

WILDLIFE TRENDS

January/February 2008

Volume 8, Issue 1

Creating Birds of a Feather: “Insecti-Sizing” Your Property for Northern Bobwhites

By Theron M. Terhune & John Carroll



Introduction

Northern bobwhites feed on a variety of foods throughout their ephemeral lives. We say ephemeral because as any quail manager knows it is difficult to keep populations of quail stable over time let alone enjoy those of increasing size. This is largely because of high natural mortality rates (i.e., which often does not even include hunting) which can be attributed in large part to a range of species, from snakes to raptors, that prey on bobwhites. Put

“Insecti-Size Me!” Here a bobwhite hen broods her chicks (photograph provided courtesy of Randy Cass); bobwhite chicks are extremely vulnerable during their early stages of life (especially the first 2-weeks post-hatch) and they rely heavily on their mother for warmth while they grow and develop feathers. To do this, chicks, again, typically rely heavily on their mother to take them to protein-rich, insect-laden habitats.

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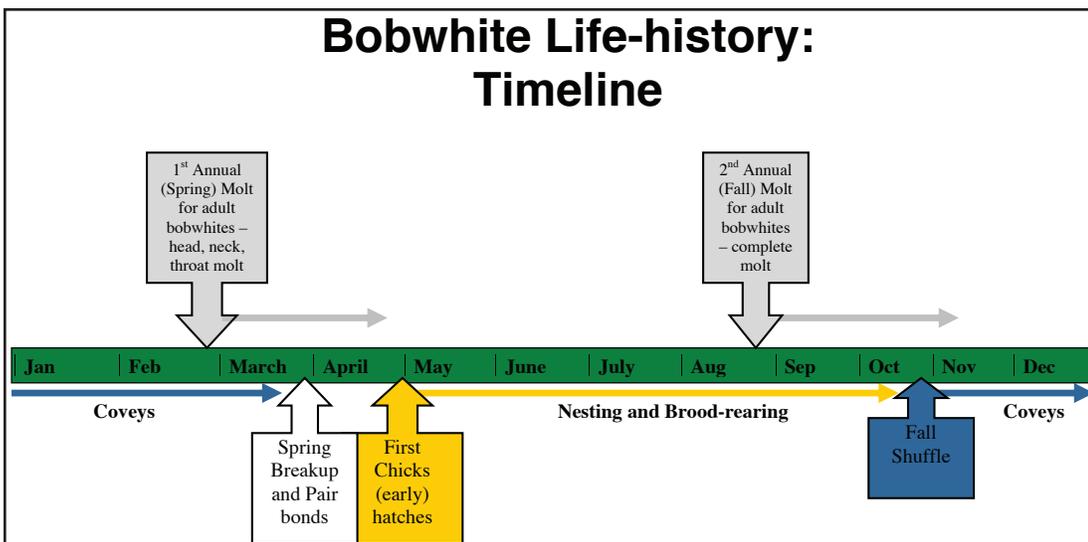
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another way, pretty much anything and everything will capitalize on the scrumptious meal of bobwhites – be it quail eggs, chicks or full-grown birds. The average life-expectancy of a quail-bird is approximately 7-8 months. Long-term radio-telemetry studies at the Albany Quail Project (AQP) and Tall Timbers Research Station (TTRS) have demonstrated that annual mortality of full-grown bobwhites is around 80 percent. This gloomy statistic does not even include bobwhite chick mortality; therefore, in all likelihood annual bobwhite survival (or life-expectancy) is much lower than the average documented 20 percent. Ostensibly, when bobwhites are chicks, especially during their first 2-weeks post-hatch, they are most susceptible to mortality. Whereas predation management can reduce certain populations of predators (namely mammalian predators), many predators preying on bobwhite chicks are not typically managed (e.g. snakes, ants). Furthermore, mortality of chicks is not exclusively attributed to predation, in fact other factors such as stress, nutrition (or lack thereof) and weather is often of importance.

Although it doesn't seem to get as much notoriety as in white-tailed deer management, the dietary needs of bobwhites are crucial and vary depending on their stage in life. For example, during the first 2 weeks of development after hatching the staple food item is insects, however, as chicks approach 2-weeks of age they begin feeding on other food sources as well, specifically seeds and legumes. Because bobwhite chicks are so small it is difficult, to near impossible, to equip them with a radio-transmitter without hindering their survival and normal activity. As a result, we as researchers know relatively little about chick ecology during the first few weeks following hatch. We have, however, gained insight to brood ecology indirectly (by radio-tagging parents) and directly (lab-based experimentation) by studying many aspects of bobwhite ecology. Studying nesting ecology (e.g. nest production and survival) and other demographic parameters (e.g. seasonal and annual survival) concomitant with population parameters affords us crude inference into brood production and survival. For example, we have observed years where survival, nest production, and nest survival have been relatively similar but large population changes have occurred. In these cases, we have been able to correlate these data, although anecdotal, with poor weather and/or poor insect abundance, thereby a possible explanation is that poor brood development or survival was driving these declining populations. Ultimately, we know that chick survival is a key factor affecting population levels,

Bobwhite Life-history: Timeline



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though its magnitude is uncertain; and thus, it would be prudent to manage our properties accordingly (that is, to improve chick survival) if our goal is to increase quail abundance.

As quail managers, we must incorporate multiple management techniques and strategies into our management plan(s), but a vital component for successful management is to first understand and manage for the fundamental needs of bobwhites. That is, managing habitat appropriately to meet their basic, daily requirements during all life stages throughout the year. This understanding will allow us to better manage for bobwhite quail, specifically, and natural resources, in general. In this article, we will briefly discuss some of the basic life-history characteristics of bobwhites and focus on a single, small but absolutely crucial component: bobwhite chick growth and feather development. We believe that lack of proper habitat for bobwhite broods (i.e. chicks) is often a key component among both managed and non-managed properties that limits population increases or even stability from year to year.

General Life history of Bobwhites and their Diet

Among altricial species (species where chicks remain in the nest for 2-3 weeks post-hatch; e.g. most songbirds), parents can offset or mask the overall poor quality of habitat by finding high quality forage or feeding their chicks high-quality feed by nutritionally supplementing their food with potential detriment to their own nutritional well-being. In contrast, precocial species' (species that are covered with down upon hatching and leave the nest immediately) chicks such as Galliformes, including bobwhites, immediately must depend on food availability at nearby areas whether of poor or good quality. Therefore, quality habitat and food resources must be available for bobwhites and their chicks during the breeding season to ensure proper nutrition levels, growth and survival.

Importance of Insects to Bobwhite and other Galliformes (Quails, Partridges, & Pheasants) Chicks

The importance of insects to chick development, especially during the first few weeks post-

hatch, is unparalleled in many respects to any other single dietary item in the life of a gamebird. Insects provide a high-energy and protein-rich diet which contributes significantly to chick growth and feather development. Numerous lab-based experiments have concluded that invertebrates are irreplaceable in terms of plumage development. Likewise, other high-energy food sources (e.g. fish) were determined as inferior to invertebrates for thermoregulation among gamebirds. Finally, many studies on various Galliformes species including grouse, northern bobwhite, grey partridge, pheasants, and wild turkeys have all reported that insects are imperative for chick growth and survival.

Growing Chicks & Feather Development

Research on various Galliformes species has suggested that 3 main components contribute to normal feather development: genetics, hormonal balance, and nutrition. While genetics is largely outside the realm of practical management for most of us, research suggests that nutritional adequacy of the diet is actually the major factor influencing the overall structure and growth of feathers in birds (Wyatt et al. 1975). Fortunately, by using our knowledge of ecology and experience when managing habitat, we can improve nutritional adequacy by manipulating and/or planting for specific habitats rendering desirable seeds, grains, and invertebrates for food availability and thereby meeting the daily requirements of bobwhites in their various life stages.

Feathers are comprised primarily of protein (up to 97%), which is almost entirely keratin. There are 2 sulphur-containing amino acids (building blocks of proteins) that are said to be the major constituents needed for feather keratin synthesis: **methionine** and **cystine** (Potts 1986). These amino acids also contribute to the general maintenance and growth of chicks (Wheeler and Latshaw 1981), and proportionately are overwhelming in their contribution to feather development. Another important amino acid is **lysine** which contributes to feather pigmentation; however, lysine is often prevalent in different seeds or grains and is therefore not found only in insects. So, why is it important to ensure ample insects for bobwhite chick development and not merely supplementary feed?

Containing high-quality proteins, insects possess the optimum type (i.e. the amino acids methionine and cystine) and quantity of amino acids important for maintenance, growth and feather development. Further, the composition of these amino acids found in insects is more readily digestible by birds than those found in plants (e.g. legumes, grains). For example, although lysine is a component in some grains, legumes and seeds consumed by birds, lysine found in insects is more digestible and thus more usable. This assimilation disparity of amino acids and other nutrients among forage types (insects and plants) results from the digestive process of birds' inability to efficiently breakdown hard seed hulls and thereby hindering the extraction of certain amino acids and nutrients from these food types. Among insects, varying amounts of the 2 important amino acids listed above are also contained in different insect types and some studies have even delineated insect preferences via Galliformes which may be correlated with optimal nutritional benefit. Plant bugs, hoppers, cicadas, grasshoppers, beetles, caterpillars, aphids, and some

types of ants are just a few of those 'preferred' invertebrates. Managing habitat to promote a diversity of insects is important to not only meet the nutritional needs, but also to increase their selection. Additionally, managing for a diversity of insects will provide different sized insects available for consumption by chicks of varying sizes. It is difficult for a 2-day old chick to tackle a large grasshopper, but much easier to snatch aphids, ants, plant bugs and leafhoppers, and then as chicks mature they can decrease the number of insects consumed by feeding on the larger insects such as grasshoppers.

The critical time period for feather development in bobwhites and other Galliformes chicks is during the first 2-3 weeks of post-hatch development. The first 12-14 days are also the most susceptible time in a quail's life because they cannot fly and are limited to their on-the-ground mobility and evasion tactics or skills. Although that said, we know from experience they are still quite amazingly quick and difficult to capture especially when in a large group (i.e. brood). An insect-rich diet will afford growing chicks the



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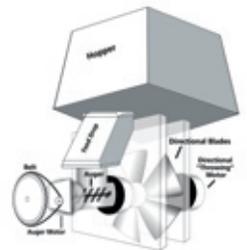
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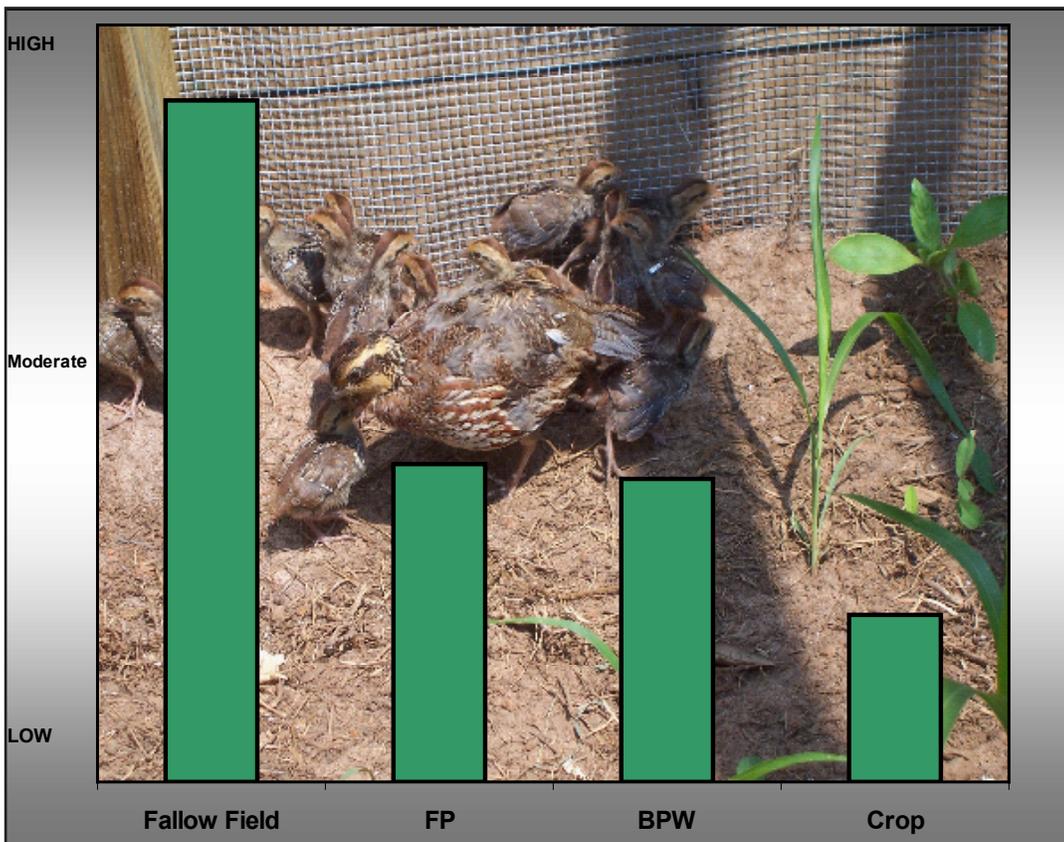


proper nutrition to produce healthy feathers while maintaining rapid body growth and development during these first couple of weeks post-hatch.

