

# Precision Agriculture Technology

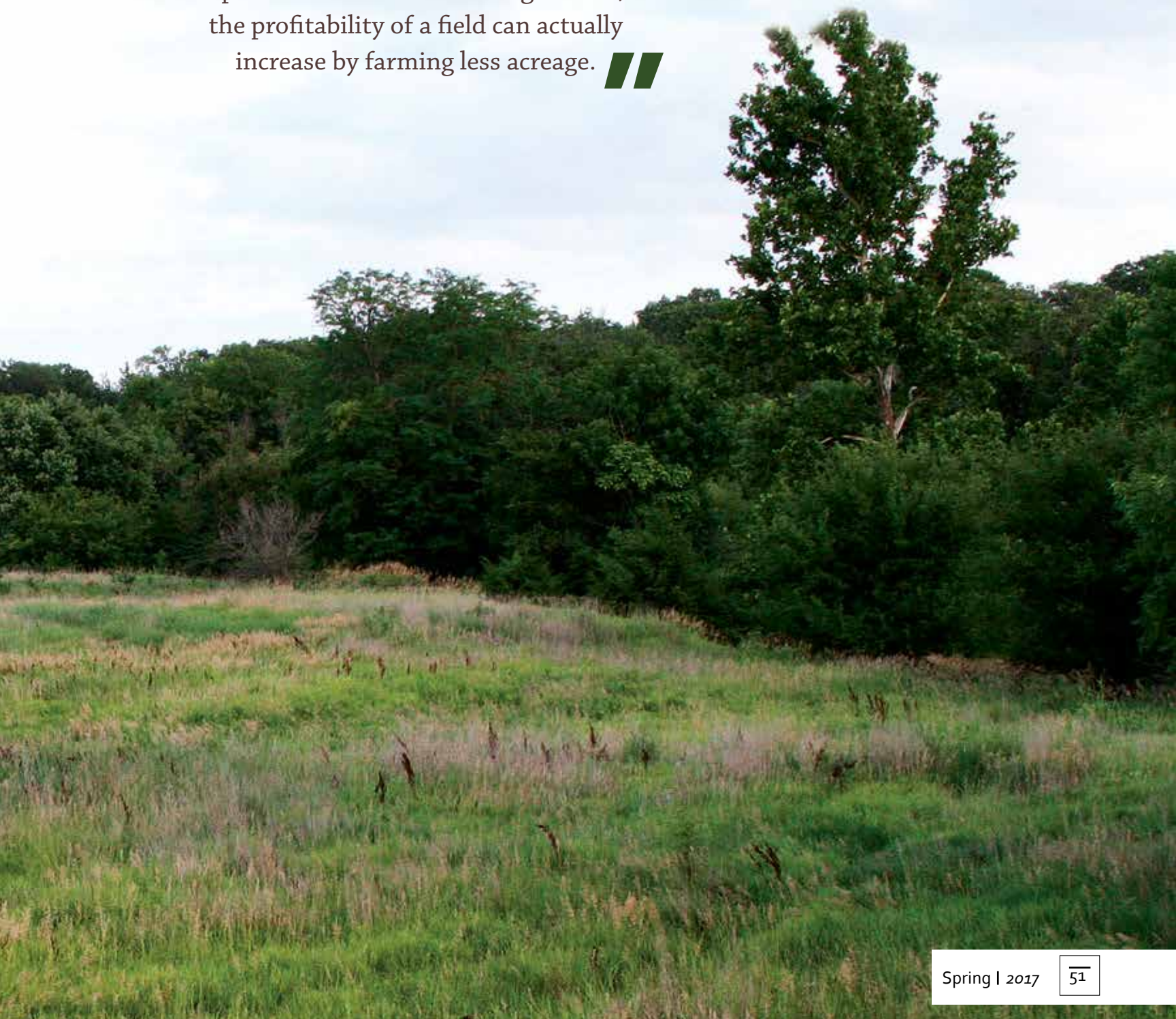
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We often hear 'old timers' talking about how great the quail hunting was 'back in the day.' Many of these guys will swear that some of the best quail hunting in the South was in and around agriculture fields.

