and enclosing the seed container in a protective cage made of hardware cloth. Forty improved seed traps were installed in four forest communities across a flooding gradient and monitored for structural integrity and seed capture over an g-month period. Ten traps were placed in each of the following locations in the South Carolina Lower Coastal Plain: a tupelo swamp, a transition to bottomland hardwood forest, a bottomland hardwood forest, end a pine hardwood forest. All traps provided protection from predators and effectively captured several seed types. The use ofwater-based latex paint as a sealant in the high humidity locale enhanced the durability of the improved seed trap design.

Keywords: Floodmg gradient, forested wetlands, predation, seed production, seed trap.

Introduction

Estimates of forest production should include measurement of seedfall, but traditional seed traps may be inappropriate for long-term studies of seed production in some forest types. For example, traps designed for collecting light seeds (Easley and Chaiken 195 1, Houle and Payette 199 1) are not accurate for collecting heavy seeds from species, such as oak and hickory, because many of the heavy seeds bounce out. Klawitter and Stubbs' (196 1) improved design retains 90 percent of the heavy mast, but because the trap is paperboard, it is not durable enough for long-term seed collection studies.

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A mast production study in four wetland communities across a soil moisture gradient prompted us to modify Klawitter and Stubbs' (196 1) seed trap. The traps had to withstand the humid climate of the South Carolina Coastal Plain, accurately collect a variety of seed types, remain intact for 3 years, provide easy collection in both upland and permanently flooded terrain, and resist animal predation. Other traps shown to be effective in collecting the soft mast produced in a cypress-tupelo swamp (Schneider and Sharitz 1988) would probably have resulted in inaccurate seed production estimates in upland sites because heavier seeds bounce out. Because Klawitter and Stubbs (196 1) designed a trap that was accurate for collecting acorns, we based our improved seed trap on their design. Improvements include greater durability, easy retrieval of collected seeds fi-om traps in flooded areas, and protection from potential predators.

Methods

First, we converted available four-sided traps designed for pine seed collection (Easley and Chaiken 195 1) to three-sided traps (fig 1.) according to Klawitter and Stubbs (1961). Their modification increased the angle of the sides, reducing the possibility that hard and heavy seeds would bounce out of the trap. To improve durability, we reinforced the outside of the seam with 1 -inch wide screen door molding strips. The molding was stapled to the trap with %-inch long, 20-gauge crown staples. The top 2 inches of cardboard were folded down and 16-gauge metal wire was strung between the trap and the folded flaps. Wire protruded as a loop from each comer, and the flaps were stapled to the outside of the trap.

The three-sided trap of Klawitter and Stubbs (1961) was raw paperboard and intended for short-term use only. We needed a seed trap that would not deteriorate during a long-term study. In an attempt to improve the durability of Klawitter and Stubbs' design, we treated and tested the traps for water

Figure 1.—Carl Phillips replacing protective cage on seed trap located in a Tupelo Swamp in the Donuelley Wildlife Management Area in the AC.E. Basin of South Carolina's lower Coastal Plain.

repellency. We painted the traps with a water-based latex exterior glossy house paint, an oil-based latex exterior glossy house paint, and an oil-based stain. Forty traps were painted: 20 with the water-based paint, 10 with the oil-based paint, and 10 with the oil-based stain. Paint was applied using strokes in the direction of the eventual rainfall (vertical) to facilitate the rapid drainage of rainfall.

Klawitter and Stubbs (1961) used wooden stakes to support their seed traps. Because some of the traps in this study would be installed in a swamp, or in areas subject to occasional flooding, we needed more durable trap support. Support struts of %-inch EMT conduit were cut, varying from 4 to 8 feet in length. The longer lengths were used on traps installed in areas that flood to ensure that the traps and seed collection cages remained above the high water level.

Notches were cut into the top of each pipe so the wire loop at each comer of the trap could rest in the notch. This design allowed easy removal of the trap from the support (fig. 2), an improvement over Klawitter and Stubbs' permanently attached trap supports. The improved traps installed in the swamp were emptied by removing them from the support struts and tipping them so the trap could be accessed from above. This method of trap support also simplified replacing damaged traps.