Other than flight, why is rapid feather development important?

Other than flight, feathers serve numerous functions: thermoregulation, protection from the elements (rain, sun/heat), and provide camouflage to name a few. Thermoregulation, specifically keeping warm, is important for bobwhite chicks because they are precocial species meaning upon hatching they have a layer of down feathers, are capable of eating on their own, and quickly leave the nest. Being precocial has its advantages and disadvantages; one of its disadvantages is susceptibility to the weather (e.g. hot, cold, rainy or dry). A typical concern among biologists and managers relative to thermoregulation is late-season chicks (those hatching during late September – October) keeping warm, particularly during cold wet

nights. Feather development, in addition to their down feathers among bobwhite chicks after they hatch, further aids in thermoregulation. Bobwhite chicks, however, do not rely solely on feathers for thermoregulating; chicks are “brooded” by their mother and they also induce shivering as a mechanism for warmth. Similarly, feather development aids in protecting chicks from rain, again this is related to thermoregulation. On another note, a complete set of feathers provide some pretty impressive camouflage for bobwhites. This camouflage is relevant to chick survival for hiding from predators, including humans. Finally, we have the issue of vulnerability of the chicks while foraging. Filling their crops rapidly with insects in good habitat reduces their exposure to predators. When putting all of these issues together it becomes apparent that it’s not just a single factor that is important, but a range of interacting factors which affects the survival of bobwhite chicks.



Insect populations rated on low to high scale for Fallow fields, Feed Patches (FP), Burned Piney woods (bpw), and Crops. The background picture is a bobwhite hen raising a brood in a pen-study. (photograph provided courtesy of Randy Cass).

Are insects a part of an adult quail’s diet?

The short answer: YES! Using video-cameras placed at nests we have commonly observed bobwhite hens snag the occasional grasshopper, ant, etc. as an opportunistic meal while incubating a clutch of eggs. Further, we have watched through binoculars as hens and cocks fought over lush grasshoppers, and we have observed bobwhites randomly ingest insects while feeding or carrying about their normal business. Whereas no comprehensive studies exist on insect consumption by full-

grown (juveniles and adult) bobwhites, we speculate that insects are ingested quite regularly when available. We also speculate that insects provide a high-energy diet not only for chicks, but also for hens which may help them to defray the cost(s) of reproduction (e.g., nest building, mating, and egg development). Likewise, insect consumption by full-grown bobwhites may supplement the predominant diet of seeds and legumes and, therefore, rendering methionine and cystine available for new feather development during feather molt. Adult bobwhites undergo 2 molts each year: one during the early spring and another during August – September (see *Bobwhite Life-history Timeline*). The spring molt is typically limited to the feathers on the throat, side of the head, and neck, and perhaps is for purposes associated with ‘mate selection’. The fall molt is a complete molt whereby all the feathers are eventually replaced. Hence, insects are likely an important component of the diet to provide the essential amino acids needed for proper feather development; improper feather development could be problematic by inhibiting the utility of feathers (i.e. flight, protection, and camouflage).

Habitat Management for Insects and Broods

The 2-week time period whereby bobwhites require the high-energy diet of insects is seemingly a relatively short interval to focus so much habitat management attention. However, when taken collectively, the chance that a recently-hatched brood (a group ≥ 2 bobwhite chicks) is in this crucial 2-week stage of development on a given property and for a given population of bobwhites is actually quite high for the duration of

the breeding season, particularly during June and July (see *Bobwhite Life-history Timeline*). In the Southeast, where the breeding season occurs during April – September (and hatches occur as late as early-October) this critical time period for a population of quail is much longer: nearly 7 months. Therefore, in that context, the need for quality brood habitat is much more salient. Below we outline some practical ways to incorporate various habitat management techniques into your management plan to optimize (i.e. “Insecti-Size”) your property for insects and consequently bobwhite chick development.

It is important to note that implementation of many of these techniques is contingent on the location of the property, the soil type, topography and other site-specific attributes and, thus may need to be augmented to obtain the desired results. For example, the scale of implementation may vary relative to site-specific variables and, the size and shape of habitat patches may also differ among properties relative to the overall landscape. A professional quail biologist can help you to design a management plan tailored to your specific property. In fact, one of the first things that we look for when perusing a property

<u>Seed Mix 1</u>		<u>Seed Mix 2</u>	
<u>Plant Species</u>	<u>Rate (lbs./acre)</u>	<u>Plant Species</u>	<u>Rate (lbs./acre)</u>
Sorghum Alum	7 - 10	Pearl Millet	10 - 12
Brown-top Millet	6 - 8	Wildlife Sorghum	3 - 5
Hairy Indigo	2 - 3	Partridge Pea	5 - 6
Ladino Clover	1.5 - 2	Crimson Clover	5 - 7
<u>Seed Mix 3</u>		<u>Seed Mix 4</u>	
<u>Plant Species</u>	<u>Rate (lbs./acre)</u>	<u>Plant Species</u>	<u>Rate (lbs./acre)</u>
Sorghum Alum	7 - 10	Wildlife Sorghum	3 - 5
Pearl Millet	10 - 12	Hairy Indigo	2 - 3
Partridge Pea	5 - 6	Alyceclover	5 - 6
American Jointvetch	3 - 5	Florida Beggarweed	3 - 6
Florida Beggarweed	3 - 6		

Insect (feed/cover) Patch Plantings: The rates in this table are broadcasting rates. You may wish to swap out or add plant species to these four seed mixtures; however, it is important to have 1 or 2 plant species to serve as cover types (e.g., pearl millet, sorghum alum, wildlife sorghum) and 1 to 2 forbs and/or legumes in each mixture to increase insect abundance and diversity. Additionally, planting rates and planting times may vary depending on the site. Several of these mixtures are also beneficial to other wildlife species such as wild turkey and white-tailed deer.



Researchers use radio-telemetry to track radio-tagged hens with broods to capture their chicks. A fence is constructed in a ring-formation prior to daylight around the brood (left picture) and as dawn approaches 2-4 researchers pull-up all of the vegetation until the hen flushes at which time the chicks are captured (middle picture) and tagged with wing-bands (picture on the left). Data collected from banding and recapturing chicks provides information on chick survival.

during consulting is to evaluate the amount of brood habitat available and its juxtaposition to quality nesting habitat! And, by taking a stroll through what seems to be appealing, insect-rich habitat one can crudely gauge the abundance and diversity of insects on the property.

As we have already discussed, two considerations are crucial to increasing quail chick survival: food and cover. Quail chicks need an average food intake of approximately 28% protein during the first few weeks of life, while full-grown quail only need about 10-12% protein and laying/incubating hens need about 23% protein. While supplemental feed provides plenty of protein for full-grown quail to survive it does not fulfill the nutritional needs of young chicks or often that of laying/incubating hens. Therefore, managing for young quail chicks is largely a matter of managing for arthropods, specifically grasshoppers, beetles, and other invertebrates whose protein content can be as high as 45 - 50 percent. During good rainfall years, insects are found abundantly in most habitat types; however, oftentimes cover is lacking in many of these areas especially in areas with "light" soils. Here we provide some practical habitat management tips for improving insect abundance and diversity:

Weed fields. In the Southeast, we typically refer to 'weed fields' as ragweed fields. These are fallow fields that are managed specifically for ragweed and vary in size from 1.5-4 acres. Ragweed is ideal because of its multifaceted function, providing for the basic needs of adults and broods alike. For brood rearing, ragweed is unparalleled in its structure. The stout, erect stalks branch out into broad-leaved canopies at the top providing excellent cover from avian predators. Additionally, ragweed remains open beneath its canopy allowing easy litter free ground access for mobility, dusting, and feeding. Early studies conducted by the AQP showed a greater amount of insects in managed ragweed fields than any other type of habitat including burned piney woods (see *Insect abundance Figure*). Ragweed fields are usually disked (harrowed) twice annually: once in the fall (October-November) after the seed has matured and once in the late-winter or early-spring (February-March). The amount, size, and shape of fallow fields are dependent on site-specific variables

(e.g., geographical location, soil type, and topography) and will therefore likely differ among properties.

Planting Insect Patches. Frequently, it is beneficial to plant small patches either specifically for insects or as a combination of feed (insect) and cover patches. The combination of feed/cover patches may also improve over-winter survival of bobwhites if planned and planted properly by providing quality habitat during late-winter when cover is generally lacking. There are a few issues that may come to mind when planting insect patches: what to plant; plant composition; when to plant; and what size plots to plant. To make your feed (insect) patches quail-chick friendly we suggest using a diversity of vegetation types (see the *Seed mixtures table for a few of examples*). Also, while it is important to provide insects we must also provide protection from predators. Therefore, plant composition should comprise vegetation types and mixtures that produce quality cover above chick level (a broad-leaf or dense canopy) and open space for easy mobility and feeding at the ground level. Additionally, to improve insect abundance and diversity consider incorporating **moderate** amounts of legumes and forbs into your mixtures; rates of legumes and forbs that are too high may produce undesirable results. For many vegetation mixtures that are planted as insect patches, optimal planting times are during late-winter to early-spring (March-May); however, some sites (more Southern zones) can get away with planting patches as late as June. Based on research conducted through the AQP and based on our recent experience, patch size should be no smaller than one-half an acre and preferably should range closer to 1-1.5 acres in size.

Agricultural Fields. Management of agricultural fields for bobwhites can be beneficial for broods when conducted properly. A first consideration is whether pesticides are being applied. When application of pesticides is not being broadly applied, management of field margins (field edges, buffers, etc.) can provide ideal insect habitat under certain conditions. A general rule is that wider field-margins (≥ 150 ft) are better than thinner margins. Soybeans are characteristically better than corn or cotton. Field margins that are disked every 2-3 years can provide excellent chick habitat and keep Bermuda grass from invading too much so as to

inhibit chick mobility. Conservation tillage in fields, especially soybeans can also improve fields for broods by increasing invertebrate abundance. Also, management of pivot corners can give you that edge in brood habitat and aid in tying woodlands (piney woods) management to agricultural management or multiple patches together. It may also be beneficial to plant field margins or corners especially during their initial establishment rather than waiting for natural vegetation to respond.

Woodlands. We won't spend much time here because there have been numerous articles in previous issues of *Wildlife Trends* covering woodland management for bobwhite quail. Generally, we suggest using timber thinning and prescribed burning to provide open timberlands (≤ 55 BA) with a matrix of different aged unburned and burned habitats. Regular prescribed burning (30-70% burned annually) and maintaining a 'good' balance of one-, two-, and three-year unburned habitat will provide a diversity of habitat types, thereby yielding good insect abundance and diversity while mitigating hardwood encroachment. Finally, incorporating strip disking into your woodland management regime can further increase habitat diversity.

We believe that incorporating the above practical management techniques into your management plan will not only dramatically improve insect abundance and diversity, but will also improve your overall habitat management endeavors for quail. Managing for a diversity of insects ensures multiple types and various sizes for different age of chicks to consume. Again, managing for insects is important, but managing for diverse habitats which provide quality cover for protection from predators and abundant insects, and thereby decreasing foraging time, is even better.