When we've inquired about how different the landscape looked back then, the answer is always the same: more hedgerows, more grass, more weeds and smaller fields. Even quail hunters today can agree that they typically get more flushes in the field margins that aren't being farmed or in those select patches of grass left for one reason or another. ↓

In the modern agricultural landscape, quail are reliant on the edges mainly because they are the only habitat left. Unfortunately for quail, intensive agriculture is here to stay. Feeding a growing human population doesn't come without costs. But intensive agriculture also comes with better technology and the opportunity to farm more efficiently. Ironically, the same technology that we use to increase agricultural productivity can now be used to increase bobwhite populations.

We've all seen shorter crops near a tree line or next to a turn row. It's a no brainer that the yield is often lower in these areas. But what's not so obvious is how much lower. Any farmer worth his or her salt can tell you where the best and worst areas of the fields are, but it takes a little help from technology to put a number on it and assign an economic value. Precision agriculture technology can put a dollar sign on how much revenue is lost on marginal farmland and show how profitability varies spatially. Researchers at Mississippi State University (MSU) have gone a step further and used this technology to simultaneously increase farm revenue and bobwhite populations through informed conservation practice delivery.

From soil maps to variable rate applicators, precision agriculture can easily be described as using technology to farm smarter. Add to that a combination of global positioning systems (GPS) affixed to combines with yield monitors and an in-cab computer and you've got the most efficient, advanced farming system known to man! This technology allows farmers to identify low yielding

areas and apply just the right amount of inputs in the right places to maximize yield, reduce inputs and time, therefore reducing cost.

But there are often areas of a field where yield is consistently so low that it is not profitable to farm given the costs of inputs. In fact, on many of these areas the farmer may be losing money farming it. These low yielding, revenue negative areas provide an opportunity for bobwhite restoration in landscapes dominated by production agriculture.

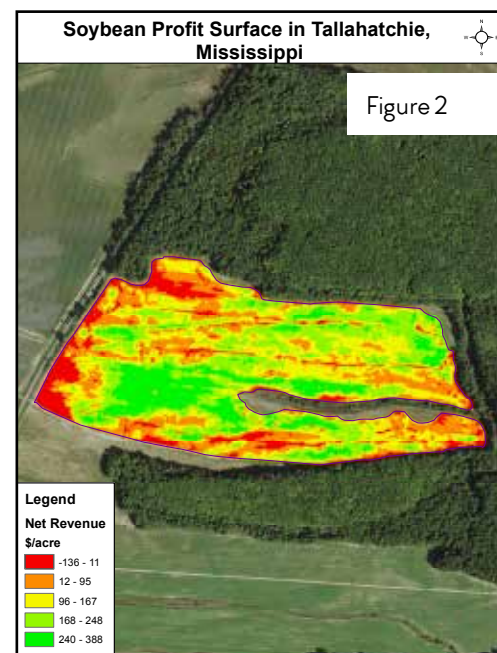
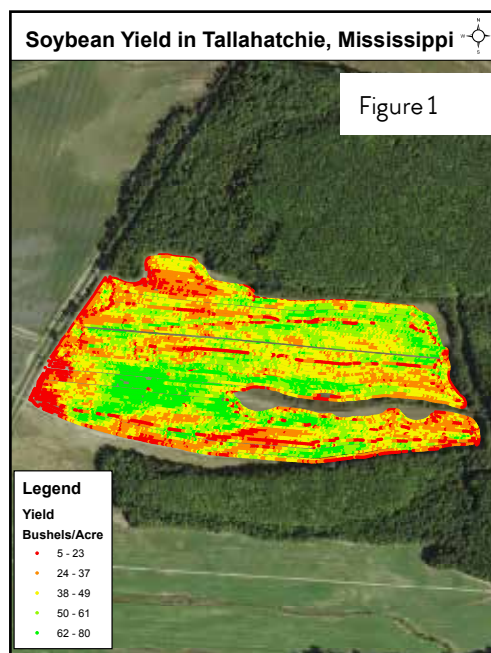
### Yield Monitors