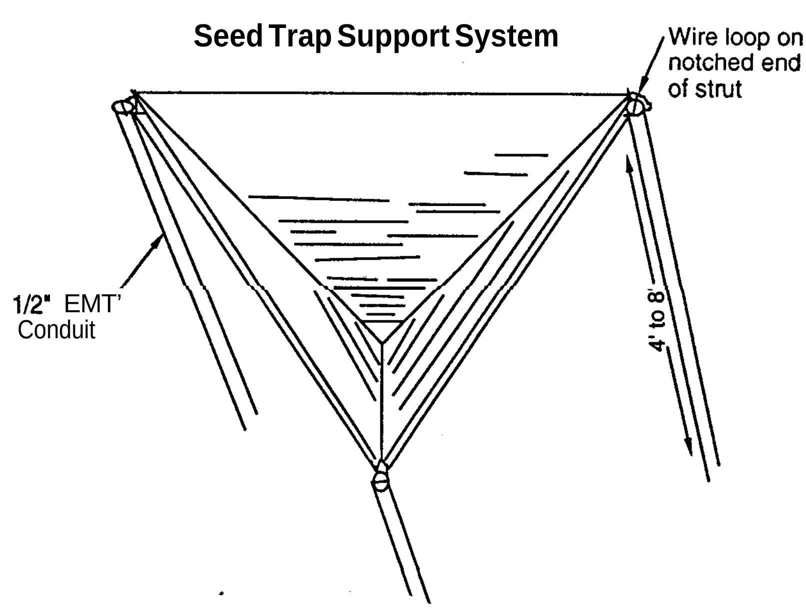

Figure 2.
Support struts made of EMT conduit were notched linchiudepth. Thewireloopsrestinthenotches. The trap can be removed by lifting the wire loops from the notches. Strut length depends on level of water rise.

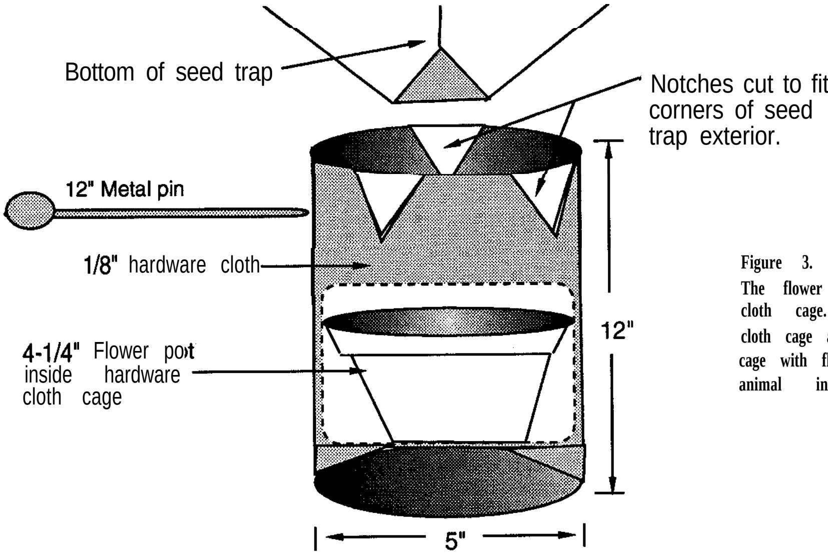

Figure 3.
The flower pot is completely enclosed in the hardwood cloth cage. A metal pin driven through the hardware cloth cage and the bottom of the seed trap attaches the cage with flower pot inside to the trap and hinders animal intrusion.

Because seed predation by animals was a potential problem, the seeds collected in the trap needed protection (fig. 3). First, ⅛-inch mesh hardware cloth was placed in the bottom of a 4 %-inch plastic flower pot to prevent loss of small seed and to provide drainage. The flower pot was protected and supported by a cylindrical cage made with a 15-inch by 12-inch piece of ⅛-inch mesh hardware cloth. The mesh hardware cloth was notched in three places so that when it formed a cylinder, it could be attached to the bottom of the trap with the notches fitting the comers of the trap. A 5-inch circular piece of ⅛-inch mesh hardware cloth fastened to the unnotched end of the cylinder became the bottom of the cage. The flower pot was placed inside the cage and the cage mounted on the trap by running a 12-inch, g-gauge metal pin through the cage's hardware cloth and the trap's cardboard.

Application

Forty seed traps were installed during September 1993, 10 in each of 4 locations at the Donnelley Wildlife Management Area in the Ashepoo, Combahee, Edisto (A.C.E.) River Basin of South Carolina: a tupelo swamp, a transition to bottomland hardwood forest, a bottomland hardwood forest, and a pine hardwood forest. It took approximately two person days to modify and install 10 newly designed traps. The sampling area of the three-sided version is 4.72 square feet per trap, and the dimensions for one side are given in figure 4. Seed was collected from the traps approximately every 2 weeks during the autumn and early winter and monthly during the late winter and spring. It is assumed that the capture rate of hard-mast seeds (90% from a 90-foot drop) was the same as that determined by Klawitter and Stubbs' (1961) trap, and this capture rate was not retested. During seed collection, all traps were inspected for structural integrity.