Summary

As quail managers, we have the option to employ numerous management strategies to benefit quail. Often we mistakenly search for the 'silver-bullet', the panacea, the 'cure-all', or the 'quick-fix' to increasing quail numbers and, in doing so, we expend hundreds or even thousands of dollars exploiting techniques, such as supplementary feeding and predation manage-

ment. We are not saying these are poor management options; in fact, we are a proponent of both, but only when the conditions are appropriate for their implementation (which is usually after habitat has been sufficiently managed). As such, when searching for the 'best' management strategies, it's easy to overlook the simple, mundane management tasks such as managing our properties for diverse habitats which are requisite to meeting the daily, seasonal, and annual requirements of the species (in this case bobwhites) for which we are managing. This is particularly important for species that have high mortality rates and are sensitive to quick (stochastic) population fluctuations such as that experienced by northern bobwhites. Therefore a management plan which optimizes the habitat and nutritional conditions throughout the entire year is without a doubt the best strategy for success. One such need is providing the proper quantity and quality of habitat to render insects readily available for bobwhite chicks during the breeding season.

Despite the relatively short time-period (only about 2 critical weeks) during which bobwhite chicks are highly dependent on insects for protein and the essential amino acids they comprise, providing insect-lush habitat is a crucial component to integrate into your quail management plan. As discussed herein, a diversity of insects renders the best 'buffet' to meet the nutritional requirements of bobwhites (specifically, bobwhite chicks). Hence, to procure a diversity of insects on your property, a general rule is to manage your habitat for diverse vegetation types – quail generally thrive in areas where diverse habitats exist (of course, excluding certain habitat types such as late-succession vegetation and thick, sod-forming grasses is important). Incorporation of weed fields, strip disking in both the piney woods and open areas, use of prescribed fire via maintaining a suitable ratio of burned and unburned habitat, and limited use, if at all, of pesticides (typically only applicable to agriculture-managed landscapes) will for most areas meet the needs of growing bobwhite chicks by propagating an assortment of insects.

While knowledge regarding bobwhite chick ecology is limited, what we do know based on many studies, both on quail and other Galliformes, is that a high-protein diet is essential for normal

feather development, rapid growth and optimal chick survival. And, the best way to meet this high-nutritional demand is by managing habitat to promote an abundant and diverse crop of insects. Furthermore, the bobwhite's best predator-avoiding tactic is flight and as such without the proper nutrition to make feathers and rapidly grow, bobwhite chicks will never make it to the next stage of life wherein only 20% will survive annually. The more chicks that survive to 2 weeks, the better your chances for having more birds to hunt the following fall. Thus, "Insecti-Sizing" your property will improve your chances for creating more birds of a feather – that is, the Prince of Gamebirds – for many hunting seasons to come.

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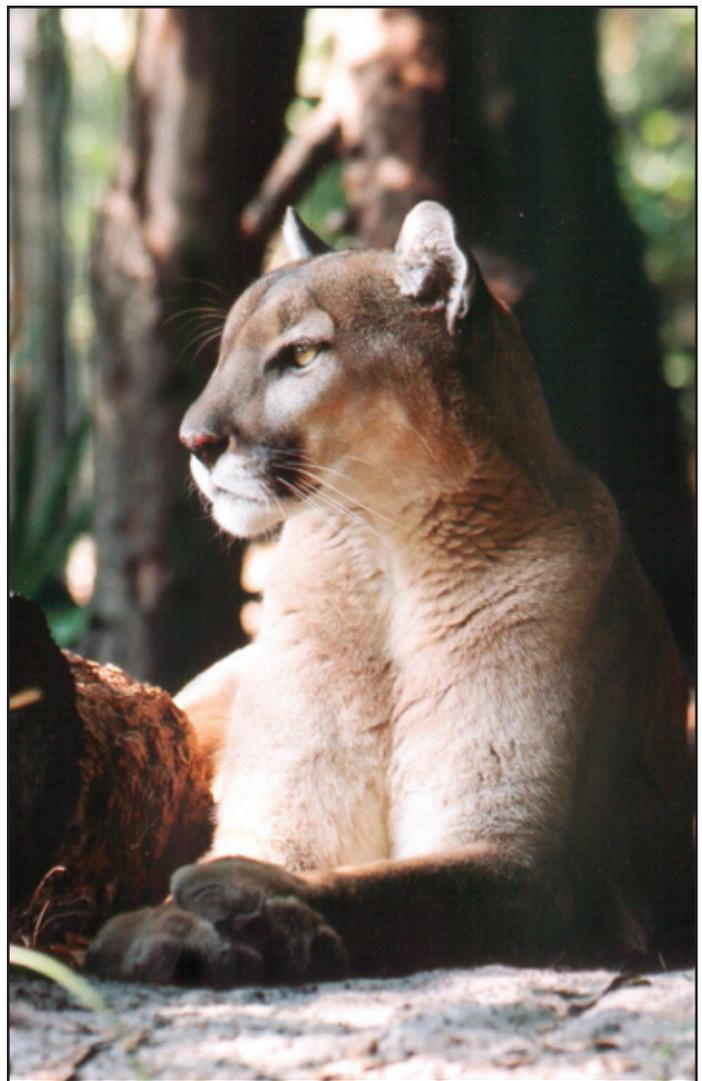
Search for the Illusive Eastern Cougar (*Puma concolor cougar*)

By Anna Huckabee Smith

Editor's Note: The reason for this article is that I've heard for years and years from friends, family, and hunting buddies that they swear they've seen a black panther here in the southeast while hunting or just riding down the road. The only problem is no one, and I mean no one has ever produced evidence of a black panther. Even my good buddy, Wayne Bassett, tells about the time he and his hunting buddy were deer hunting several hundred yards apart and both say they saw a black panther in the woods. Unfortunately, Wayne's buddy can't corroborate the story because he was hit by a train a few years later! (True Story). If you have had panther sightings, pictures, or any other kind of evidence, please send them along to us because, to tell you the truth, I'm a little beyond skeptical. As you will see, Anna has done a great job of research. So let the debate begin! Editor.

Where I come from in the South, ask any outdoorsman if they have ever heard of the "eastern cougar" and they will probably tell you they have seen one or at least know someone else that has seen one. My own family is not even exempt from reporting sightings to me. Twenty-one eastern states comprise the former range of the species and list it as endangered and therefore protected under the Endangered Species Act, despite its presumed status by the US Fish and Wildlife Service as extinct. However, to hear the locals talk, the countryside is crawling with these big cats, even "black panthers." In South Carolina alone, the Department of Natural Resources receives approximately 100 to 150 reports a year, and in North Carolina, the Wildlife Resources Commission maintains a database of reports and whether the incident was investigated along with the findings of that investigation. Nuisance wildlife control companies get calls as well but they pass them off to the state wildlife agencies to investigate. Cryptozoology (the study of hypothetical or presumed extinct creatures) welcomes another candidate, the eastern cougar (*Puma concolor cougar*).

The cougar (*Puma concolor*), in general, is known by many different names: panther, painter, catamount, puma, mountain lion, mountain screamer, and ghost cat, the last being an apt description of what it has become in the East. Disputing its existence with the wrong crowd can get you in trouble. When I worked in state government, we shared our funniest reports



Cougar in repose. www.BigCatRescue.org

from the public with our colleagues in our own agency and at regional meetings. The names of the citizens reporting were withheld, of course, to avoid embarrassment. Some of my favorites included: "It was laying up under my carport screaming." "I saw it swimming across the lake with a butterfly stroke." "When I chased it out of my yard, it turned around to catch the potato that I slung at it." (Clearly some brown liquor must have been involved in some of these sightings!) Many a black Labrador retriever, bobcat, coyote, or house cat has been accused of being something more than it really was.

All jokes aside, though, new data on the eastern cougar and the argument over its existence has caught the attention of the US Fish and Wildlife Service (USFWS) and prompted them to re-examine the evidence surrounding the possibility that distinct populations of Eastern cougars may have survived and are living amongst us. There are too many truly credible reports coming in to state agencies to be ignored, and suitable habitat and prey are available in the region. The USFWS is long overdo in revising

their Eastern Cougar Recovery Plan (1982) through a five-year status assessment and has solicited the help of state agencies, the public, cougar experts, and researchers in gathering information on the historic status of eastern cougars, sightings by state, laws and regulations governing captive cougars, estimates of the number of cougars in captivity, landscape analyses, and deer populations and densities. Before a definitive answer to the mystery can be determined, it is important that all the facts are examined on both sides of the argument, beginning with the history of the species in the eastern United States.

Historical Documentation

The fossil record does not contain many feline fossils. Therefore researchers have had to rely on mitochondrial DNA analysis to determine the origins of the various species. In cougars, the evidence points to a close kinship with the jaguarundi (*Puma yaguarondi*), a smaller cat found in Mexico, Central America, and South America, as well as the cheetah of Africa and

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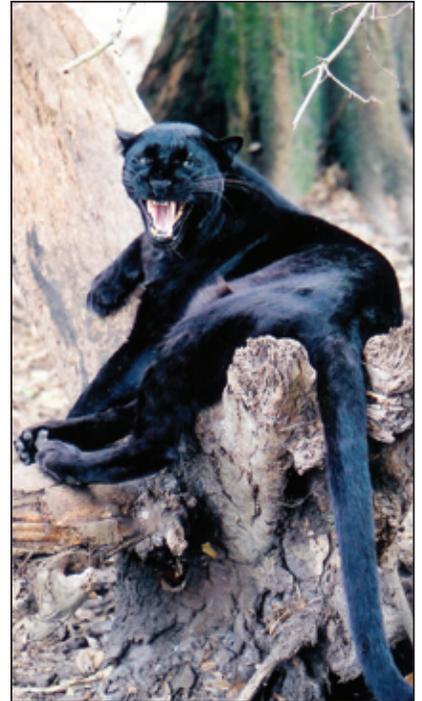
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Asia. How the migration between Old World and New occurred is as yet unresolved. With this new data, cougars were moved from the genus *Felis* to *Puma*. Additionally, a new theory suggests that during the Pleistocene, the cougars in North America went extinct only to have the land recolonized later by South American cougars pushing north. The name “cougar” is derived from a word in the Tupi language of Brazil while “puma” comes from the Quechua of Peru.

Until European settlers arrived, the cougar was once the most wide-ranging mammal in the Western Hemisphere. The species as a whole could be found from southern Canada to the southern tip of South America. However, the former range of the eastern cougar subspecies (*Puma concolor cougar*) included only eastern Canada (southern Ontario) and the eastern United States from Maine to South Carolina and west from Michigan to Tennessee. The Florida panther (*Puma concolor coryi*), which, incidentally, is not a true panther, is presently considered a separate cougar subspecies that used to roam the southeast but is now only found in southern Florida. Once settlers arrived in the New World, it wasn't long before the cougar began to suffer the same fate as wolves and other large carnivores. Bounties were placed on them as people feared for their families and livestock. Through overhunting and trapping, loss of prey (a decreased deer population), and loss of habitat to deforestation, most eastern cougars were effectively eliminated from their former range by the late 1800's. By the 1920's, no more eastern cougar (*Puma concolor cougar*) breeding populations could be confirmed, and by 1940 the species was considered effectively extirpated from its eastern

range except for its close relative the Florida panther (*Puma concolor coryi*). As public sentiment changed, the Endangered Species Act was created, and on March 11, 1967 the Florida panther made the list followed by the eastern cougar on June 4, 1973.