Of all the tools in the arsenal of precision agriculture technology, one is particularly

useful for bobwhite managers and hunters: yield monitors. A combine with a yield monitor and a GPS can change the way we manage quail in agricultural landscapes. Here's how it works. As the combine harvests grain a GPS unit records the exact location of grain yield (bushels/acre) in the field, illustrating where and by how much yield varies across a field. This yield map (Figure 1) is the first step to identifying potential habitat for bobwhite. But yield doesn't tell the whole story.

By accounting for the cost of production (e.g., seed, fertilizer, diesel, labor, time, etc.) and the commodity price (\$/bushel) we can figure out how profit varies across a field. We then create a profitability map (Figure 2). Now, instead of just seeing how yield varies, we see how profit varies across a field. As you can see in Figure 2 some areas of a field, often near the edges, farmers are actually losing money. This can be attributed to soil type, soil compaction and competition for sunlight, water and nutrients from adjacent forests. Often this ground is reducing the overall profitability of a field.

Now that we have identified where the least productive ground is, we can develop



a way to increase the economic potential of these areas and the field as a whole while also creating bobwhite habitat. Fortunately, the United States Department of Agriculture's (USDA) Conservation Reserve Program and other conservation programs, administered by the Farm Service Agency (FSA), that pay landowners a rental fee to establish herbaceous field borders (or buffers) and provide extensive cost-share assistance for establishment and maintenance.

### Buffers Pay More

When you consider the money saved from not farming low yielding areas and then add to that the rental fees and sign-up incentives for establishing buffers, the profitability of a field can actually increase by farming less acreage. The idea of increasing farm revenue by farming less acreage, while also increasing bobwhite populations is novel, but relatively simple.

