

# Food Plot Plantings

*FOR WHITE-TAILED DEER IN LOUISIANA*



# introduction

Hunters and land managers are always seeking new and more innovative ways to improve the quality and attractiveness of their hunting areas. Wildlife biologists and other experienced personnel who deal with the management of deer are often asked the one question that relates to how these same hunters and land managers attempt to improve the quality and attractiveness of the areas they control: “What should I plant to attract and hold deer on my hunting area?”

As with any management decision, consideration should be given to what is already available on the area before making any changes to the habitat. Management of native browse species is many times overlooked when hunters and sportsmen want to improve habitat conditions. Fertilizing Japanese honeysuckle (*Lonicera japonica*), blackberry and dewberry (*Rubus*) and other forbs and vines normally found in open timber stands will greatly enhance the food and cover that Louisiana upland wildlife depend on. In some cases, individuals fail to plan and prepare when it comes to planting food plots and actually destroy large areas of these native browse species. The critical step is to plan before you plant.

# Properly planted food plots can be a tremendous benefit to white-tailed deer. Before you plant food plots, consider these factors.

The total acreage to be planted in food plots, along with the size of individual plantings, must be decided before planting begins. There is always considerable debate when trying to determine the correct amount of acreage to devote to food plots. The answer to this question is best provided by closely examining the natural habitat conditions surrounding the area to be planted. When native habitat provides adequate food and cover for deer, look at food plots as a supplemental management option that can improve the forage quality of an area. As mentioned earlier, however, these plantings should never be done at the expense of managing for high quality native foods. Where habitat conditions and finances allow, planting up to 10 percent of an area in various types of supplemental food plots could be considered a management option, while planting as little as 1 percent of the total area may benefit deer as well as attract them to the area for viewing or harvest opportunities.

In considering the size of the openings to be planted, managers should first look to existing openings such as power line or pipeline rights of way or existing open fields. Food plots should be wide enough to allow for adequate sunlight to reach the ground and at least one-half acre in size. In areas with high deer densities, planting plots smaller than this will generally be of little value since deer will quickly “eat down” these small plots with no long-lasting benefits. Where manipulation of the native habitat is possible, establishing long narrow food strips in a “wagon wheel” fashion can be of maximum benefit in getting the highest amount of food plot acreage established on a minimal amount of total area. In this planting arrangement, the deer stand or viewing platform is the hub of the wheel, with food strips coming off at various angles and lengths as the spokes of the wheel. In many cases, over-hunting a food plot by continual usage in morning and evening will cause deer to avoid use except nocturnally.

The forest habitat type is a second factor to consider when deciding how to establish food plots for white-tailed deer. Various forest habitats and the soils upon which they exist play an important part in determining the carrying capacity of deer and other wildlife on an area. Pine and mixed pine/hardwood forests of Louisiana cannot support the numbers of deer that our state's bottomland hardwood forests are capable of supporting. Regardless of the forest type, regular manipulation of the native habitat by timber management is necessary to keep a forest productive for deer. Clear-cutting, regular thinning and prescribed burning are forest management activities that land managers can use to accomplish this task. With the forest habitat type considered, food plots have the potential to be more beneficial where soil and timber types are not as productive in providing the necessary food and cover for white-tailed deer.

*Figure 1 and 2: Prescribed fire and regular timber thinnings are two of the most important management tools that land managers have to manipulate native vegetation to benefit white-tailed deer.*



The availability and types of agricultural crops grown on farms located on or adjacent to hunting leases have an impact on the decision of what and how much to plant in food plots. In areas where corn or soybeans are grown close to wooded tracts, the potential for these crops to be a tremendous supplemental food source for white-tailed deer should not be overlooked. The same is true for many cattle operations where fields of winter wheat and rye grass established as part of improved pasture operations provide white-tailed deer with a readily available source for winter foods. Studies have shown that these types of agricultural operations, when done on a large scale, can increase body weights and improve the overall condition of deer in the surrounding area. The absence of these farming operations should make the establishment of permanent food plots a more critical management decision in most cases, particularly in intensively managed pine plantations where long-term hardwood control is practiced.

Another factor to consider when initiating a food plot program is deciding what species will be planted. The most successful operations involve plantings that are available for deer more or less year-round. To achieve this objective, plant cool and warm season plots. In this type of operation, quality food is available to deer during the two most critical periods — late summer and late winter. Normal Louisiana weather provides little rainfall during late summer. Native vegetation under these conditions develops into browse that is low in nutrition and palatability. Lactating females and bucks in the later stages of antler development depend on quality forage for maximum body performance at this time of the year. Late winter finds some deer habitat devoid of the hard and soft mast crops and deciduous browse species that they started with the previous fall. Food plots at this time of the year may provide deer with the necessary energy to carry them through until spring green-up takes place.

Mixing various seed items is often a good way to provide deer with a variety of food items to choose from. This mixing also saves time and money by using the necessary equipment to prepare and distribute all seed to be planted at one time rather than making repeated trips into the field. Land managers can often decide on what food items they want included in a mix and buy the necessary ingredients to achieve the desired results. Buying different food plot items that are premixed and bagged is more convenient for use but also more costly. In whatever items are chosen for planting, wire enclosures over a small portion of the food plot can serve to document the amount of use that occurs. (Figure 3)

*Figure 3*



The importance of inoculating legumes with the proper *Rhizobium* bacteria should not be overlooked in the seed preparation phase of establishing any warm or cool season food plot. Even though some bacteria will remain in the soil for several years after a legume crop was grown in a food plot, inoculants are inexpensive and provide cheap “insurance” that proper nitrogen fixation will be obtained.

This list represents some of the warm and cool season plantings that can be established as part of a food plot operation, along with the necessary management procedures. Before planting any food plot, perform a soil test to determine fertilization and lime requirements. Soil test results will determine rates at which fertilizer and lime are actually needed. It is recommended that any seed be lightly covered following planting to increase germination success.

## Warm Season Food Plots

<b>American jointvetch</b>	<b>Planting Dates: April 1 – June 1</b>
Jointvetch is a reseeding legume that will grow on sites too wet to support most other food plot items. Plant at the rate of 10 to 20 pounds of seed per acre on a well-prepared seedbed. Jointvetch requires fertilization at the rate of 200 – 300 pounds per acre of 0-10-20, and soils should be limed if pH is 5.0 or lower. Established plots produce quality grazing from June through November.	
<b>Soybeans and cowpeas</b>	<b>Planting Dates: May 10 – July 15</b>
Soybeans and cowpeas are among the most preferred food items that deer will use where available. Their high use potential is evident by the fact that small plantings have almost no success for establishment on areas with high deer densities. Seeds can be row planted or broadcast at the rate of 15 – 25 pounds per acre for cowpeas and 30 - 50 pounds per acre for soybeans. Varieties have maturity dates ranging from mid September to late October. Maturity dates are not of tremendous importance, however, because of the use of both vegetative and seed portions of the plant. Fertilization requirements should be based on a soil analysis; liming is required when pH falls below 6.0.	
<b>Corn</b>	<b>Planting Dates: April 1 – May 1</b>
Corn is a high carbohydrate food item that deer will readily use upon maturity. It has the added benefit of providing cover for deer late in the summer when standing stalks are “worked over” to obtain seed from the mature ears. Plant at 10 to 12 pounds per acre in 36-inch rows or broadcast at the rate of 12 to 15 pounds per acre on a well-prepared seedbed. A balanced blend of fertilizer such as 13-13-13 is recommended on poorer soils; liming should be performed to bring soil pH between 6.5 and 7.0.	
<b>Alyce Clover</b>	<b>Planting Dates: May 1 – June 15</b>
Alyce Clover is a warm season legume that is used by deer in the summer and early fall. It holds up well to grazing pressure, unlike most other warm season forages. Alyce Clover provides supplemental nutrients to benefit doe lactation, fawn production and antler development in bucks. It can be drilled at 16 pounds per acre or broadcast at the rate of 15 to 20 pounds per acre. Fertilize at the rate of 200 pounds per acre with 0-14-14 after planting is established. For best results, soil pH should range from neutral to slightly acidic (6.5 - 7.0).	
<b>Lab Lab</b>	<b>Planting Dates: April 15 – June 15</b>
Lab Lab, a warm season legume, is noted for its tolerance to extremely dry conditions. It is a fast-growing erect plant that is a perennial even though it does not readily reseed. Newly established plantings are extremely sensitive to competition, which makes weed control necessary to achieve desired results. Seed can be drilled at the rate of 5 to 10 pounds per acre or broadcast at 10 to 20 pounds per acre. Fertilize at the rate of 300 pounds per acre with 0-20-20, and establish a soil pH in the range of 6.5 to 7.0.	
<b>Milo</b>	<b>Planting Dates: April 15 – June 15</b>
Milo or Grain Sorghum is a hardy warm-season annual that white-tailed deer along with many upland game bird species feed upon once seed has established on the plant. Dwarf varieties producing seeds of low tannin content should be chosen for wildlife food plots. Seed should be drilled at 8 pounds per acre in 24- to 36-inch rows, or broadcast at the rate of 12 to 15 pounds per acre. Seed production can reach 5,000 pounds per acre on fertile soils and seed are used over extended periods, making this an excellent planting choice.	