Today, the eastern cougar is presumed extinct while the Florida panther mainly survives in refuges such as the Arthur R. Marshall Loxahatchee NWR, Florida Panther NWR, and the Okefenokee NWR in a population consisting



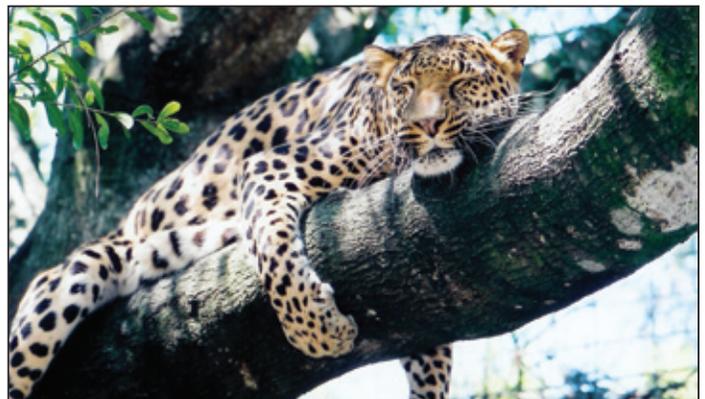
Black phase (melanistic) leopard.
www.BigCatRescue.org



Typical and melanistic (black) jaguars. www.BigCatRescue.org



Bobcat. www.BigCatRescue.org



Typical coloration of the leopard. www.BigCatRescue.org

of about 80 to 100 individuals. This subspecies is plagued by genetic defects caused by inbreeding within a small population. Some of these include kinked tails, weakened immune systems, low fertility to outright sterility, and heart murmurs. Sadly, due to the ever increasing pressure



Cougar cubs. www.BigCatRescue.org



Cougar Hissing. www.BigCatRescue.org

of human encroachment on cougar habitat, both the eastern cougar and Florida panther will probably always remain on the Endangered Species List despite legal protection, the construction of wildlife underpasses to reduce roadkills, and the setting aside of suitable habitat. Cougars require large territories and, as large predators, naturally occur at low densities. The Florida panther, for example, is hemmed in by development and may already be at its carrying capacity. For a self-sustaining population of cougars to survive anywhere else in the east, there would need to be at least 50 breeding adults and 3 separate population centers, all close. Losses would therefore be replaced by immigration and through reproduction within the populations. Having multiple centers would also lessen the impact to the species should a natural disaster destroy one segment of the population. Recent population modeling has revealed that current eastern cougar reports/sightings do not indicate enough individuals exist to avoid extinction within 20 years.

Despite the decline of the cougar population in the east, the western population has experienced an increase since the 1960's. Some experts believe that there are more western cougars now than there were when Europeans first arrived in the New World. This population growth can be attributed to legal protection of the species as well as the increase in and expansion of prey populations. Subsequently, sightings of cougars have increased in the Midwest and Great Lakes regions.

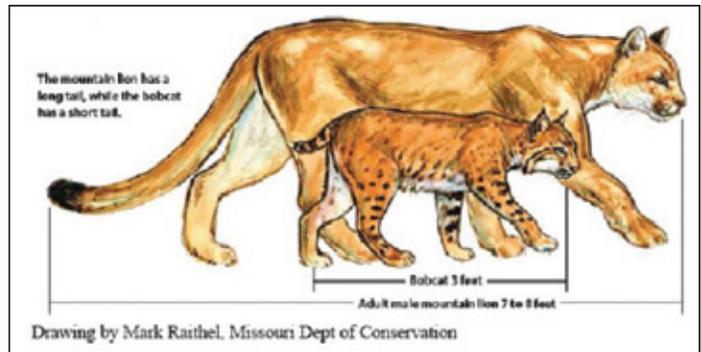
Species Description and Behavior

When wildlife officials attempt to investigate a reported sighting of an Eastern cougar, they have to consider the description, behavior, and location of the animal in question. By analyzing the clues, the authenticity of the sighting can be determined. The Eastern cougar (*Puma concolor cougar*) is a large, slender, tawny to grey-brown cat with adult males reaching 8 feet in length (including the tail) and weighing up to 140 pounds and females measuring slightly less at 6 feet and 105 pounds. Adults are 2 to 3 ft. tall at the shoulder. (Specimens vary in size by latitude with much larger cats appearing closer to the poles and smaller ones near the equator—Berg-

mann's Ecogeographic Rule.) Belly fur is paler in comparison to the rest of the body and may be reddish-white. The ears are black on the backside and white inside, round, and held erect while the tail is long, dark, and hooked at the end and carried low. It is this black tip that earned it the nickname "painter." These agile felines are stalk-and-ambush predators and can leap 20 feet, climb trees, and swim quite well. They can sprint short distances after prey and reach speeds up to 35 mph. Cougars appear to be habitat generalists and have been found in a variety of habitat types including mountainous slopes, open woodlands, riparian zones, and coastal marshes. The only requirement seems to be underbrush for stalking cover. Cougars are most active at dawn and at dusk (crepuscular).

Loners except when paired for breeding purposes, females patrol a home range of 5 to 20 mi² while adult males cover 25 mi² or more, often overlapping the females' ranges. Variations in home range size depend on the quality of the habitat and its available prey-base. A male's territorial boundaries are marked with 3 to 5 in. wide scrapes in the dirt in which the cats urinate. These scrapes most often appear along travel corridors and under large trees. Other means of advertising their presence include dung heaps—mounds of earth with urine and feces on them. Both sexes create these basketball-size heaps, especially near kills. However, the feces of cougars is easily confused with the excrement of other species and can only truly be discernable through DNA analysis. Vocalizations include chirps, growls, purrs, and hisses, but the popular "scream" is not a typical call and is probably a matter of confusing the cougar with some other animal's sound.

The main prey base of the cougar in general is deer, but other species known to be taken on a regular basis include small mammals, turkeys, bighorn sheep (in the western US), porcupines, and domestic livestock including horses. The eastern cougar subspecies (*Puma concolor cougar*) may have added to this diet the extinct eastern elk while the Florida panther (*Puma concolor coryi*) currently prefers feral hogs and armadillos. South American cougars have to compete with the jaguar (*Panthera onca*) and tend to take smaller mammal prey including capybaras. Cougars typically kill prey with a bite



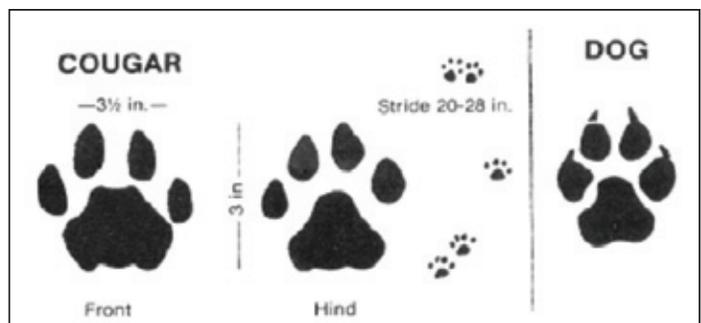
Comparison of a cougar and a bobcat. www.cougarnet.org



Front paw of a cougar. www.cougarnet.org



Cougar track in mud. www.cougarnet.org



Comparison of cougar and dog tracks. www.cougarnet.org

to the back of the neck, effectively severing the spinal cord. Hemorrhaging at the base of the skull is often evidence of this. Strangulation of the prey may also be utilized as a killing mechanism. Canine puncture marks are typically about 2 inches apart for adults. Feeding patterns include plucking of the fur followed by opening the body cavity behind the ribs and eating the choice parts—liver, heart, lungs, and the large



Cached deer carcass. www.cougarnet.org



Partially covered cougar kill. www.cougarnet.org

muscles on the inside portion of the legs. Remains are usually moved under vegetation and covered. Drag marks are often visible as the prey item is moved from one location to another and reburied. In good habitat, cougars subsist on one deer every 7 to 10 days. Females with older cubs may need to kill every 3 days. Females begin breeding when they reach 2 or 3 years of age and produce a litter of 2 to 3 spotted cubs after a 30 day gestation period. The young stay with the female for 18 to 24 months or at least until the female breeds again in 2 to 3 years. Young cubs are rarely seen accompanying the female. The average lifespan of a wild cougar is 8 to 13 years while reports of 20-year-old cats are documented for captive specimens.

“Did I Just See What I Thought I Saw?”

In the eastern United States, the search is on for any possible remaining populations of *Puma concolor cougar*. The evidence for and against is compelling. In the 1980’s researchers from the USFWS and Clemson University followed up on leads in the Southern Appalachians. Despite extensive investigations of deer kills, scats, and scrapes, the evidence was ruled inconclusive. Many state wildlife agencies have always doubted the existence of the eastern cougar in their jurisdictions and cite many reasons why these cats cannot be out there. The biggest argument is taken from the Florida panther example. Despite the small population size, individuals are killed every year on highways. However, there have been no such carcasses found elsewhere in the eastern US. Big cats in self-sustaining populations do not go unnoticed. Other evidence lacking in the case for the exis-

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A Florida Panther.

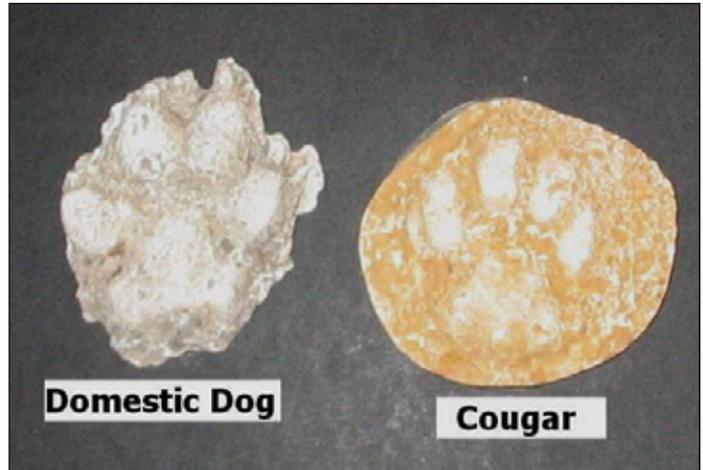
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tence of the eastern cougar is the fact that there are plenty of game cameras out there but no one has photographed a wild cougar in the eastern US (unlike in states with known cougar populations and states with newly documented migrants). Also, with the number of raccoon and bear hunters using hounds, it would stand to reason that at least one cougar should have been treed by accident. After all, similar dogs are used out west for this purpose. Additionally, there are thousands of deer hunters out there that have shot many a coyote (~20,000 per year in South Carolina alone) but none have shot a cougar or come upon a cougar kill. This is despite the fact that a single cougar could theoretically take 50 or more deer a year in its territory.

The best proof would be a carcass that could be tested for DNA confirmation, but if someone shoots a cougar and it turns out to be of North American origin, then they could be tried in court for violating the Endangered Species Act. However, I find it hard to believe that they could be prosecuted since the USFWS has been telling us for decades that the species doesn't exist anymore and that no one is seeing cougars. One sure way to avoid prosecution would be if the animal attacked someone or otherwise endangered their property and was shot in self defense. Luckily, I suppose, most specimens submitted were determined to have a South American DNA profile indicating that they were most likely imported for the exotic pet trade. Other signs of captivity often seen include tattoos, blood titers indicating exposure to vaccines, filed down canines, de-clawing, and behavioral changes attributed to close human contact. (Cougars are secretive and usually avoid humans.) The idea that these random individual cougars could survive in the wild and find each other across the vast eastern United States and breed is an unreasonable assumption. Many wildlife agencies have been accused by the public of "covering up" the existence of the cougar in the east, especially due to wildlife agencies' lack of interest in following up on reports. However, this makes no sense as there is too much of a monetary incentive for eastern cougars to be present. Millions of dollars in federal money could be poured into researching the species and managing habitat for its continued survival.



Plaster cast track comparison of a Labrador retriever and a captive cougar. Anna Huckabee Smith, 2007.

In those instances when tracks have been left behind, most turn out to be those of a dog, coyote, small bear, bobcat, or a prank. In determining whether a track is that of a cougar or another animal, certain characteristics can be analyzed. Adult cougar (*Puma concolor*) front tracks are 4 in. long (about the diameter of a baseball) and the stride can be up to 36 in. when

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walking and further apart when bounding after prey. The back footprint often overlaps the track of the front foot. Domestic dogs do not tend to travel in such a straight-line pattern. The third toe on the front foot of the cougar leads, making the track asymmetrical in appearance compared to the even toes of the dog. On the front pad of the cougar's paw, the base is evenly tri-lobed and top bi-lobed whereas a dog's paw is bi-lobed at the base and has no indentions on the top. While both felines and canines make a four-toed track, cougar toe prints are rounded while dog toe prints are angled, especially on the lateral toes. One of the easiest characteristics used to distinguish cougar tracks from dogs and coyotes is the absence of claw marks as cat claws are held in the retracted position while walking.