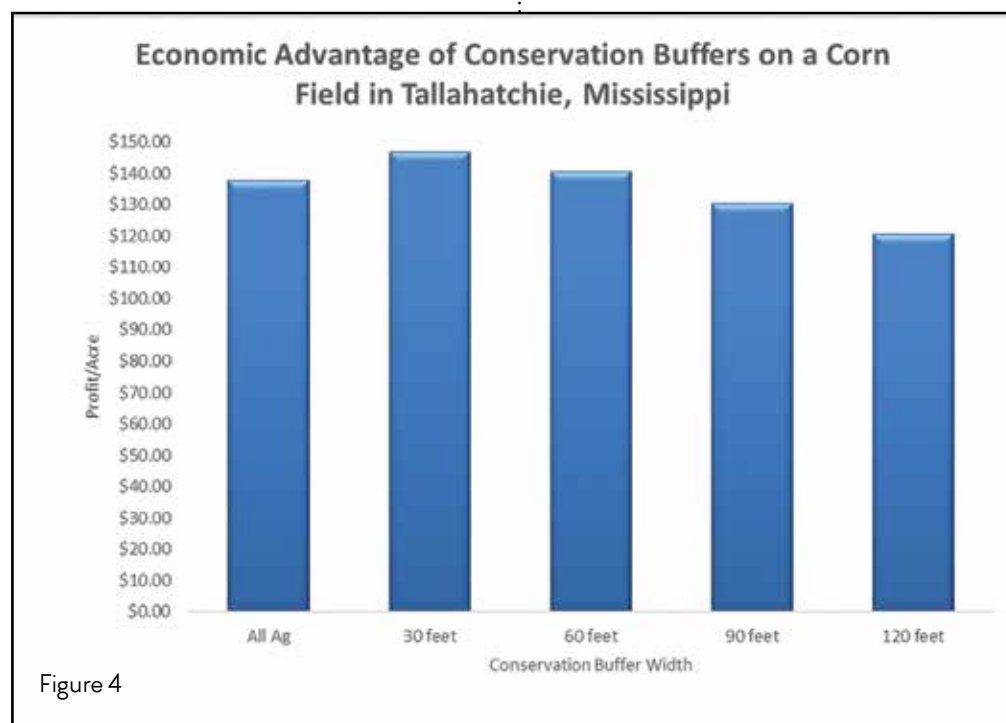
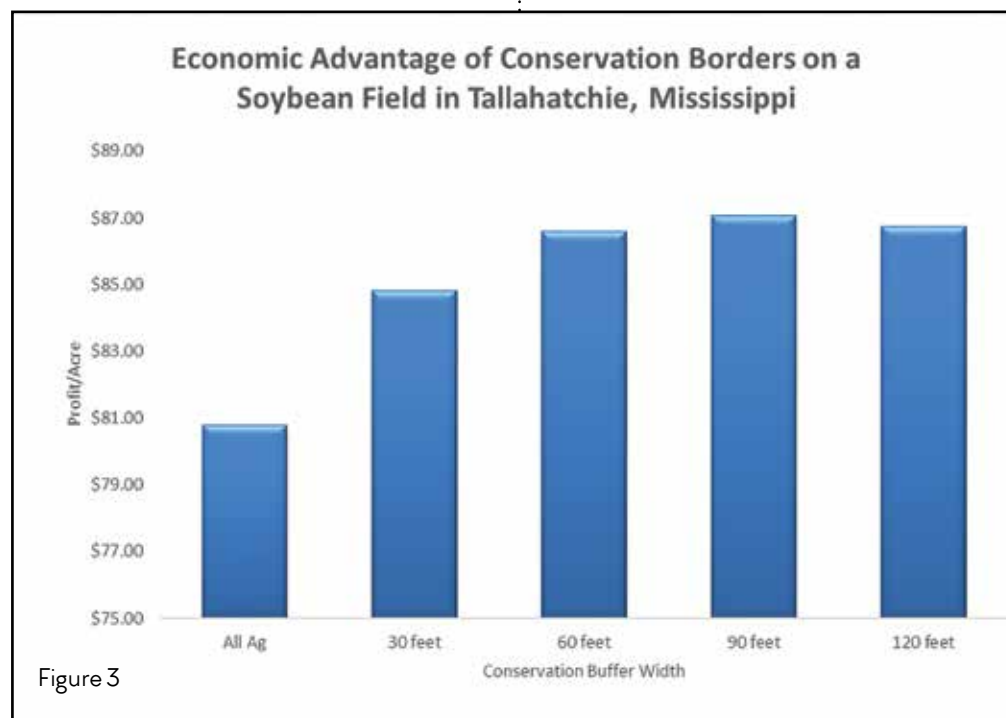
Researchers at MSU developed an approach that uses precision agriculture technology to evaluate the economic opportunities of different conservation buffer widths on field profitability. They also looked at how bobwhites respond to this new habitat on the landscape. They used Conservation Practice 33, Habitat Buffers for Upland Birds (CP-33) for this research because it was designed specifically to restore bobwhite populations in agricultural landscapes. Their results were pretty exciting!

They found that by targeting the lowest yielding field edges with CP-33 buffers, the profitability of the whole field went up (Figure 3 & 4). Obviously, commodity price has a lot to do with profitability, so they measured field revenue at a range of prices to look at multiple scenarios. For the average corn and soybean prices farmers are facing today, the potential to increase field profitability with targeted conservation buffers exists. It is very important to point out that the largest buffer scenario did not always produce the highest profit. This is because most low yield areas are generally near the field edge and as you move closer