# Cool Season Food Plots

<b>Austrian Winter Peas</b>	<b>Planting Dates: Sept. 1 – Nov. 1</b>
Austrian winter peas, a cool season forage, rival warm season plantings of soybeans and cowpeas in their attractiveness to white-tailed deer. Inoculated seed should be drill planted at 40 pounds per acre or broadcast at 40 to 60 pounds per acre. These plantings are better adapted to heavy clay soils with moderate to heavy fertility. Fertilize at 250 pounds per acre with 0-14-14 and maintain a soil pH between 6.0 and 7.0.	
<b>Crimson Clover</b>	<b>Planting Dates: Sept. 1 – Nov. 15</b>
Crimson Clover is one of eight or more clovers that can be planted for deer in Louisiana to provide a high protein source in the winter. Clovers are generally planted in a mix with other cool season annuals. Clovers are rather expensively priced per pound, but this cost can usually be justified when one looks at the small amount of seed required to cover an area. Clovers are one of the items land managers can save money on by mixing chosen species themselves rather than buying premixed bags. In planting any variety, take care to maintain pH at recommended levels. Most clovers are very site specific. The big advantage of Crimson Clover is its high tolerance to acidic soils. With any species of clover chosen for planting, reseeding can be enhanced by disking or mowing in the fall after initial establishment. After soil disturbance, apply 0-20-20 fertilizer at the rate of 300 pounds per acre and maintain soil pH between 6.5 and 7.5. Seed should be inoculated and drill planted at 15 pounds per acre or broadcast at 20 pounds per acre.	
<b>Subterranean Clover</b>	<b>Planting Dates: Sept. 1 – Oct. 15</b>
Subterranean Clover is a cool season annual legume that can tolerate shade quite well, making it an ideal choice for plantings on narrow logging roads and small loading decks in thinned timber stands. Fertilize at the rate of 200 pounds per acre of 0-20-20 and maintain soil pH between 6.5 and 7.0. Inoculated seed should be drill planted at the rate of 8 pounds per acre or broadcast at 15 pounds per acre.	
<b>White or Ladino Clover</b>	<b>Planting Dates: Sept. 1 – Nov. 15</b>
White Clover or Ladino Clover is another popular cool season annual legume that provides excellent high protein deer forage. Plantings can be established by seeding as little as 4 pounds per acre when drill planting and 5 to 6 pounds per acre when broadcast planting. Fertilize with 400 pounds per acre of 0-20-20 and maintain soil pH between 6.5 and 7.0. Ladino Clover varieties include Osceola, Tillman, Regal, Louisiana S1 and California.	
<b>Elbon Rye</b>	<b>Planting Dates: Sept. 1- Nov. 15</b>
Elbon rye is a small grain annual plant that is similar to wheat and heavily used by deer in its early growth stages. It is very cold tolerant and can survive fairly frigid conditions later in the year although as it matures it loses a portion of its protein levels. Plantings established in the fall begin to die back the following summer. Elbon rye should be drilled or broadcast at the rate of 80 pounds per acre with 200 pounds per acre of a balanced fertilizer blend such as 13-13-13 applied at planting. Soil pH should be maintained between 5.6 and 6.5. Elbon rye makes its best growth on well-drained, light-textured soils.	
<b>Oats</b>	<b>Planting Dates: Sept. 1 – Nov. 1</b>
Oats are a cool season annual grain that has the disadvantage of being less cold tolerant than rye or wheat. Established plantings are browsed heavily by deer in their early growth stages. Seed should be drilled or broadcast at 80 pounds per acre, and 200 pounds per acre of 13-13-13 should be applied at planting. Top dressing with a blend of ammonia nitrate fertilizer such as 34-0-0 in January or February is recommended to give added growth later in the year. Maintain soil pH between 5.5 and 6.5.	
<b>Ryegrass</b>	<b>Planting Dates: Sept. 1 – Nov. 1</b>
Ryegrass is able to grow under such a wide range of soil and light conditions that it is one of the most common plantings to establish for white-tailed deer either planted alone or more often as part of a mix. It is a cool season annual grass, but repeated stands can be achieved by allowing plantings from the previous year to mature and go to seed. Disking such areas the following fall will almost always show some ryegrass returning. Seed can be drilled or broadcast at the rate of 20 pounds per acre. Fertilize at planting with 250 pounds per acre of 13-13-13 followed by top dressing with 150 pounds per acre of 34-0-0. Ryegrass grows best in soils maintained at a pH of 6.0.	
<b>Wheat</b>	<b>Planting Dates: Sept. 1 – Nov. 1</b>
Wheat is a cool season annual small grain that is widely used by deer in the early stages of growth. It, along with ryegrass, is a staple food plot item that represents some of the most used food plot ingredients for white-tailed deer. Establish plantings by broadcasting seed at the rate of 80 pounds per acre. Fertilize at planting with 200 pounds per acre of 13-13-13 and top dress later in the year with 150 to 200 pounds per acre of 34-0-0. Soil pH should be maintained between 5.5 and 6.5.	

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**Pub. 2843**

**(1M)**

**10/08 Rev.**

Issued in furtherance of Cooperative Extension work, Acts of Congress of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. The Louisiana Cooperative Extension Service offers equal opportunities in programs and employment.



# FUR IDENTIFICATION

2013 Envirothon - Wildlife



BADGER

FISHER

MARTEN

BOBCAT

COYOTE

BLACK DYED  
FOX

BLUE FOX

POLAR FOX

LYNX

BEAVER

CROSS FOX

OTTER

RED FOX

MUSKRAT

GREY FOX

ERMINE

OPOSSUM

SKUNK

CIVET CAT

MINK

RACCOON



Striped Skunk (two white stripes or more), Raccoon (banded tail, mask on face), American Badger (three white face bars)