Videos and photos that have been submitted as "proof" of the eastern cougar's existence are usually disproved through visual analysis by cougar experts. Sightings are usually determined to be a case of mistaken identity through interviews with the person making the report. On film, it may be hard to determine scale. In one instance, a man reported a large cat walking past a pine plantation. It turned out to be a

domestic housecat set against a backdrop of 3 foot tall planted pines. Often, the field of view is obscured, the distance is great, there is poor lighting, the observer only gets a fleeting glance or is unfamiliar with the species he or she was seeing. Many bobcats are reported as cougars because they share many behavioral and physical traits such as making scrapes and covering their prey (despite the obvious differences in size as well as the tail length and coat color). Adult bobcats feed on the same prey items as cougars and have been known to pull down adult white-tailed deer. However, they typically prefer the much smaller fawns and rabbits. Investigated kills can yield clues into the hunting behavior of the animal in question, often divulging the identity of the predator. Cougars do not like spoiled meat and therefore avoid carrion. Claw marks and raking down the sides of the prey are often visible as well as the tell-tale neck wounds and feeding pattern previously described. In contrast, feral dogs are inefficient killers and often harass their quarry, damaging the hindquarters of the prey through chewing.

The most bizarre of the sightings of cougars comes from those people who claim to have seen a "black panther." First of all, there is no such thing as a black (melanistic) cougar. Jaguars (*Panthera onca*) and leopards (*Panthera pardus*) can be dark in color but even then their patterned coats show through the black. Jaguars, though once in the southwestern United States, are now only found in Mexico, Central America, and South America. Leopards are found in Africa and Asia but the black variants are typically found in southern India, Nepal, southwest China, Burma, Java, and the Malay Peninsula. It is these leopards that are often bred for the exotic pet trade, resulting in temperament problems and poor parenting skills. Some possible explanations for the origin of the "black panther" in the United States include escaped captive exotics, black coyotes, bears, dogs, and even an extinct supposed subspecies of wolf known as the Florida black wolf (*Canis rufus floridanus*). Wild jaguars rarely venture into the southwestern United States. Jaguarundis are another possibility since this brownish cat of South America does have a black color phase and crosses over into Texas at times. In addition, a small population was introduced into Florida in the 1940's

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when they escaped captivity and began breeding in the wild. It is said that the species is still seen there. However, this feline species is much smaller than a cougar.

“Hope springs eternal.”

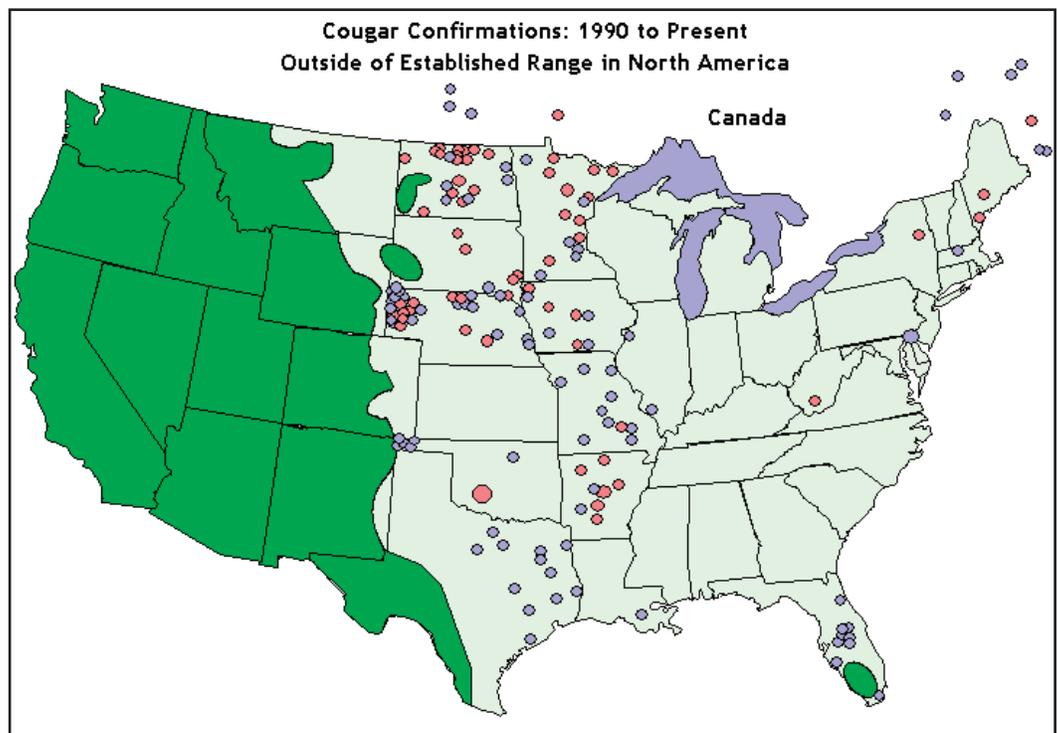
For those that believe that the eastern cougar still roams the eastern United States, it does have some odds in its favor. Because they are habitat generalists, there are a variety of landscapes they could inhabit in the east. For instance, from Virginia to Georgia there is a network of national forests and parks that comprise 7 million acres. Some researchers hold out hope

that a remnant population of the eastern cougar is in the Appalachians, especially since the 500,000 acre Great Smokey Mountains National Park contains areas that have never been disturbed by loggers. GIS forest cover layers and habitat analyses look promising for this park and other large tracts. In addition, the deer population has rebounded in the eastern United States since colonial times, and in some places is out of control.

Therefore, the prey base is here. Other predators such as bears, wolves, and bobcats have increased in numbers and are migrating to recolonize old parts of their ranges. Cougars too are slowly pushing eastward from known populations in western states such as Texas. Young transient male cougars, in general, often travel hundreds of miles, often in a straight line, as they seek unoccupied territories. The Florida panther has also been known to travel farther than expected, showing up much farther north than their typical range. For example, three radio collared panthers once crossed the Caloosahatchee River in Florida, surprising

the tracking teams. Also, reports from Georgia and Louisiana indicate vagrants from Florida have crossed into these states in the past.

Other adequate contiguous forests (>200 mi²) with ample prey do exist and may be harboring remnant populations of could be used for future reintroduction attempts. Examples of large tracts considered include the Jefferson-George Washington-Monongahela National Forests in Virginia and West Virginia, the Great Smokey Mountains National Park in North Carolina and Tennessee, the Savannah River Site in South Carolina and Georgia, the Ozark Mountains in Arkansas, and the lower



KEY

● Class I Confirmation:

1. The body of a dead cougar, or a live captured animal
2. Photographs (including video)
3. DNA evidence (hair, scat, etc.)*

* Confirmation from two independent laboratories and/or photographs from remote cameras at predetermined DNA collection sites will enhance confidence in cougar activity.

● Class II Confirmation:

1. Track sets verified by a qualified professional
2. Other tangible, physical evidence verified by a qualified professional (i.e., prey carcasses, microscopic hair recognition, thin-layer chromatography of scat)

■ Known cougar range (Florida panther population also noted)

Map and key from The Cougar Network, 2007.

Apalachicola River in Florida. Other states also being considered for reintroductions include Louisiana, Mississippi, Alabama, and Florida. Bringing the eastern cougar back to the east may be extremely difficult since there will need to be population centers and gene flow between them. Of course, the public outcry as seen with wolf reintroductions would be quite an obstacle to overcome, despite the obvious benefits the species would have in controlling the booming deer population. There is also hope that the species could initiate a kind of ecotourism like the Florida panther has created in south Florida.

Some exciting breakthroughs in the search for the eastern cougar have occurred, and The Cougar Network, a well-respected organization and information source presents them on their website (www.easterncougarnet.org). They have compiled a list of "confirmed reports" of cougars throughout the Prairie States, Midwest, and in Louisiana, Florida, Arkansas, Illinois, West Virginia, Connecticut, New York, Maine, and the Maritime Provinces of southern Canada. Their strict confirmation criteria are divided into two classes. Class I confirmations include a body (alive or dead), photographs/video, or DNA evi-

dence (such as from hair or scat). Class II confirmations include professionally verified tracks and any other professionally verified physical evidence such as prey carcasses or microscopic studies of hair samples or scat. DNA confirmations are best believed when blind tests are run at two or more independent laboratories. Of the confirmations tracked by The Cougar Network, only the Florida samples seem credible as possibly belonging to the eastern subspecies. The USFWS is investigating these reports.

The Plot Thickens

Just when researchers think they are beginning to sort out the facts, the proverbial "monkey wrench" gets thrown into the works. Today, 15 subspecies of cougars are recognized, down from 32 taxonomic divisions in the 1980's. However, new rigorous DNA research out of the University of Maryland suggests that the current taxonomy is wrong and that all these subspecies can be collapsed into six, including one for all North American cougars to be called *Puma concolor cougar* (the same name currently used for the eastern cougar). The other subspecies occur south of Nicaragua and are broken into Central America, Northern South America, Eastern South America, Southern South America, and Central South America. If all North American cougars are genetically the same, then the implications for the listing of the eastern cougar and the Florida panther are immense. The USFWS is studying these findings and will consider this new evidence in their 5-year status report. Because the Florida panther does exhibit specific behavioral and physical traits and shows some genetic variations due to isolation and the associated inbreeding, it may still qualify for listing with the Endangered Species Act as a Distinct Population Segment (a discrete and significant population within its former range). Then again, the Florida panther population was given a genetic "boost", so to speak, when biologists introduced Texas cougars (*Puma concolor stanleyana*) into Florida in 1995 in a controversial move to rescue the Florida subspecies whose numbers had dwindled to about 30 individuals. Also, it is possible that escaped or released pet cougars of a South American origin could have also entered into the population.

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The Final Report

The arguments for and against the existence of the Eastern cougar are many and may be simply a matter of semantics. The question the public often asks is, "Are there cougars out there?" to which the answer is yes but they are most likely released or escaped captives. Wildlife professionals, on the other hand, are asking, "Are these verified sightings of animals belonging to a wild breeding population of the eastern cougar subspecies?" It is presumed no, but that is the question we are waiting to hear answered by the US Fish and Wildlife Service's 5-year status report. The first draft of this report is due out in February of 2008 and will be first sent to the regional offices and states for comment and then released to the general public. Perhaps the answer is a combination of things: western cougars dispersing to the east and mingling with residual populations of eastern cougars, Florida panthers, and cats from southern Canada. Until a specimen is produced for verification, we will always speculate if the eastern cougar is still out there. Perhaps, according to the latest genetic research, it never existed in the first place. In the meantime, I'm going to buy more game cameras...just in case!

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Anna Huckabee Smith is a TWS certified Associate Wildlife Biologist with Innovative Wildlife Management Solutions, LLC out of Mt. Pleasant, SC. She has worked for both South Carolina and North Carolina state governments, first as the SC Department of Natural Resources' Forest Stewardship Biologist and the Comprehensive Plan Coordinator. She then became the NC Wildlife Resources Commission's first Urban Wildlife Biologist. Smith has a BS degree in Biological Sciences and a Masters in Zoology both from Clemson University. For more information on services provided by her family-owned and operated consulting business, contact her at huckabee_anna@yahoo.com.

January/February 2008

An Automated Box Trap Monitoring System for Quail Hunting Properties

by Brad Mueller

Over the past several years the role of predator control has been brought to the forefront of quail management. Recent research at Tall Timbers Research Station (TTRS) and the Albany Area Quail Project (AQP) have conclusively demonstrated the positive population impacts of integrating an aggressive mammalian nest predator control plan into an overall quail management program. Predator control forms one of the three principal legs of the quail management triangle. The other two legs of the triangle are effective supplemental feeding and development and maintenance of a diverse and productive understory vegetation.

TTRS and AQP have worked cooperatively on a multi-year predator control study that uses a classic “cross-over” design. Two pairs of large acreage tracts were selected in both the Thomasville and Albany area. During the first 3 years of the study only one site at each location was intensively trapped while the other site was not trapped. After the initial 3-year period the treatment (predator control) was “crossed over” to the other paired property and the initial trapping area was not trapped. While the completed data from this project is still being analyzed the preliminary findings show dramatic differences in all measured reproductive parameters such as higher nesting success and more chicks produced per hen on the trapped sites. When treatments were reversed, predators quickly re-colonized the previously trapped areas and substantially reduced quail reproductive output and fall population levels. Conversely, the newly trapped sites responded in a predictable manner by hav-

ing higher reproductive output. What was remarkable is how quickly predators moved into the previously trapped areas and how effective they were at reducing the overall quail population.