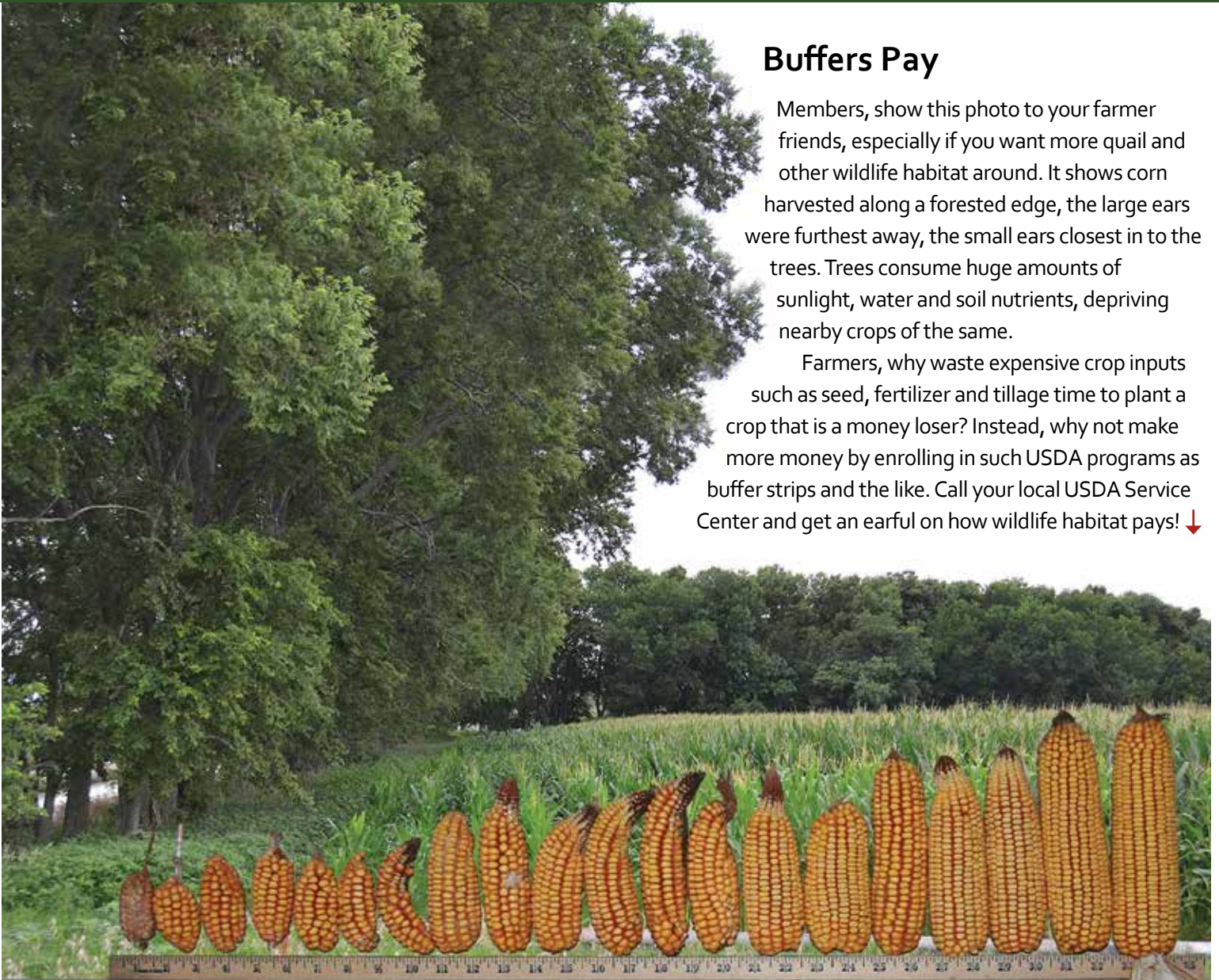
to the middle of the field, yield and profit goes up. Therefore, at some point, the middle of the field is more profitable than the field edge with or without a buffer. Establishing

a conservation buffer in such areas would reduce the profitability of the field.