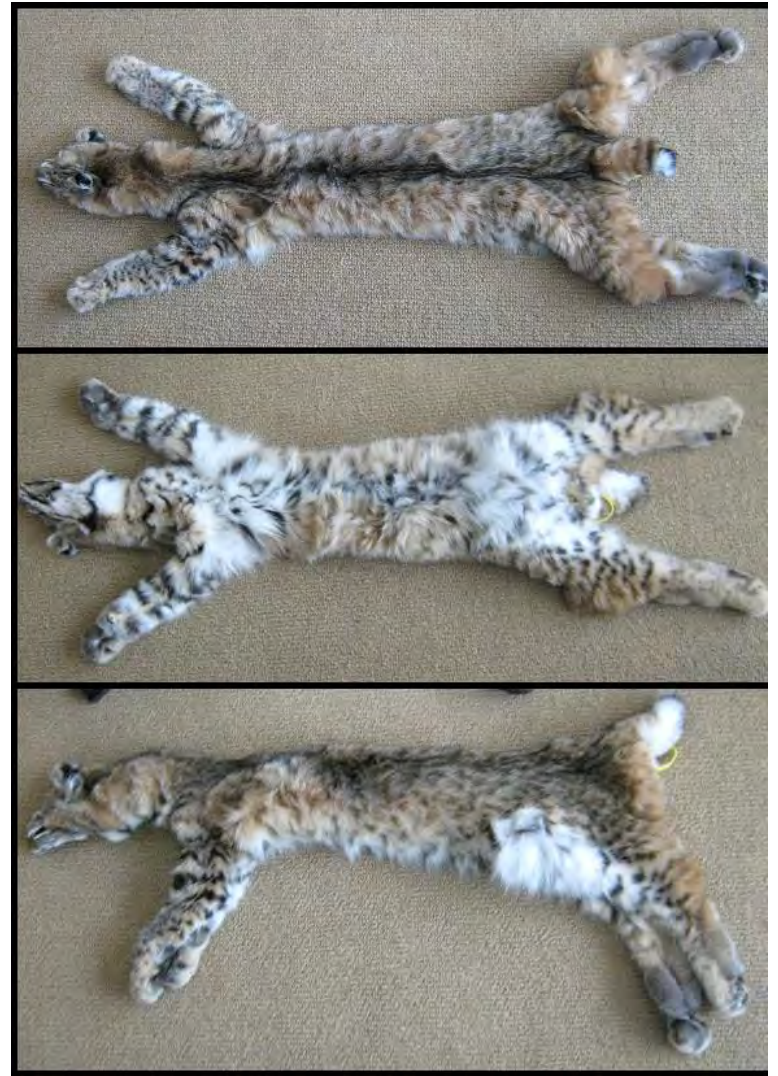
Raccoon, Groundhog (coarse fur)



Grey Fox, Red Fox



Red Fox



Bobcat (spotted, smaller size, half black and white tipped tail)



Lynx (larger size, larger paws, fully black tipped tail)



Lynx/Bobcat



Lynx/Bobcat





Coyote Pelt (narrow face, smaller than wolf, shorter legs then wolf)



Gray (Timber) Wolf (much larger than coyote, longer legs, broader face, variety of colours)



Wolf vs Coyote



Ermine (black tipped tail, slim and long)



American Mink (white chin mark, slim tail)



Pine Martin (orangey/cream coloured chest, large ears)



Fisher (Larger, long full tail, no chin mark, chocolate brown colour)





Beaver



Groundhog



Muskrat

Beaver (larger, round, darker colour)



Muskrat (oval, smaller than beaver very soft)



River Otter (Long furred tail, fur feels slightly oily to touch)

# MANAGEMENT

**Biological Control:** A few biological control agents exist for the potential control of giant salvinia including an aquatic grasshopper (*Paulinia acuminata* De Geer), the pyralid moth (*Samea multiplicalis* Guenee). The moth and the grasshopper were primarily investigated in Australia and currently are not approved for use in the United States. Herbivorous fish including the grass carp (*Ctenopharyngodon idella* Val.), and tilapia (*Oreochromis niloticus* Trewavas); the last has shown promise as a biological control agent (Table 1). However, the salvinia weevil (*Cyrtobagous salviniae* Calder and Sands) is the most notable and only organism that has demonstrated success in giant salvinia control. Both adult and larval damage can reduce giant salvinia infestations when conditions are optimal for weevil growth. Optimal conditions include water temperatures between 61 and 86 °F. Water temperatures outside this range results in decreased weevil performance. Similarly, feeding and larval damage depend on levels of nitrogen in plant tissues; low levels of plant nitrogen result in low densities of the salvinia weevil.

**Mechanical Control:** Manual (hand pulling) or mechanical (wire nets and floating booms) control of giant salvinia is only practical during the early stages of growth (Table 1). After giant salvinia is established in a given area, increased biomass and rapid growth makes harvesting and hand pulling unfeasible. Manual and mechanical control measures are very expensive and need frequent deployment for acceptable results.

**Chemical Control:** Herbicides are the most widely used and effective method for controlling infestations of giant salvinia. Herbicide use is restricted to those herbicides and herbicide formulations approved by the USEPA for aquatic environments. Systemic herbicides such as 2,4-D and triclopyr are not effective in controlling infestations. Fluridone has been effective however high rates are needed which may be cost prohibitive as a large scale treatment. Currently, diquat and glyphosate have been the most effective for giant salvinia control (Table 2). Copper formulations such as Komeen and Clearigate have had success in controlling infestations. To aid in successful giant salvinia control apply herbicides to actively growing plants; ensure even distribution of spray material to plant surfaces; repeat applications may be necessary if plant stand is dense; and always consult the product label for use restrictions. Always use a non-ionic surfactant with these herbicides.

Table 1. Biological and other control techniques deployed to control giant salvinia infestations.

Category	Technique	Deployment	Effectiveness
Biological Control	grass carp ( <i>Ctenopharyngodon idella</i> )	prior to mat formation	not effective
	tilapia ( <i>Oreochromis niloticus</i> )	prior to mat formation	not enough data
	salvinia weevil ( <i>Cyrtobagous salviniae</i> )	on established salvinia mats	excellent to fair
Mechanical Control	manual (hand pulling)	early in growing season	effective, expensive, labor intensive
	mechanical (wire nets and floating booms)	early in growing season	effective, expensive
Physical Control	water drawdown	winter	fair

Table 2. Recommended aquatic herbicides and rates for use in controlling giant salvinia.

Herbicide	Trade Name	Application Rate <sup>1</sup> (gal/acre)	Type of Chemical	Effectiveness <sup>2</sup>
Diquat	Reward	0.5-0.75	Broad Spectrum	Excellent
Glyphosate	Rodeo	1.0-2.0	Broad Spectrum	Excellent
	AquaMaster AquaPro AquaStar			
Copper	Komeen	5.0	Broad Spectrum	Good to Fair
	Clearigate	4.0-9.0	Broad Spectrum	Good to Fair

<sup>1</sup>Rates expressed as gallons of product per surface acre

<sup>2</sup>Excellent = ≥ 95% control of sprayed plants

Good = 80% control of sprayed plants

Fair = < 80% control of sprayed plants; re-growth can be expected

\*\*Use the higher rates for dense plant infestations

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Published by the GeoResources Institute in cooperation with the United States Geological Survey (USGS). This info is to be published as part of the GeoResources Institute's Invasive Species Spotlight program with the Extension Service at MSU.



GRI Publication #5006

# INVASIVE SPECIES FACT SHEET

## Giant Salvinia (*Salvinia molesta* D. S. Mitchell)

### Description, Distribution, and Management

Ryan M. Wersal and John D. Madsen, Ph.D., GeoResources Institute, Mississippi State University

## INTRODUCTION

Giant salvinia (*Salvinia molesta* D.S. Mitchell) is an aquatic fern native to southern Brazil. Giant salvinia is free-floating and can form thick mats of up to 3 feet thick when plant densities are high. The dense mats fill in water-bodies resulting in decreased density and diversity of native aquatic plants and animals. Similarly, giant salvinia mats clog irrigation canals, interferes with rice production, and impedes access to waterways for humans and livestock. Giant salvinia is considered one of the world's worst weeds. The ecological consequences of giant salvinia introduction have prompted the United States Department of Agriculture and the Mississippi Department of Agriculture and Commerce to list this species on both the federal and state Noxious Species List.