Quail managers in recent years have responded to this information by initiating aggressive trapping programs using large numbers of box, or live, traps. The key to the success of these box trap programs is that large numbers of traps are utilized on a permanent or semi-permanent basis, thereby providing an aggressive and consistent predator deterrent. Traps are commonly placed at a density of one trap for every 10-20 acres of habitat. Capture rates vary from plantation to plantation and throughout the year. On well-managed properties capture rates average about 2-5% daily (2-5 captures per 100 trap nights). The main drawback to this type of a trapping program is the



Automated Box Trap

large labor, fuel and equipment costs necessary to “run” several hundred traps on a daily basis.

American Wildlife Enterprises (AWE) has developed a telemetry-based system that remotely monitors individual box traps and provides the manager with daily information on trap status. This system will allow a manager to check the status of 100 traps in just 5 minutes. Up to 800 traps can be monitored by this system. Therefore, on a classic 3,000-acre plantation with 200 box traps, the manager can simply listen for 10 minutes while having his morning coffee to decide which 4-10 traps he needs to visit. The “heart” of this system is a powerful radio transmitter that has a unique frequency allocated to a specific trap. Upon closure of the trap door, the transmitter sends a uniquely identified radio signal to a centrally located scanning receiver indicating that a trap has been closed. The base receiver and antenna are normally set up at the plantation office; however, the system has tremendous flexibility and can be used in remote and non-permanent locations. An LED has been included on the transmitter that blinks once the trap door has been closed. The LED will turn off once the trap door has been opened, therefore allowing the

trapper to know that the system has been properly re-set. One additional benefit of this system is that it allows for placement of traps along principal predator movement corridors as opposed to a standard trapping system that uses primary and secondary roads for speed and efficiency of trap checking. When using a box trap monitoring system (TMS) traps are only visited when they have been closed or during re-baiting. Therefore, traps can be located in remote areas of the property. A good quality aerial photograph or map is all that is required for establishment of this system. If needed, AWE can develop a cost effective map with trap locations clearly marked.

The key to making a TMS cost-effective is developing a series of baits that will last approximately one month. A considerable amount of experimentation has been done over the past year by experienced local trappers to develop long-lasting and effective baits. While chicken eggs are fairly effective we have also had good success with a modified “cray fish” bait or plastic eggs filled with a “stink” bait or lure, which should last approximately 3-4 weeks. The improved effectiveness of these types of baits means traps only need to be visited once monthly. We are beginning to understand the efficiencies of baits over time; however, more experimentation is needed. Future research should help to develop more effective and longer lasting trap baits.

While the “start up” cost for this type of system is fairly high; the savings in labor, fuel and vehicle maintenance should allow for recovery of initial expenditures within 1.5-2 years. This system is currently set up on properties in Florida, Georgia and South Carolina and on these sites the managers feel that a 1.5 year “break even” time is very realistic. Transmitters should last for several years and have been designed so that the user can change the batteries. With proper care the monitoring system should provide many years of quality service. A minimal amount of training is all that will be required to operate this simple system.

For further information on the feasibility of this system for your property please contact Brad Mueller at (850)-997-3551. I look forward to discussing your particular situation in more detail.

Brad Mueller is a Wildlife Biologist and President of American Wildlife Enterprises.

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Coyote Prolific: Part 2

By Kevin Patterson

In Part 1 of this article, I touched on the fact that coyotes are omnivores, meaning that they eat both plant and animal matter. Additionally, coyotes are also widely known as being, “generalists”, meaning that they will take what they can get. They are usually not finicky about what they eat. During the late spring and summer months, berries, fruits, insects and amphibians are usually plentiful and the coyote takes full advantage of these minuscule offerings. However, coyotes are first and foremost carnivores and will most often go out of their way to enjoy a meal of fresh red meat such as the occasional field mouse, wild turkey poult and the ever so vulnerable fawn whitetail deer.

During late fall and winter, the colder weather mandates the coyote’s need for protein energy. Additionally, during this time of year, there are not many berries, fruits and insects available. Therefore, the coyotes acclimate to their habitat offerings and target animals such as cottontail rabbits, bobwhite quail, wild turkey, whitetail deer and various forms of livestock and poultry which may be available. In my job as a Predator Control Specialist, I must understand and take advantage of these facts in order to be most effective in my pursuit of coyotes and other predators.

The coyote is at or very near the top of the food chain wherever it may live. Humans are the number one predator of coyotes and the main reason is because coyotes and humans compete for many of the same things. Most of my clients are individuals who spend a great deal of money, time and effort in managing

their habitat for wildlife species such as whitetail deer, bobwhite quail, wild turkey and sometimes, even exotic species. As you can imagine, these individuals do not take predation of their wildlife lightly and welcome my services in curtailing and dramatically decreasing their coyote populations.

There are two basic methods of catching coyotes; snares and traps. There are also two basic methods of setting these devices to catch coyotes; either as a “blind” set or as a lured or baited set. Sound easy? Well, its not and it can get quite complicated. Any veteran coyote trapper will tell you that it takes years to become proficient at catching coyotes. The transition I went through from being a part-time “hobby” trapper to becoming a professional full-time Predator Control Specialist changed my way of thinking and pursuing coyotes and other predators immensely. Spending every day pursuing coyotes led to my knowledge being expanded



Omega female coyote

and to start actually thinking like a coyote.

During the late fall and winter months, I take advantage of the coyote's habits and diet by utilizing a lot of meat-type (protein) baited sets, along with skunk based type lures and scents which will emit odor better in colder weather. I have found that coyotes will more readily work these types of sets if they are more interested in eating protein based type foods, etc. During the months of January, February and March, I will include "matrix" type lures and scents which cater to the coyote's mating instincts. Knowing the predominant habits and diet of the coyote during the late spring and hot summer months, I minimize the use of those meat-type baits and overly strong pungent odors. I utilize sets which are lured with what is called "curiosity" type lures and scents. Some of these scents and lures may even emit a "fruity" type odor.

When conducting professional trapping instruction, the actual setting of the traps are just a small part of the knowledge I share with my students. I have to break their thought pattern down and get them to look at coyote (predator) trapping in a different way. Once I have successfully accomplished this task, all other technical information pertaining to trap placement, bait and lure type, set type, wind direction, etc., just falls into place.

This is the time of year (post deer season) that I most often hear from my clients that due to my consistent efforts in reducing their resident coyote populations, they have for the first time, been seeing successful twin and sometimes triplet fawn whitetail deer recruitment within their deer herd. I have numerous friends

and professional acquaintances all over the Midwest, Eastern, Southeastern and Southern United States who are wildlife biologists and professional wildlife managers. Some of them do not feel that predation on whitetail fawns is a significant problem. However, as a Professional Predator Control Specialist and one who makes their sole living by reducing predator populations (i.e. coyotes), I can personally attest that there is a direct reflection on increased whitetail deer fawn recruitment and additional wildlife prey species due to significant coyote population declines, via effective and consistent predator control efforts.

Coyotes have been known to live up to 10 years in the wild and 18 years in captivity. They are, without a doubt, the most abundant wild member of the dog family in the United States. The overall population is increasing because of a natural extension of range, an increase of density within the range, and transplants by humans.

Last year was the very first year in 29 years of trapping predators that I did not catch a single fox during the entire fall or winter months on my fur trap lines. However, my coyote catch dramatically increased in those areas that I previously harvested a fair amount of red and gray fox. Foxes are natural enemies of coyotes because they predate on the very same prey species with the exception of live whitetail deer. Coyotes will kill every fox that provides them the opportunity. Last year's results on my own winter trap lines reflect that the areas that I personally trapped currently have a much higher population of coyotes than foxes. You can bet that if you are not seeing any or very few foxes in your area that the coyote population has exploded. If there is no concerted effort in incorporating and maintaining a predator control program on your property, the only predators left standing will eventually be coyotes. Coyote populations can be very invasive to all predator and prey species alike. Manually controlling their populations is fundamental to healthy wildlife management.

Coyotes will occasionally hybridize with domestic dogs and produce fertile offspring. These hybrids are commonly known as, "Coydogs". The resulting young may resemble one or both parents and, in some instances, may look so much like the coyote parent as to mask



its mixed inheritance. A laboratory scientific examination of the animal's blood is sometimes the only way to positively identify accurate genetics of these particular animals. However, actual coy-dogs will, most of the time, be larger than a true 100 percent full-blooded coyote. This has always been my perception as to why the Eastern coyotes are, on the average, much larger than coyotes of the Western and Southern (south Texas) United States. The average weight of all coyotes that I harvest in south Texas does not exceed 25 pounds. In turn, the average weight of coyotes that I personally harvest in the east and southeastern United States is usually around 35 pounds or more. Think about it: areas of the United States with the greatest human populations also have the greatest domestic dog populations and therefore, provide the greatest opportunity for domestic dogs and coyotes to mate and reproduce.

It is significant that coyotes show a great adaptability to live in man's world and to survive under other than pristine conditions. I have had many individuals who share with me their ideas

on what they think is the most effective method to control coyote populations. I will be the first to admit that I do not know everything. However, some of the methods that these individuals "think" are the ultimate solution just right out scares me. It has become very apparent to me that a lot of wildlife managers, livestock owners, etc. have not been exposed to a professionally operated predator control program and how scientifically based it is premised and how effective it can be, if continually practiced.

If you are a wildlife manager or a landowner attempting to manage wildlife species on your personal and/or hunting land, I urge you to consider seeking the services of a professional Predator Control Specialist. Be certain to require multiple recommendations of previous work history. Honesty and credibility should be at the top of your requirement list. Good luck with properly managing your wildlife resources!

Kevin Patterson is CEO and President of Predator Control Systems, LLC. His new website is www.predatorcontrolsystems.com.



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Managing Oak Forests

By Bryan Burhans

To many of us, nothing quite matches the beauty of an oak forest. And for the turkey hunter, oak woodlands represent a preferred habitat for wild turkeys. Oaks also represent a significant income source to the landowner. However, over the last 100 years, we have seen our oak forests transition into sweetgum, maple, hickory, yellow popular and other species depending on the region. This loss of oak woodlands is a silent catastrophe spreading across the range of oaks.

There are several factors that are contributing to the loss of oak forests. Ironically, overharvest of oaks is probably not a significant factor. Instead, loss of periodic fire, high deer densities, and poor silvicultural techniques are the main culprits. Diseases may also play an important role in the decline of oaks.

To regenerate a new oak forest after a mature oak forest is harvested, landowners are often forced to plant bare-root seedlings and use tree tubes to protect the seedlings from deer browsing. This can be an effective technique and a good option for many landowners. However, this represents considerable expense and may be unnecessary if there were oaks in the overstory prior to the harvest.

Fortunately, researchers have been working on a plan to help landowners cost effectively ensure the continual existence of their oak stands, especially after the mature trees are harvested. Although the process is fairly straight forward, landowners should always seek the expertise of a qualified forestry professional. This new technique provides a way to regenerate a new oak stand from an existing, mature stand of oaks. After all, all forests mature and eventually the decision is made to harvest the stand. The outlined technique, provides a cost effective method to ensure a new stand of oaks.

Step 1. Forest thinning

First, an initial shelterwood cut is performed to the stand and 40 to 60% of the basal area is removed. Uncut trees, or “leave trees,” are the higher quality oaks. It is important to work with your logger and have them keep slash (the tops

of harvested trees) away from the leave trees. This will help reduce any danger from the subsequent step, prescribed fire.

Removing a significant amount of the overstory trees allows sunlight to reach the ground. Oaks, especially, are classified as having only a moderate tolerance to shading. In other words, if you don’t get enough sunlight on the ground, your oaks will not grow fast enough to compete with other trees that can tolerate shade, such as red maple, sweetgum, and yellow popular. With much of the canopy removed, existing oak seedlings finally have a chance to grow and compete



Prescribed burning oak, used correctly, is an important management tool to promote future oak seedlings.

with other tree species.