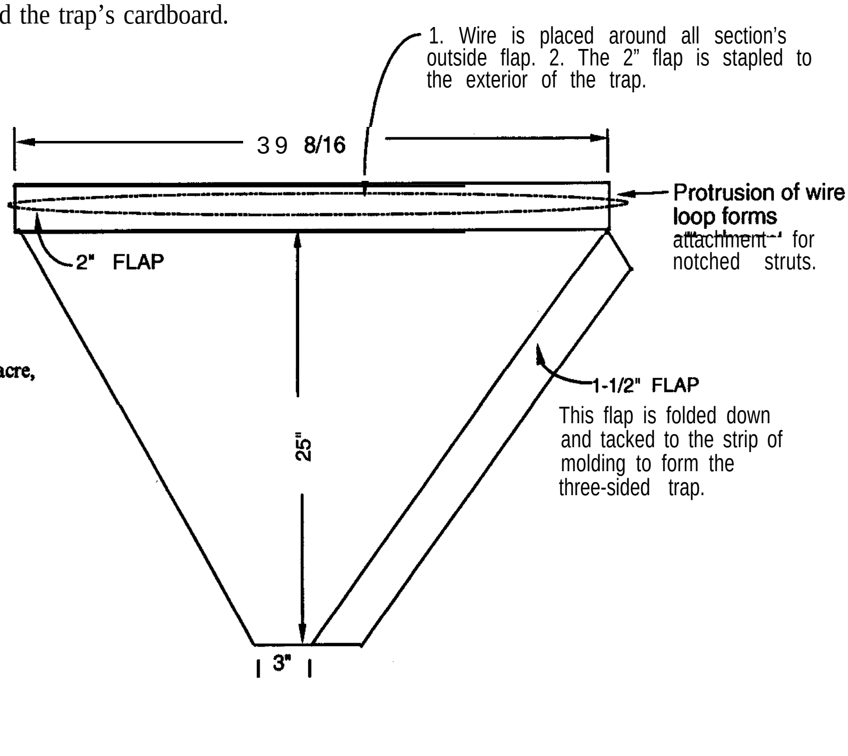

Figure 4.
Pattern for one side of a 0.1 1-milacre, three-sided seed trap.

Results

The new trap design appeared quite durable and well-suited to the humid climate in the South Carolina Coastal Plain where the average annual rainfall is 52 inches (Landers 1970). The latex paint proved water repellent. The 20 traps painted with the water-based latex exhibited good moisture tolerance after 8 months in the field. Of the 10 traps treated with the oil-based latex, 8 soaked up moisture, began to tear at the corners and along the seams, and were replaced within the first 6 months. All 10 traps painted with the oil-based stain exhibited severe water damage and were replaced with water-based latex treated traps within 3 months.

The new trap successfully restricted predation of the trapped seeds. Despite occasional signs of wild hogs and deer near the traps and observations of turkeys, squirrels, and blue jays in the area, no traps were disturbed. The deep seed-collection compartment and the cross pin blocking the entrance to the compartment prevented entry by rodents and birds to the flower pot in the hardware cage. The hardware-cloth cage prevented entry by larger animals from below. However, some predation of seeds by birds is possible when litter obstructs the seed collection compartment.

The new design allowed easy removal of the seeds and replacement of the traps. This was particularly important in the swamp where the water level ranged from 3- to 4-feet deep, and the traps were supported 4-feet above the high water line. All traps were emptied first by removing one comer from the support strut and tipping the top of the trap to access litter fall. Afterwards, the collection container pin was pulled and the seed removed from the flowerpot in the hardware cage.

Discussion

Our improved trap is versatile and adequately collected a variety of seed types. The seeds were easily retrieved from above or below the trap, an important feature at the swamp sites that were only accessible by foot. In addition, trap integrity remained high in the humid environment of the South Carolina Coastal Plain. Although other styles of traps appeared effective in catching the soft mast falling in a tupelo swamp (Schneider and Sharitz 1988) and light seeds falling in upland sites (Houle and Payette 1991), our trap was more versatile among the forested wetland community types.

Whether in the swamp or on upland sites, the trap design was effective in preventing predation on the collected seeds. Predation on seeds has an important impact on plant population biology (Harper 1977), and when an accurate measurement of seed production is sought, the traps must restrict predators. Apparently, the hardware cloth cage securing the flowerpot to the trap adequately repelled animals. In contrast, the collection container used by Klawitter and Stubbs (1961) and unattached bucket types of containers allow deer, hogs, blue jays, turkey, and squirrels access to the collected seeds.

The improved seed trap takes longer to install than the Klawitter and Stubbs' trap, but the modifications are worth the extra effort for long-term seed production studies. A key to trap longevity was the water-based latex paint, which provided total trap integrity 6 months after installation. The oil-based latex paint and oil-based latex stain provided little protection from moisture and could possibly cause water contamination. Whether placement of the pm through the base of the trap contributes to trap longevity is unknown. The pin placement exposed unpainted cardboard to the weather and could weaken the trap. If traps are weakened by pm placement an alternative method of connecting the hardware cloth cage to the trap will be needed.

Other seed traps, such as plastic trash cans, milk jugs, and nets offer good capture of seed crops and can be used for collecting specific seed types over the short term. However, the advantages of our improved trap include versatility among forest types, durability, and resistance to seed loss from predation. Seed trap sides used in construction of the improved reliable oak seed trap may be obtained from Palmetto Packaging Company, Attention: Mr. Paul Stewart, P.O. Box 4740, Florence, SC 29502.

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