## DESCRIPTION

Giant salvinia is a rootless, free-floating fern that can be identified by its broadly rounded green fronds (Figure 1). Pairs of these emergent fronds are produced at each node of a horizontal stem that floats just beneath the water surface (Figure 1). The upper surfaces of the emergent fronds display a prominent midrib that is covered with stiff white hairs that aid in leaf buoyancy (Figure 2). The hairs of giant salvinia differentiate this species of *Salvinia* from others such as *Salvinia minima* Baker and *Salvinia auriculata* Aubl. by forming cage-like or egg-beater-shaped hairs (Figure 3). Giant

(Continued on page 2)



Fig. 1. An individual giant salvinia plant displaying fronds (A), horizontal stem (B), and submersed fronds (C). Submersed fronds resemble a root mass. Photo by Ryan M. Wersal.





Fig. 2. Giant salvinia fronds showing the rows of stiff hairs that aid in the buoyancy of the plant. Photo by Ryan M. Wersal.



Fig. 3. A magnified view of the cage-like or egg-beater-shaped hairs on the surfaces of giant salvinia fronds. Photo by Julie Graham.

(Continued from page 1)

salvinia also produces a brown submersed leaf that is often mistaken for roots. Similarly, stalks extend beneath the water surface where sessile sporocarps are produced (Figure 4). Giant salvinia sporocarps are uniquely egg-shaped and occur in straight chains among the submersed fronds. Although mature plants can produce a great number of sporocarps the sporangial sacs are most often void of spores. Giant salvinia can produce reproductive structures (spores) however; when the spores are present they are generally deformed and non-viable. It is believed that the primary means of reproduction is solely asexual.

Giant salvinia has three different phenotypes or growth forms. The survival stage occurs when growing conditions are less than optimum (e.g. when nutrients are low). During this stage the plant grows slowly and bears 4 to 5 pairs of flattened fronds that are each approximately one half inch in diameter. In the colonizing stage, plants can be found in open water with fronds 1-1.5 inches in diameter. During the mat stage the plant is present in established mats where growth is restricted and slow; with plants having erect pairs of fronds on a 6-8 inch rhizome (Figure 5). When plants are transferred from one environment to another, they adapt their growth stage to better suit the new conditions and maximize dominance in the new environment.



Fig. 4. The male sporocarps of giant salvinia. Sporocarps are attached directly to individual plants. Photo by Ryan Wersal.



Fig. 5. The mat forming stage of giant salvinia displaying the erect pairs of curled, emergent fronds. Photo by Ryan M. Wersal.

## DISTRIBUTION

Giant salvinia was likely introduced in the United States via the nursery trade as an ornamental species in the late 1970's or early 1980's. Records from Florida indicate that giant salvinia was in cultivation in nurseries as early as 1983. The first recorded natural population of giant salvinia was discovered in 1995 in South Carolina. Since then this species has spread through the southern United States infesting waters in Texas, Mississippi, Louisiana, Georgia, Florida, Alabama, California, Hawaii, Arizona, North Carolina, and Virginia (Figure 7). In Mississippi, giant salvinia was first observed in 1999 growing in a wetland in the central portion of the state. In 2004, giant salvinia was observed near Hattiesburg, Mississippi on a 40-acre lake close to the Leaf River (Figure 8).



Fig. 6. Mat formation of giant salvinia on a small pond at the Lewisville Aquatic Ecosystem Research Facility (U.S. Army Corp of Engineers, Lewisville, TX). Photo by Ryan M. Wersal.



Fig. 8. Location of giant salvinia observations in Mississippi. Data taken from United States Geological Survey and the Mississippi Department of Agriculture and Commerce, Plant Industry Division.

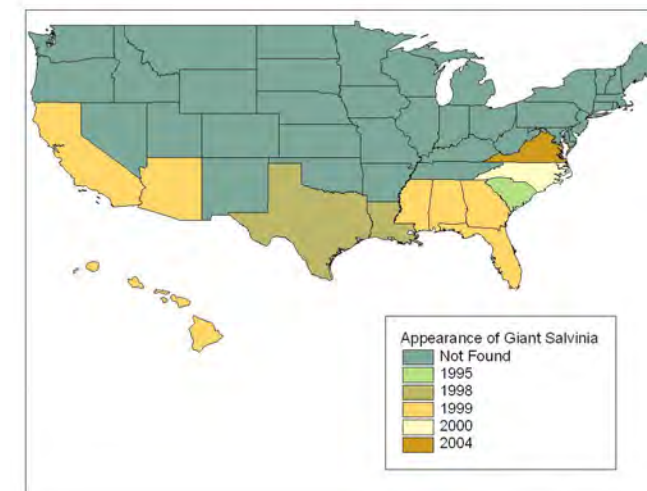


Fig. 7. The distribution and year of appearance of giant salvinia in the United States. Data from United States Geological Survey.

## MORE INFORMATION

Invasive Species Web Links

<http://www.invasivespecies.gov/profiles/giantsalvinia.shtm>

Mississippi State University, GeoResources Institute, Invasive Species

[www.gri.msstate.edu/lwa/invspec.php](http://www.gri.msstate.edu/lwa/invspec.php)

United States Department of Agriculture

<http://www.ars.usda.gov/is/AR/archive/nov01/giant1101.htm>

United States Geological Survey

<http://salvinia.er.usgs.gov/>

Western Aquatic Plant Management Society

<http://www.wapms.org/plants/salvinia.html>

## HABITAT

Giant salvinia inhabits calm waters of lakes, ponds, wetlands, and rivers (Figure 6). Plants have been located in ditches, rice fields, and slow-moving rivers and streams. The most common habitats include disturbed sites such as flood canals, rice paddies, artificial lakes, and hydroelectric facilities. Giant salvinia is best adapted and thrives in warm-temperate to tropical areas. Giant salvinia cannot tolerate saline environments and thus will not colonize brackish or marine environments. Likewise, this species can not tolerate dry environments and individual plants can be readily killed by desiccation.

# Key to Common Mammal Skulls

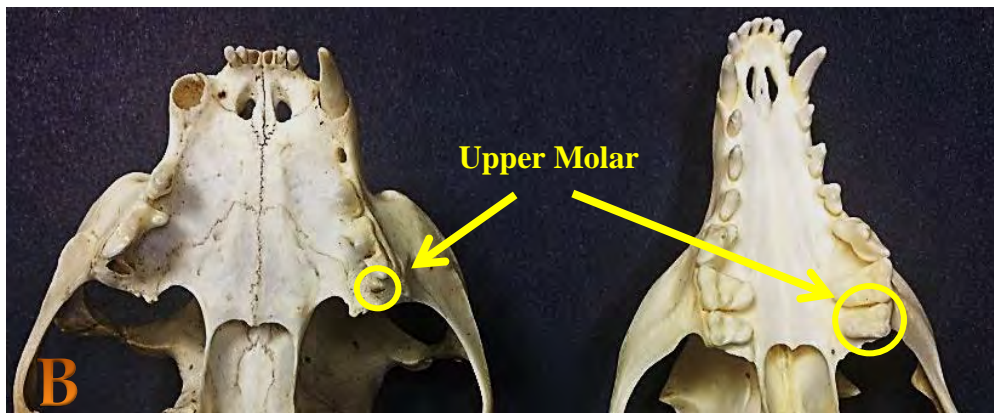
Kerry Wixted

- 1. Canines present .....2
- 1. Canines absent ..... **Section A**
- 2. Incisors 5/4 and large sagittal ridge present (Figure A).....**Opossum**
- 2. Incisors not 5/4.....3