Step 2. Prescribed fire

Using prescribed fire in an oak stand may be counterintuitive to many landowners. There is a

common misconception that fire will hurt oaks. However, oaks are actually what ecologists refer to as a *fire-dependent* species. Without fire, an oak stand, over time, will eventually convert to tree species that are less fire dependent. In much of the Southeast, sweetgum and maple are the forests that eventually take over.

For at least the last 12,000 years, Indians used fire to improve land for hunting, clear land for agriculture, and to make travel through the forest easier. However, these fires also created a favorable environment for young oak seedlings. This past fire history is a large reason for the oak forests we see today.

Oak seedlings, with their deeper rooting depths and thicker bark, tolerate fire better when compared to some of their competitors, especially when spring growing season burns occur. Oak seedlings also have a much larger tap root that enables them to quickly and vigorously sprout back from fires. As long as the fires are not too frequent, periodic fire ensures that the seedlings growing on the forest floor will be primarily oak. After one or sometimes two spring burns, many of the other competitors can no longer survive.

The researchers recommend using



High intensity fires do not necessarily mean high flame length. A slow, hot fire will put a hurting on oak tree competitors such as poplar and maple.

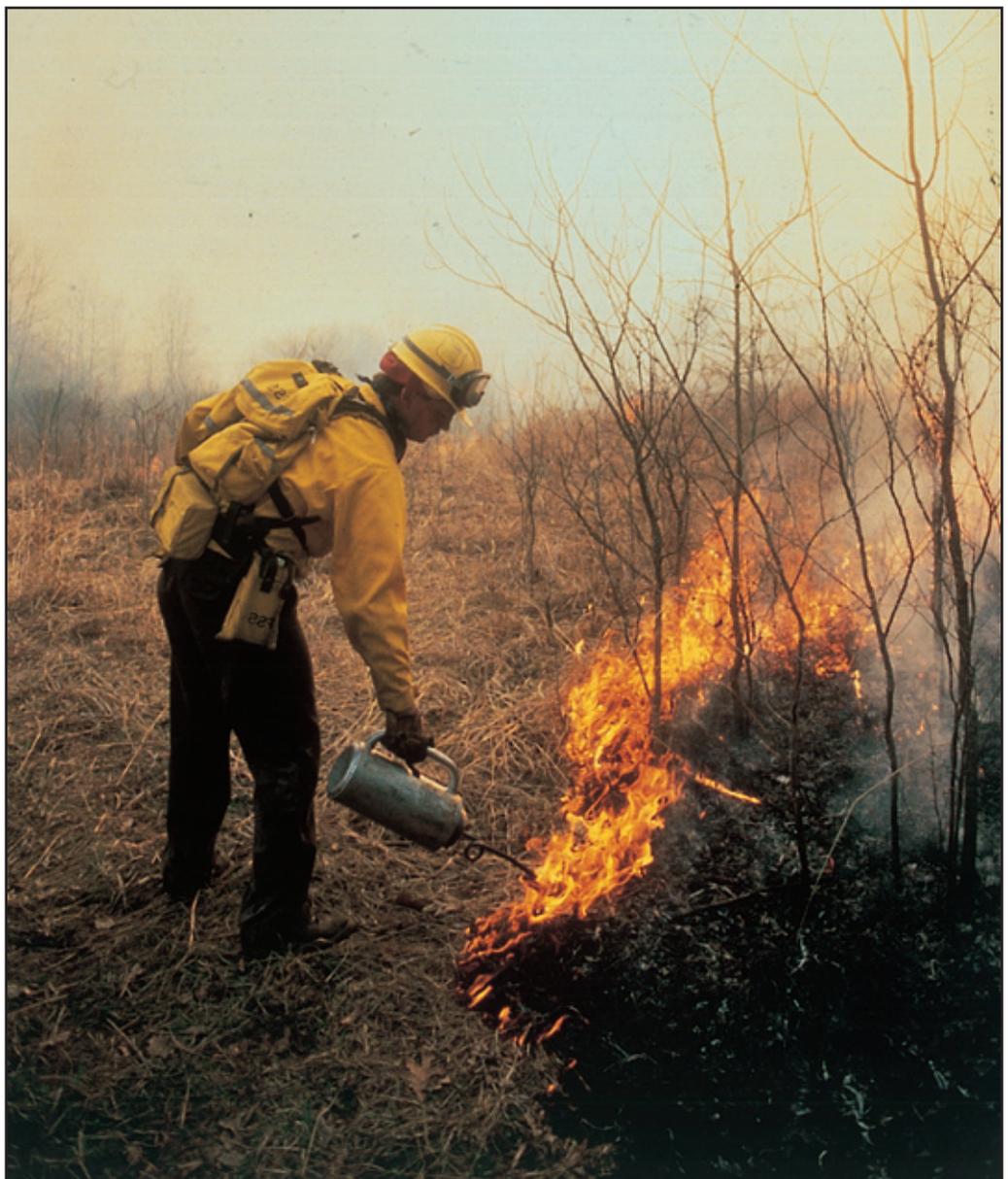
prescribed fire in the stand during the spring when new leaves are about one-half expanded. This burn is conducted three to five years after the shelterwood cut to allow the oak seedlings to become well established and allow the competing seedlings (non-oak) to develop. However, there must be an abundance of oak seedlings that are at least 4-feet tall and “free-to-grow” (no major competing trees overtopping them). To ensure a well-stocked oak stand in the future, they recommend that there be 150 free-to-grow oak seedlings per acre in the stand prior to the burn.

The intensity of the fire was also an important factor in eliminating oak competitors. The researchers found that high intensity fires removed competing trees, such as yellow poplar, better than less intense fires. High intensity *does not* mean flame lengths over 4 feet in height. An intense fire can be achieved with a slow-moving, thorough burn with flame lengths of 2 to 3 feet. A slow moving fire keeps heat on the seedlings longer and allows the fire to girdle the seedling.

With such fires, researchers found no damage to the mature oak trees in the stand. After the spring burns, researchers found that oak seedling densities on one study site had only declined from 1,500 stems per acre to approximately 1,300 stems/acre; a decline of only 200 stems per acre! Competitors such as poplar and maple declined by 70% and 32%, respectively. In

contract, researchers only found declines of 38% and 14% for these same two species when fire was applied during the winter – even using high intensity fires. Timing is everything.

As you can imagine, the key to ensuring your oak stand is eventually replaced with another stand of oaks is based largely on the amount of young oak seedlings (called *advanced oak regeneration*) waiting to take over once sunlight conditions are adequate. The researchers suggested that if there are at least 150 oak seedlings per acre, the stand will likely regenerate to primarily oak. However, if competing, less desired tree species are out-competing the





Oaks are an important tree species, both for their timber value and for wildlife. Active forest management is needed to secure the future of this important ecosystem.

oaks, or there are less than 150 oak seedlings per acre, eventually your oaks will lose the race. A spring growing season burn is the tool needed to eliminate the competition with oaks.

So why not just clearcut the stand in the first place? The researchers found that using the shelterwood cut method provided the necessary oak litter needed to carry the fire three years after the thinning. Without this fuel source, it is unlikely that the prescribed fire would generate enough heat to effectively control the competing trees. The shelterwood cut also increased the number of oak seedlings more than 7-fold. And finally, a shelterwood cut allows enough light for oaks to grow vigorously.

Like the needles of pine trees, the leaves from oaks, mainly southern red, white, black, chestnut and scarlet oaks, create a fuel source that is ideal for burning. The leaves of oaks typically decay slowly and curl at the ends allowing fire to spread easily. Leaves from species like willow and pin oak typically do not provide good conditions for fire.

Usually one spring growing season fire is enough to release the oak seedlings. The remaining mature trees can then be removed from the site about five years later. Landowners

can apply additional spring growing season burns if necessary, but repeated burns will eventually convert the site to a hardwood savannah. A hardwood savannah is actually a great habitat for many species of wildlife, especially wild turkey and bobwhite quail. However, if your goal is to have another oak forest replace your existing oak forest, than you will need to keep additional prescribed burns to a minimum.

The key to the future conservation of oak ecosystems is

active forest management, such as thinning and prescribed fire. As with any silvicultural technique, landowners should seek the guidance of a qualified forestry professional. Often, techniques must be altered to meet the specific site requirements. In the end, it's a win-win for the landowner; more profit from timber and more wildlife on your property.

Source

Title: Using Prescribed Fire to Regenerate Oaks

Author: Van Lear, D.H.; Brose, P.H.; Keyser, P.D.

Date: 2000

Source: In: Yaussy, Daniel A., comp. 2000.

Proceedings: workshop on fire, people, and the central hardwoods landscape; 2000 March 12-14; Richmond, KY. Gen. Tech. Rep. NE-274. Newtown Square, PA:

U.S. Department of Agriculture, Forest Service, Northeastern Research Station: 97-102.

Bryan Burhans is a certified wildlife biologist and is the director of land management programs for the National Wild Turkey Federation. Bryan can be reached at bburhans@nwtf.net.

Management Calendar

February/March

By Dave Edwards

Prune apple trees.

Pruning is a management strategy that will improve the health of apple trees as well as enhance fruit production. Moderate pruning is usually best. Heavy pruning dwarfs trees and may delay fruit bearing, and is especially undesirable for young trees. Proper pruning shapes the tree's structure for life. Prune young trees to establish a strong scaffold system with wide-angled, well-spaced branches that will not split from high winds or heavy crops. A well-trained young tree bears heavy crops early and continues to bear efficiently. The dormant season is the best time to prune fruit trees, although dead or diseased branches may be removed any time. Prune bearing apple trees regularly, preferably every year; it is a mistake to neglect trees for years and then prune them severely. Old trees, however, can sometimes be rejuvenated with heavier pruning than younger trees require.

Spring is a good time to check soil pH and lime food plots if needed.

To check the soil pH, simply collect soil samples and send them to a soil laboratory (see previous *Wildlife Trends* articles on how to properly collect soil samples). Your local farmers cooperative will often have soil collection bags and will also know where you can send the soil to be tested. Although there are exceptions, most crops grow best in a relatively neutral soil pH of 6.5 – 7.0. Thus, lime is often needed to enhance the soil (this is particularly true in sandy soils). Because it can take several months for lime to effectively change the soil pH, checking the soil in the spring will give you ample time to enhance the soil before the fall planting period. Remember, ensuring proper soil pH is often more important than what you plant or how much you fertilize. In fact, proper soil pH is essential for fertilizer to be available to the plants.

Although lime can be spread any time of year, applying it at least 6 months before planting will allow time for it to enhance the soil.

Make preparations for spring turkey season.

One of the best ways to ensure you have gobblers in the spring is to manage your property throughout the year to promote quality nesting cover. Where do you think gobblers will spend much of their spring? - where the hens are. Where are the hens? - where the best nesting habitat exists. I have worked with landowners that had gobblers on their property all year except during the spring. After closer inspection, their property didn't have good nesting habitat and the hens had moved to adjacent properties carrying the gobblers with them. Quality nesting habitat is created by maintaining a patch work of early successional habitat throughout your property. Burning, herbicide applications, strip disking, timber harvest, and roadside management strategies are all tools that can help you create quality nesting habitat for turkeys. Besides the key element of creating nesting habitat, what are other things you can do to enhance turkey hunting on your property this spring?...something you can do now.



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Creating strutting areas in strategic areas around your property will help put turkeys where you want them to be. A bushhog/mower is the tool of choice for this task. Creating strutting areas simply means mowing areas that will be attractive to turkeys for breeding courtships. I often create these areas between roosting and nesting areas and preferably near a food source such as an old field, chufa patch, or food plot. Areas that often lend themselves well to creating strutting areas are powerlines, old fields, and roadsides. Lastly, mowing hunter access trails will help you slip into areas to hunt without making a bunch of noise. If these trails go through thick habitat, don't be surprised if turkeys use the same trails.