They also simulated bobwhite response to increasing amounts of CP-33 buffers in the







## Buffers Pay

Members, show this photo to your farmer friends, especially if you want more quail and other wildlife habitat around. It shows corn harvested along a forested edge, the large ears were furthest away, the small ears closest in to the trees. Trees consume huge amounts of sunlight, water and soil nutrients, depriving nearby crops of the same.

Farmers, why waste expensive crop inputs such as seed, fertilizer and tillage time to plant a crop that is a money loser? Instead, why not make more money by enrolling in such USDA programs as buffer strips and the like. Call your local USDA Service Center and get an earful on how wildlife habitat pays! ↓

landscape and found that as the amount of buffer habitat increases, bobwhite abundance increased disproportionately to the change

in land use (Figure 5). That means that bobwhite don't just respond to the increase in new habitat acreage created by conservation

buffers, but that the addition of the buffers also increases the amount of useable habitat in the landscape. In other words, the buffer



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produced habitat and it also increased the use of the adjacent crop field.

Another MSU study looked at bobwhite abundance on fields with CP-33 buffers and those without across 14 states for six years. Results showed that although buffers only accounted for about 5-10% of the landscape, bobwhite breeding density (males/acre) was 85-109% greater on CP-33 fields than non-buffered fields, and fall covey density was 50-110% greater for buffered fields.

While the benefit of conservation buffers to bobwhite is apparent and well documented throughout the bobwhite range, the use of precision agriculture technology to identify both conservation and economic opportunities is novel to farmers, bobwhite managers and hunters. In most scenarios there exists a tradeoff between generating revenue and increasing bobwhite abundance. Precision agriculture technology allows farmers to understand the economic impact of alternative scenarios so they can make an informed decision that optimizes their mutual goals.

#### Hunters Needed to Spread the Word

Quail hunters can increase bobwhite populations by increasing adoption of this technology. Talk to farmers you know and see if they have heard of this technology. Ask them if there are low yielding field margins they would rather not go through the hassle farming and let them know the opportunity to increase revenue may exist.

The latest USDA estimates suggest that yield monitors are used on ~40% of the grain crop acres in the US. However, this number varies regionally. For example, a survey showed that Southeastern states were below the national average in precision agriculture adoption (19%). While this estimate is much higher than a decade ago, it still has room to increase. If the majority of farmers throughout the bobwhite range adopted this technology and used it to replace marginal farmland with bobwhite habitat, the outlook for bobwhite populations would undoubtedly be brighter! 🐾

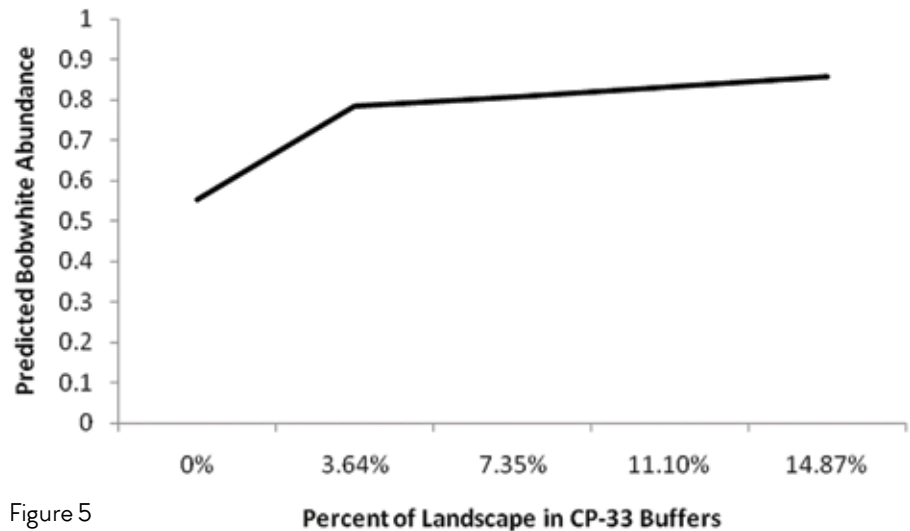


Figure 5

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