By Dawson @ en.wikipedia, CC BY-SA 2.5

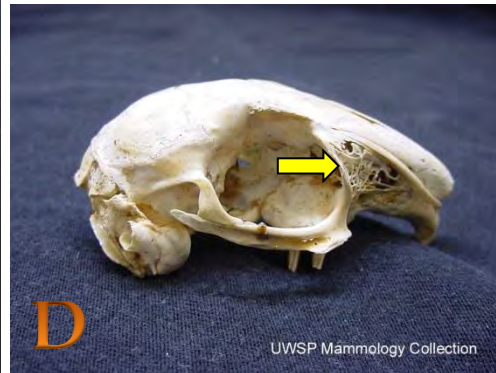
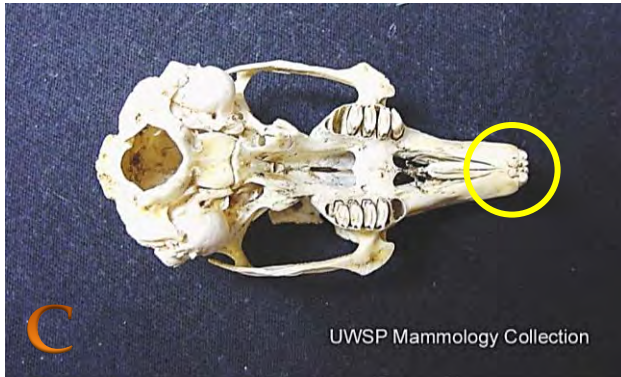
- 3. Rostrum short. Upper molar reduced and peg-like (Fig. B, left) .....4
- 3. Rostrum short or long. Upper molar(s) large and robust (Fig. B, right) .....5



- 4. Premolars 3/2; greatest length of skull 77-101 mm.....**House cat**
- 4. Premolars 2/2; greatest length of skull over 101 mm.....**Bobcat**
- 5. Post-orbital process in front of skull midpoint; Molars 1/2 or 2/2.....6
- 5. Post-orbital process at or near skull midpoint; Molars 2/3.....**Section B**
- 6. 4-5 upper cheek teeth with less than 40 teeth total ..... **Section C**
- 6. 6 or more upper cheek teeth with 40-42 teeth total .....7
- 7. Greatest length of skull less than 200 mm.....**Raccoon**
- 7. Greatest length of skull more than 200 mm.....**Black bear**

## Section A: Deer, Rabbits and Rodents

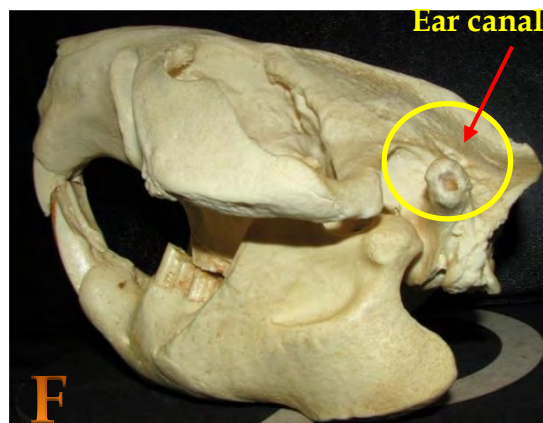
- 1. Upper incisors present.....2
- 1. Upper incisors absent..... **White-tailed deer**
- 2. Upper incisors 4 or 6; rostral fenestra present (Figures C & D)..... **Eastern cottontail**
- 2. Upper incisors less than 4; rostral fenestra absent.....3



- 3. Post-orbital process sharply pointed.....4
- 3. Post-orbital process not sharply pointed or absent.....6
- 4. Greatest length of skull greater than 76 mm..... **Groundhog**
- 4. Greatest length of skull less than 76 mm.....5
- 5. U-shaped temporal ridges form a small sagittal crest (Fig. E)..... **Eastern fox squirrel**
- 5. Temporal ridges not U-shaped; sagittal crest absent..... **Eastern gray squirrel**
- 6. Infraorbital canals round and almost as large as orbit.....7
- 6. Infraorbital canals often slit-like and smaller than orbit.....8
- 7. Paraoccipital process does not extend beyond auditory bullae..... **Porcupine**
- 7. Paraoccipital process extends beyond auditory bullae..... **Nutria**
- 8. Ear canals long and pointed upward (Fig. F)..... **Beaver**
- 8. Ear canals short and not pointed upward..... **Muskrat**



By: accipitereye, Flickr CC by SA 2.0



Skull Key 2

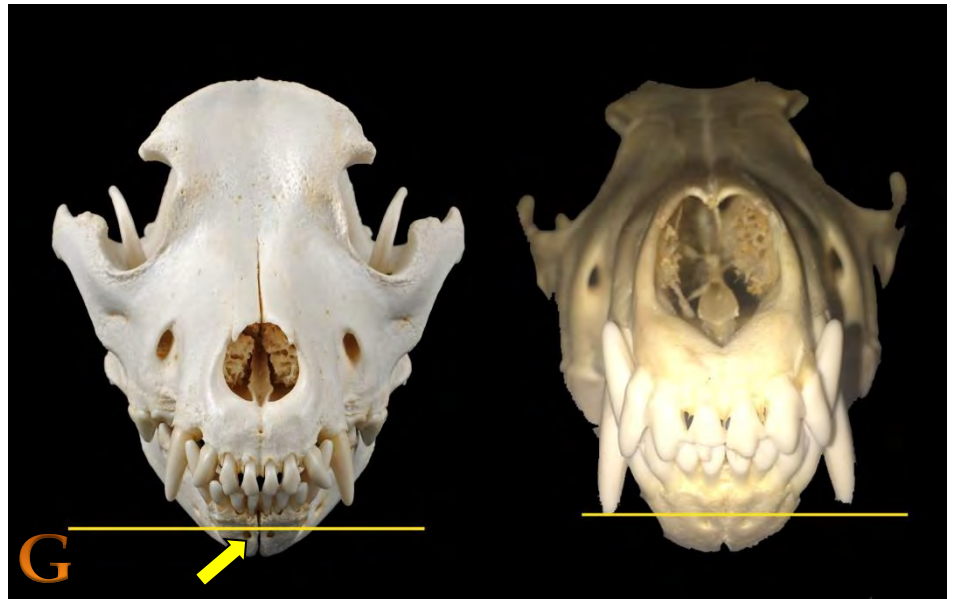
## Section B: Canids

Canids are in the Order Carnivora. The Canidae family contains wolves, coyotes and foxes. Worldwide, there are about 34 species of Canids, 8 of which occur in North America.

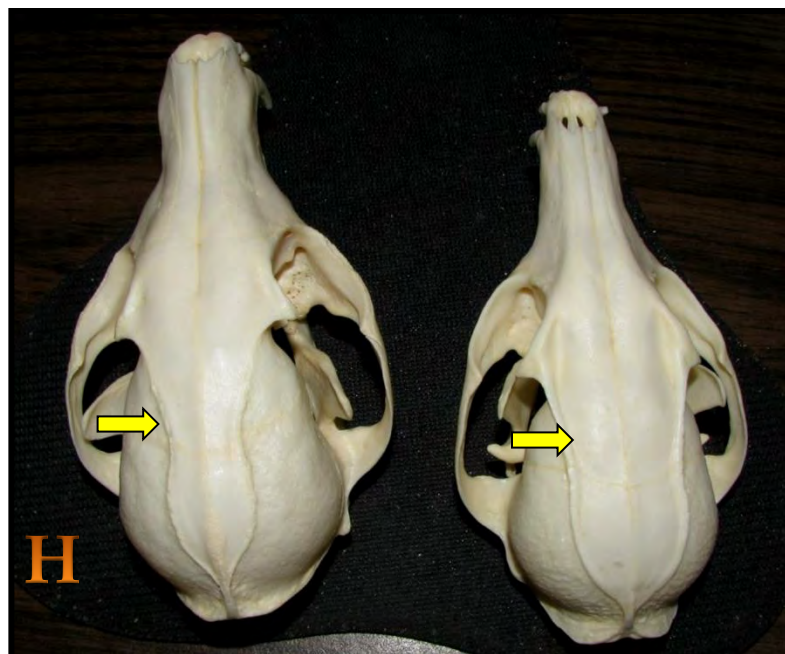
- 1. Greatest length of skull greater than 170 mm.....2
- 1. Greatest length of skull less than 170 mm.....3