Initiate Late Winter/early Spring Strip Disking

Strip disk areas to enhance quail and turkey habitat. Disking can be done along roadsides, in or around old fields, and within thinned pine plantations or mature loblolly stands. Disking strips 10-30 feet wide in late winter and early spring will stimulate the growth of desirable native quail food plants such as partridge pea and beggarweed. The new succulent vegetation that grows in the strips will also attract insects. These areas can be managed by re-disking every other year. Maintaining a balanced pH and applying fertilizer within the strips will enhance plant growth. The time of year you disk will often dictate the types of plants that colonize. For example, winter disking produces heavy-seeded quail foods such as partridge pea and ragweed, while disking in April increases the production of important seed-producing grasses such as panic grass. Disking in June favors green vegetation that attracts insects and a number of major seed plants that turkeys and quail readily feed upon in the fall. In general, seasonal disking can provide a diversity of seed producing plants for quail and turkeys as well as quality browse plants for deer.

Start planning & preparing for summer projects.

Good planning and preparation ensures you will have everything needed and be ready to initiate projects this summer. Planning also allows

you to prioritize projects, create a budget for the up coming year, and develop timelines for completion. Many landowners simply tackle projects as they come up or as they think of them. This strategy can work, but without planning they may overlook or run out of money before addressing a more needed project. Spring is a busy time for us at Westervelt helping landowners determine their property's needs. We conduct what we call

“property management reviews”. During this consultation, we review projects that had been completed the previous year, review harvest data or other information that provides insight to how the wildlife we are trying to manage is doing, re-assess progress towards goals, assess the habitat and property in general to determine its limiting factors, and develop a prioritized list of activities that need to happen to help the landowner achieve their goals. While this is a professional service we provide, it is a process that I feel all landowners should go through each year, whether they hire a professional biologist or not, to keep themselves on track.

Plant supplemental fruit trees and/or other wildlife friendly plantings.

Supplementing your property with plantings of oaks, chestnuts, pears, crabapples, plums, autumn olive, etc. is a great way to enhance both the esthetics and wildlife value of your property. Late winter through early spring (before spring green up) is the best time to plant most wildlife friendly trees/shrubs. Planting a variety of trees/shrubs will ensure that a variety of food sources are available throughout the year. The plantings should be strategically placed around food plots or fields, along roadsides/ intersec-



tions, or other areas that will receive adequate sunlight. If quail management is one of your goals, and your property has lots of open land, you may consider establishing hedgerows for additional quail habitat. Hedgerows are often created using wildlife friendly plantings such as plums, drawf chinquapin or sawtooth oaks along with other shrubs. Hedgerows can be enhanced by planting adjacent strips of partridge pea or food strips of corn, Egyptian wheat, sorghum, or millets this spring/summer. The Wildlife Group is an excellent source for obtaining beneficial wildlife trees/shrubs as well as getting advise on planting strategies and tips.

Erect new wood duck boxes and/or clean out existing boxes in preparation for the nesting season.

Place 4”-6” of sawdust or wood shavings in the bottom of the box for nesting material (I prefer shavings verses sawdust because they do not absorb moisture as easily which causes rotting and mold – check with a wood shop that uses a planer for shavings. Cedar chips that are used for dog bedding can be good nesting material as well). Erect new boxes before February in highly visible areas near good brood rearing habitat. Adequate protective cover is essential for brood survival. Brood habitat

should include a dependable source of water with plenty of shrubs and emergent vegetation for food and cover. Wood duck boxes should be cleaned out and inspected at least once per year. Word of caution – always be careful when opening wood duck nest boxes. Many other animals use the boxes. Animals that are commonly found in wood duck boxes include gray squirrel, flying squirrel, rat snakes, screech owls, and flycatchers.

Although deer season has just ended, February is the best time to scout for new deer hunting locations for next season.

Because deer have been exposed to a great deal of hunting pressure over the past few months, they are using areas that they are most comfortable in and feel safe. If you find out where they are “hiding” now, you will know where to find them next season once the hunting pressure builds and deer seem to disappear. During February the weather is still cool (or cold), leaves are off the trees, and buck sign such as

rubbs and scrapes is still fresh. Although you will have to touch them up before the season starts next year, late winter is a good time to trim shooting lanes around deer stands. Relocating stands now also allows deer to get used to seeing them over the summer.

Late winter is a great time to conduct dormant season prescribed burns.

As you probably know, prescribed fire is an exceptional tool for managing wildlife habitat. With the exception of longleaf pine/coastal plain areas, most understory burning in the Southeast is conducted during the winter dormant season. Acceptable relative humidity, temperature, fuel moisture, and steady, persistent winds often occur during this period. Try to conduct burns before turkeys start nesting (Mid-March in most areas). Cool season or winter burning is not only a good way to reduce fuel loads and control undesirable hardwoods in a pine stand (which reduces the chances of a wildfire that can be detrimental), but is also a great way to stimulate

new understory plant growth which will result in quality food sources for wildlife. Fire rotations (interval of time between burning the same area again) vary depending on your goals, habitat types, and property limiting factors but are generally every 2-5 years to promote quality wildlife habitat. It is also a good idea to strategically plan your burns to create a diversity of habitats across your property. Landowners often feel they need to burn large acreages to make a difference. This isn't so. Although larger burns are often initially needed to promote quality wildlife



habitat, after the property is in shape, I actually like small burns of 5,10, or 15 acres in size. These create great pockets of quality natural foods that are accessible by wildlife, yet leave close by quality cover. Always check local burning laws and consult with an experienced burn manager before lighting a woodland fire. The U.S. Forest Service or your state forestry commission are great sources for obtaining more information regarding burning in your area.

Leave duck ponds flooded until early spring.

Although duck season may be over, leaving your duck ponds flooded will benefit migrating waterfowl by providing energy rich foods for their flight back north. Pond drawdown and timing will vary depending on your management strategy (natural moist soil management or agricultural plantings). If you are planting agricultural crops for waterfowl, you will likely leave the pond flooded through early summer for weed control. However, if you are managing for natural moist soil plants, such as in a beaver pond, you will likely start pond drawdown in the spring. Slow drawdowns (over a 2-3 week period) are often desired because they will result in diverse emergent wetland species composition. Quick drawdowns result in decreased plant species diversity

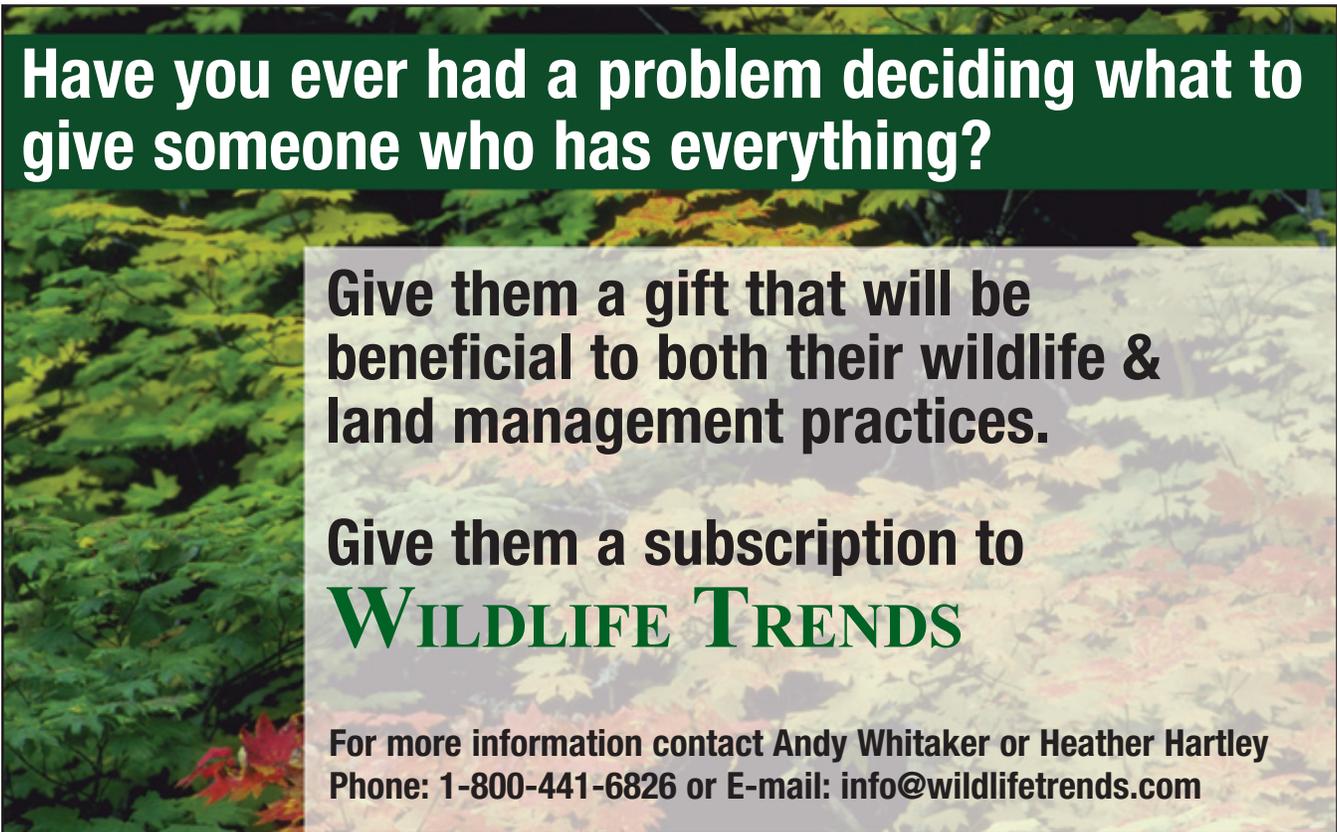
and are often composed of undesirable species.

Collect shed antlers.

By mid-March, most bucks across the country have shed their antlers. Collecting antler sheds can be a fun spring activity for the whole family. Shed collecting not only provides a great opportunity to spend time with your family, but also provides some insight to the quality of your deer herd. After a few seasons, compare the quality of sheds found from different years. If your program is moving in a positive direction, you will notice that the antlers are getting larger each year. Key areas to concentrate your searches include food plots, fields, around feeders, and along trails where deer must jump (over fences, ditches, etc). Unfortunately, many of us find them in our tractor tires!....which means you're doing something right!

Fertilize and monitor perennial clover plots

Perennial clover plots will start growing rapidly once spring green up begins and daily temperatures exceed 65 degrees. Because clover produces its own nitrogen, apply a fertilizer that does not contain nitrogen, such as 0-20-20, during early-mid spring to provide adequate nutrients for clover growth. If you add nitrogen, you



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are simply feeding competing grasses. Although I strongly recommend pulling soil samples and applying fertilizer accordingly, a “normal” fertilizer application rate for clover in the spring is 200 lbs./acre. Once the growing season begins, monitor the plot for undesirable weeds and grass. Pre-emergent herbicides are a fantastic tool that will kill weeds before they have a chance to become a problem. If you are unable to apply pre-emergent herbicide, mowing will help reduce undesirable weeds (do not mow too low...your mower should be set to cut just over the clover). However, if weeds and grasses persist, apply selective post-emergent herbicides for control. Although herbicides are more expensive than mowing, they are often the most effective. Mowing is used to give the clover a better chance to out-compete the weeds while herbicide kills the weeds.

Fertilize select roadside areas to increase browse and nutritional value for wildlife.

Roadsides and right-of-ways generally have more native plant growth than areas within the

forest. This is because of the additional sunlight these areas receive. Coincidentally, areas along roadsides are usually areas that are easy to manage by disking, mowing and fertilizing to enhance the quality and quantity of plants beneficial to wildlife. Once spring green up begins, select areas that have wildlife friendly plants such as ragweed, greenbriar, honeysuckle, etc, and apply fertilizer to enhance their growth and nutritional value. If you are fortunate enough to have a side broadcasting spreader, simply drive down the roadside broadcasting fertilizer. If you have a typical cyclone spreader, select areas you want to fertilize, then back the tractor up to the spot and spread the fertilizer. This method obviously takes more time than a side broadcast, but is more common. Although some people take soil tests to assess soil nutrient levels to determine how much fertilizer to apply, a general application is 200 lbs per acre of a balanced fertilizer. With fertilizer costs so high these days, I certainly recommend taking a soil test to ensure you do not spread nutrients that are not needed.

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