2. Canines do not extend to the line across the mandibular mental foramina (Fig. G, left).....**Domestic dog**

2. Canines at or below the line across the mandibular mental foramina (Fig. G, right).....**Coyote**

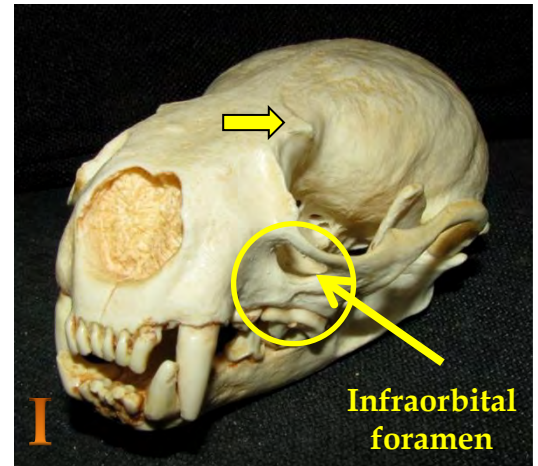


- 3. Temporal ridges on top of skull form a V-shape (Fig. H, left).....**Red fox**
- 3. Temporal ridges on top of skull from a U-shape (Fig. H, right).....**Gray fox**

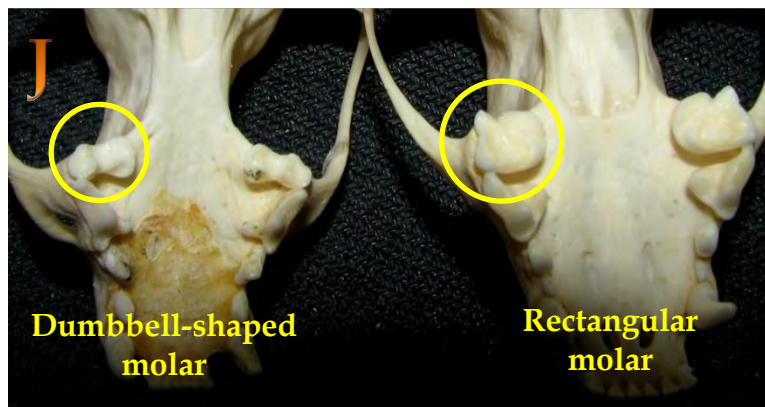


## Section C: Mustelids & Skunks

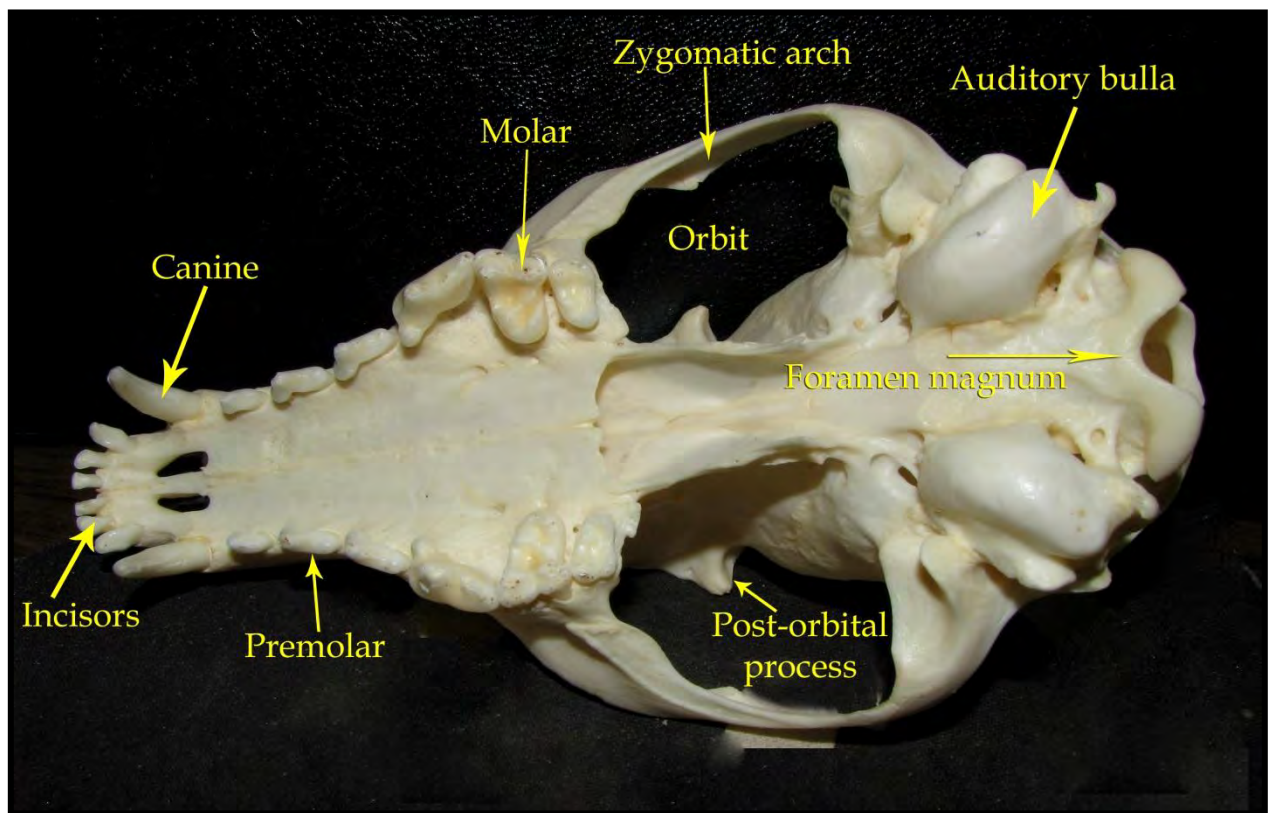
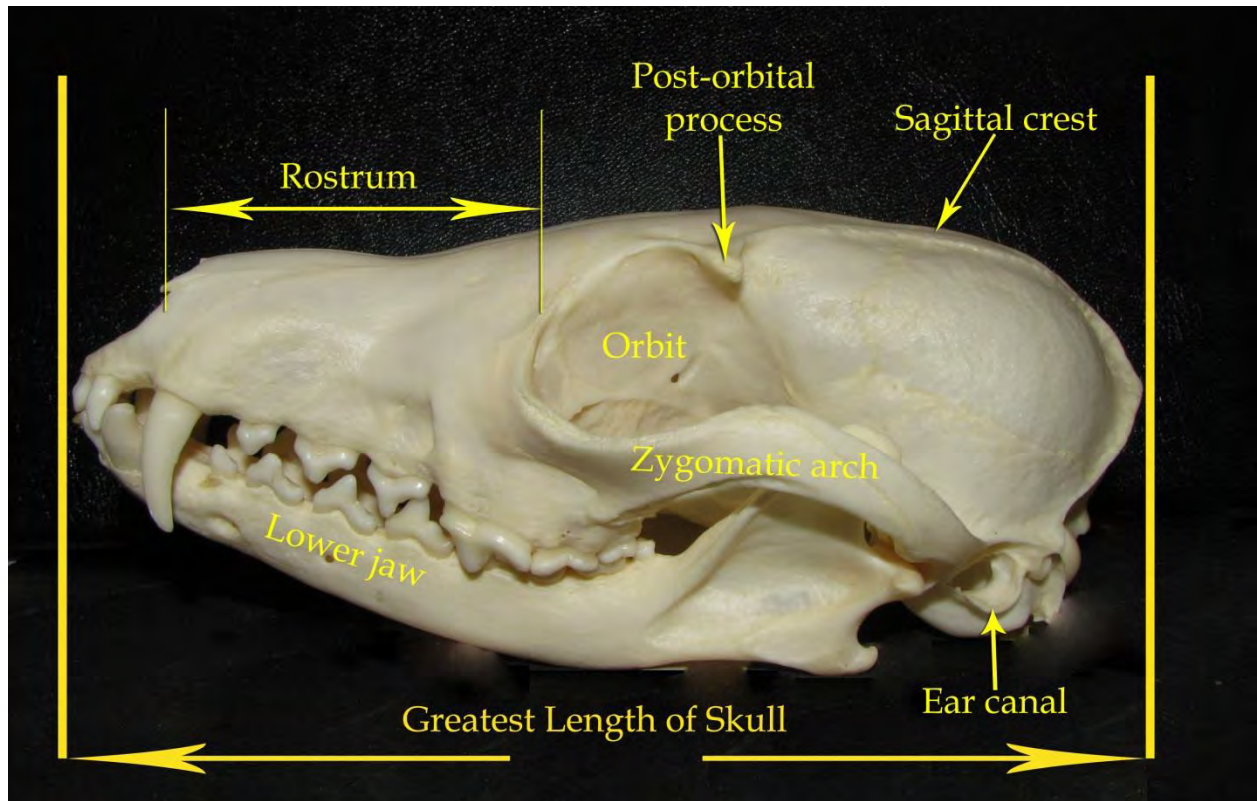
The Family Mustelidae contains weasels and allies. Mustelids have a special pair of teeth known as the carnassials. Carnassial teeth are a pair of blade-like teeth (last upper molar and first lower molar) that exhibit a shearing action. This set of teeth is found in most carnivores, but those on Mustelids are extremely well-developed. Skunks were once part of the mustelid family but are now in their own group.



1. Post-orbital process well developed; infraorbital foramen greater than 8mm in diameter (Fig. I).....**River otter**
1. Post-orbital process lacking to moderately developed; infraorbital foramen less than 8mm in diameter .....2
2. 5 upper cheek teeth per side; premolars 4/4.....**Fisher**
2. 4 upper cheek teeth per side; premolars 2/3 or 3/3.....3
3. Upper molar dumbbell-shaped (Fig. J, left); auditory bulla prominent, elongated.....4
3. Upper molar rectangular-shaped (Fig. J, right); auditory bulla flat and not elongated..... **Striped skunk**
4. Skull over 58mm long.....**Mink**
4. Skull 40-58mm long.....**Long-tailed weasel**



# Mammal Skull Index



## Glossary of Terms

- **Anterior**- front of skull or lower jaw
- **Auditory bulla**- bony capsule enclosing middle ear
- **Canine**- elongate, unicuspid tooth
- **Carnassial teeth**- pair of bladelike teeth (last upper molar and first lower molar) that exhibit a shearing action
- **Cheek teeth**- combination of premolars and molars
- **Dental formula**- numerical representation of the number of each kind of tooth on one side of the upper and one side of the lower jaw
  - **Example:** The statement 'incisors 5/4' means that there are 5 incisors on top and 4 incisors on the bottom for each side of the jaw
- **Diastema**- a gap or space in the jaw between teeth; used most often to denote gap between incisors and cheek teeth in rodents
- **Foramen magnum**- large opening at the back of a skull which the spinal cord goes through
- **Greatest length of skull**- length from tip of rostrum to the posteriormost part of the skull
- **Incisors**- anterior-most teeth (front teeth) of mammals
- **Infraorbital foramen**- opening below orbit (eye socket)
- **Mandibular mental foramen**- foramina (openings) located on the anterior surface of the mandible
- **Molar**- teeth located after premolars
- **Orbit**- eye socket
- **Paraoccipital process**- a downward-projecting spur from the base of the skull which attaches the muscle used in opening the lower jaw
- **Posterior**- back of skull or lower jaw
- **Post-orbital process**- bony projection
- **Premolar**- teeth situated between canines and molars
- **Rostrum**- distance from end of nostrils to orbit
- **Sagittal crest**- raised bony ridge on middle of cranium
- **Temporal ridge**- any of four nearly parallel curved ridges or lines situated two on each side of the skull and chiefly on the parietal bone
- **Zygomatic arch**- arch of bone protecting the orbit (eye socket)



## Definition

Prescribed burning is applying fire to predetermined areas under conditions that the intensity and spread of fire are controlled.

## Why prescribed burning?

When applied properly, prescribed burning can have a variety of applications and benefits on rangeland, native pasture, land retired from agricultural production (e.g. Conservation Reserve Program) and land managed for wildlife. Prescribed burning can be used to:

- Maintain or restore desired plants within a plant community
- Improve forage quality and/or quantity
- Improve or change grazing distribution within a pasture
- Reduce excess plant litter
- Enhance seed production
- Suppress woody plant component and/or invasion
- Improve wildlife habitat
- Enhance wetland plant diversity

Prior to performing a prescribed burn, one needs to have a clear understanding of the intended purpose of the fire. Without a clear understanding of the purpose of the burn, it is difficult to properly plan and prepare for the burn.

## Prescribed Burn Plan

Anyone conducting a prescribed burn is strongly encouraged to obtain and follow a Prescribed Burn Plan, developed by a qualified individual. This plan will outline the environmental conditions (fuel type, wind speed and direction, relative humidity, etc.) under which the burn should be conducted and contain recommendations on ignition patterns which will result in a safe, effective prescribed burn. Post-burn management guidance will also be provided in the plan.



Contact your local Natural Resources Conservation Service (NRCS) or North Dakota Forest Service office for names of individuals qualified to develop prescribed burn plans.

Prescribed burns should **not** be conducted when the Rangeland Fire Index is in the *Very High* or *Extreme* category. Rangeland Fire Index ratings may be obtained by contracting the local sheriff's department or the National Weather Service. Fire weather forecasts can be obtained from the National Weather Service at <http://www.crh.noaa.gov/bis/> or <http://gacc.nifc.gov/nrcc/predictive/weather/weather.htm>.

### Summary of Factors

There are several primary factors to consider when planning a prescribed burn. Fuel (amount, type and moisture content), wind (speed, direction and potential for change in direction/speed), relative humidity, air temperature, soil moisture, slope of the area to be burned, smoke management, and neighboring landowners/home owners.

Following is a summary of each of these and other factors for quick reference:

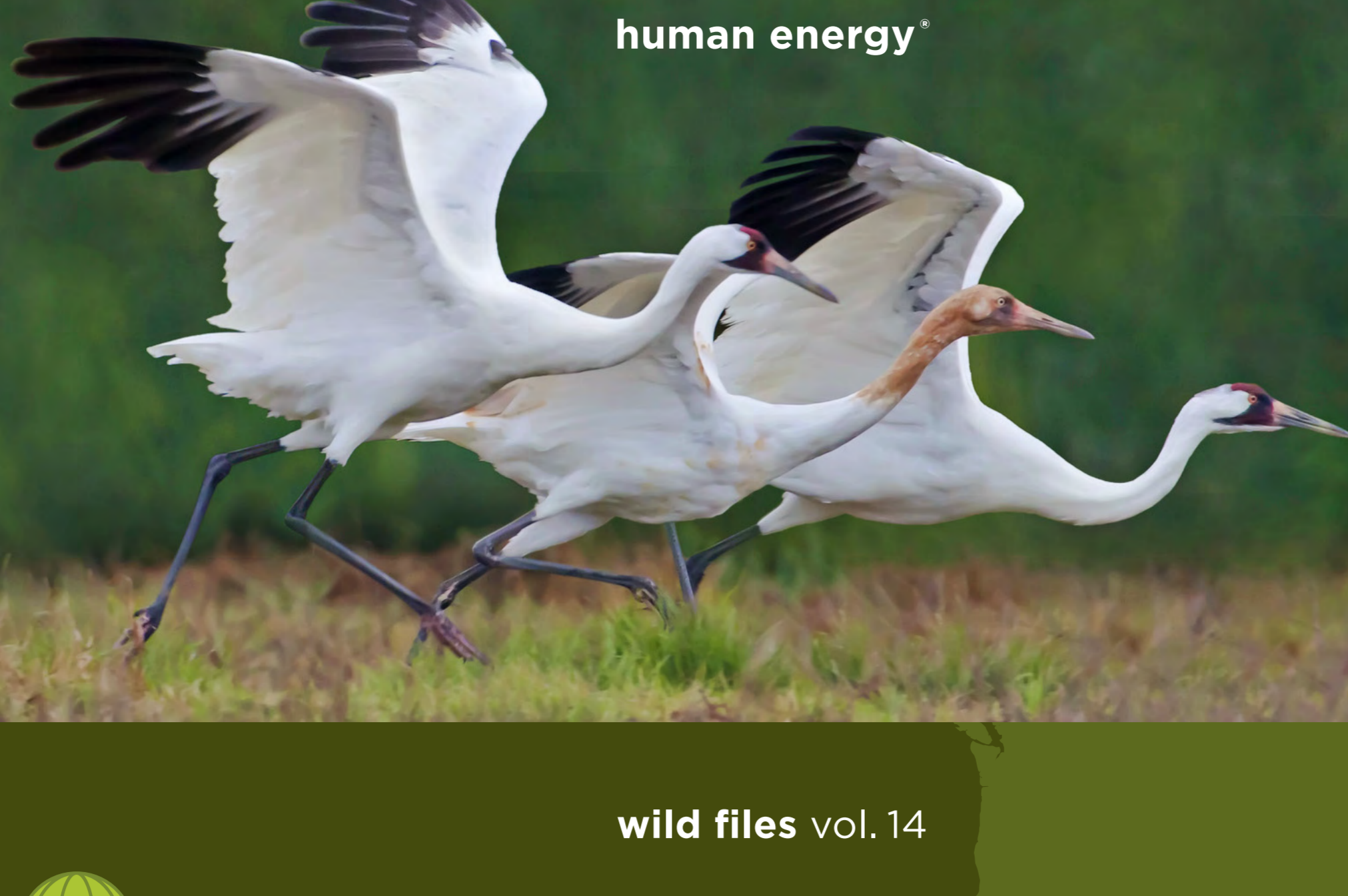
- 1) **Fuel** – Primary fuel for most prescribed burns in North Dakota will be fine to coarse herbaceous materials (grasses and forbs). For planning purposes, fuel loads can be divided into two general categories:
  - A. Fine herbaceous fuels averaging less than 20 inches in height (i.e. mixed grass prairie)
  - B. Coarse herbaceous fuels averaging greater than 20 inches in height (i.e. tall grass prairie or CRP fields)Minimum fuel load should be 1,200 pounds per acre continuous across the burn area with at least 50 percent of the herbaceous fuel in an upright or standing position.
- 2) **Wind** – Wind speed and direction should be carefully monitored before and during the burn. Wind should be steady from between 4 and 15 miles per hour. Gusty winds and/or winds shifting greater than 45 degrees should be avoided. Calm conditions (wind speed less than 3 miles per hour) should also be avoided.
- 3) **Relative Humidity** – Relative humidity should be determined prior to the burn and monitored during the burn. Relative humidity for herbaceous fuels less than 20 inches in height will be 30 to 60 percent and 45 to 65 percent for herbaceous fuels greater than 20 inches.
- 4) **Air Temperature** – Air temperatures should be determined prior to the burn and monitored during the burn. Air temperatures for herbaceous fuels less than 20 inches in height will be 32° to 80° F and 25° to 80° F for herbaceous fuels greater than 20 inches.
- 5) **Soil Moisture** – Soils should be moist or wet to the touch from the soil surface to a depth of 10 inches.
- 6) **Topography** – Special planning consideration should be given to areas within the field to be burned which contain swales with steep slopes.
- 7) **Firebreaks** – Firebreaks are used to contain the fire to the desired area. Mechanical, chemical, wetline, burned, natural or structural firebreaks should be used alone or in combination. The type, width, location and orientation of firebreaks should be determined prior to the burn. Consult the NRCS Firebreak Specification and/or local fire department for specific planning guidelines for firebreaks.

- 8) **Types of Fire** – The following types reflect how the fire moves in relation to the wind.
- Head fires move with the wind and have the highest rate of spread and longest flame lengths. They are the most difficult to control.
  - Backing fires move against the wind. They generally move the slowest and are the easiest to control.
  - Flanking fires move at right angles to the wind. The rate of spread and flame lengths for flanking fires are between that of head and backing fires. Most flanking fires evolve into either head or backing fires.
- Since backing fires are the easiest to control, they are best to use when establishing burned firebreaks or when working in heavy fuel loads (e.g. CRP).
- 9) **Smoke Management** – All prescribed burns will produce a smoke column which will be visible and impact air quality. Burning when fuel moisture is low will reduce smoke output. Unstable atmospheric conditions are best for smoke dispersal. Transport winds should be at least 10 mph at 1,500 feet or higher.
- 10) **Public Notification** – Sheriff's office, rural fire departments and neighbors, especially those living downwind from the burn site, should be notified prior to the burn.

For more information on prescribed burning, contact the Natural Resources Conservation Service office located in your local USDA Service Center or visit:  
<http://www.npwrc.usgs.gov/resource/habitat/burning/index.htm>

# whooping cranes of louisiana

human energy\*



wild files vol. 14



## situation

2011 • Louisiana

In the early 20th century, North America's whooping crane population experienced a devastating decline driven by several factors:

- Prairie and marsh habitats converted to farmland
- Unregulated hunting

An endangered species, whooping cranes mate for life and share parenting duties.

**By 1950, only one whooping crane was known to exist in the state of Louisiana.**



In 2011, the Louisiana Department of Wildlife & Fisheries (LDWF) established the whooping crane reintroduction program with support from two key partners:

- U.S. Fish & Wildlife Service
- Chevron

### Goal:

To sustain a population of about 120 individuals and 30 productive pairs for 10 years without additional restocking.



## actions taken

LDWF started a new wild population of cranes in Louisiana by releasing a "cohort" of 10 juvenile cranes.

"Cohort" is a term that refers to several young cranes assembled without parents to socialize together so they will thrive as a group.

They continued to introduce a new cohort of juvenile cranes each year with the help of other partners.

### juvenile markings

White with patches of cinnamon brown



**LDWF used grant funding from Chevron for three critical areas of support:**

1

Satellite transmitter equipment and associated communications costs for tracking:

- The cranes' movement
- Habitat selections
- Adaptive behavior adjusting to life in the wild

2

Public outreach campaign (billboards, TV and radio) designed to alert the public about:

- The species
- How to observe them from a distance
- How to report any disturbances to the bird

3

Lesson plans, classroom tools, and educational workshops for Louisiana middle and high school teachers about endangered species and LDWF's conservation programs.

## adult whooping cranes

Tallest bird native to North America

black-tipped wings

white with a red head and black facial markings

wingspan: **7-8 ft**

lifespan in the wild: **22-24 years**

weight: **11-17 lbs**

height: **up to 5 ft**

## whooping cranes are omnivorous

### winter diet includes:



blue crabs



clams



### summer diet includes:



frogs



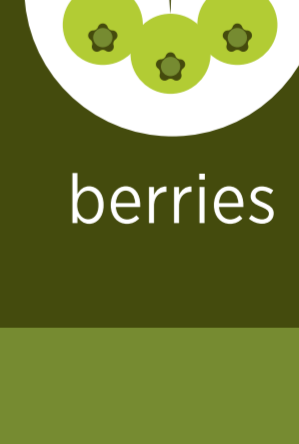
fish



rodents



small birds



berries



## results

LDWF received support and cooperation from many landowners and farmers whose properties are frequently visited by the cranes.



April 2016 brought the first verified hatching of a whooping crane chick in the state since 1939.

In 2017, Audubon Nature Institute began to provide a significantly increased number of crane chicks raised at their rearing facilities to supplement both the migratory and non-migratory whooping crane populations in Louisiana.

As of 2018, LDWF has introduced 125 juvenile whooping cranes to the Louisiana ecosystem, and seven wild-hatched chicks have fledged successfully.

our actions were consistent with our goal to conserve biodiversity:

**we strive to avoid or reduce the potential for significant impacts on sensitive species, habitats and ecosystems**