2023 Crop Production Shortcourse

Weed Control

John Byrd

Mississippi Farm Bureau Young Farmers and Ranchers
42m ·

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Congratulations to Sarah Clark, our 2023 YF&R Excellence in Ag winner!! We know you'll do great as you represent MS while competing on a national level! 🎉🎉

2023 MFB Federation

Young Farmers and Ranchers

Excellence in Ag

Sarah Clark

COOPERATIVE EXTENSION SERVICE Mississippi State University

Herbicide Resistance

Prevention and Detection

Selective herbicide use began in the 1940's with the discovery of 2,4-D. This new miracle compound killed many broadleaf weeds without damage to grassy plants, adding a new dimension to crop production. Producers could easily and economically control broadleaf weeds in grass crops that previously required mechanical or hand-removal. Use of these materials spread rapidly and has continued to grow with the discovery and registration of new herbicides.

Weeds vary in susceptibility to herbicides. Some weeds tolerate herbicides while others do not. For example, morningglory and other broadleaf plants tolerate Fusilade 2000, while annual and perennial grasses do not. Herbicide labels and weed response tables in Extension and other publications provide growers with this information. But, there is also variation in control within a particular genus or species. Selected plants of a species normally controlled by a herbicide may require slightly higher application rates for an acceptable level of control. For example, in a particular field or year, Treflan may not control smooth pigweed as well as it does in other fields or years. Similarly, spiny amaranth (also known as spiny pigweed) may not be controlled as well as smooth pigweed. One rarely obtains 100 percent control of any weed species with any herbicide.

A number of factors influence weed control. Lack of control may be attributed to target coverage, application method, herbicide rate, environmental conditions before, during, or after application, or weed size and development at application time.

Lack of control may also be due to the genetic ability of a weed to tolerate or resist the herbicidal properties of the pesticide. The Weed Science Society of America has defined resistant weeds as "species or a biotype of a species that originally was controlled by a specific herbicide that is no longer effective."

Resistance may not be detected for many years, that is, until a high percentage of the targeted species survive the herbicide treatment. The resistant-weed biotypes survive to produce seed, and the population grows. As the population of resistant weeds increases in relation to susceptible plants, one may suspect resistance, especially if this observation is made more than one year. Factors, such as seed production and longevity, seed survival, germination rate, seedling hardiness, growth rate, and competitiveness of the susceptible and resistant biotypes, influence the speed at which the resistant population grows.

Herbicide resistance has become an issue in Mississippi. By 1992, populations of johnsongrass resistant to the acetyl-coenzyme A carboxylase (ACCase) herbicides [fluazifop-P (Fusilade 2000®) and quizalofop-P (Assure II®)], common cocklebur resistant to imidazolinone herbicides [imazaquin (Scepter®) and imazethapyr (Pursuit®)], common cocklebur resistant to arsenical herbicides [DSMA (DSMA Liquid®, DSMA Slurry®, Ansar 8100®, and other trade names) and MSMA (Crabgrass Killer®, Ansar®, Bueno®, Daconate®, and other trade names)], goosegrass and johnsongrass resistant to dinitroaniline herbicides [trifluralin (Treflan®, Tri-4®, Trilin®, etc.) and pendimethalin (Prowl®)], and ryegrass resistant to a sulfonylurea herbicide [sulfometuron (Oust®)] have been found and resistance confirmed.

Confirming herbicide resistance in a weed population is a slow process. Seed or other propagation material must be collected, plants grown to treatment size in a controlled environment, treatments applied, and results evaluated. Collected seeds may require an after-ripening period or storage at freezing temperatures before germination occurs. Seedlings from a susceptible parent (preferably one that has never been exposed to the suspected herbicide) must be grown and treated with the resistant seedlings for comparison purposes. This process can require from several months to one year after the initial collection. Fortunately, there is an ongoing effort to develop techniques for quicker resistance detection.

Often, one must evaluate the situation in the field to try to determine the reason for lack of control. If several weed species that should have been controlled by the herbicide are detected, resistance probably is not the cause for lack of control. Likewise, if a pattern of no control can be detected, or if adverse environmental conditions existed at the time of application, the control failure can probably be attributed to factors other than herbicide resistance. If, however, all except one, susceptible weed species were controlled, herbicide resistance might be suspected. When resistance is suspected, contact the local county Extension agent to initiate the process of resistance testing.

Judicious herbicide selection and use can delay the development of a resistant-weed population. Crop rotation is often touted as the primary tactic against herbicide resistance, because crop rotation often mandates use of different herbicides with different modes of action. However, crop rotation may not be necessary if several alternative herbicides are available to enable one to use a herbicide with a different mode of action in that crop. For example, imidazolinone-resistant cocklebur can be controlled in soybeans with other herbicides that have a different mode of action, such as bentazon (Basagran®). Although ACCase-resistant johnsongrass can be controlled with clethodim (Select®) in cotton or soybeans, no one can determine if or when resistance to Select® will occur. Therefore, it would be wise to use glyphosate (Roundup®) as a wiper treatment, spot treatment, or after harvest for johnsongrass control in cotton or soybeans rather than continued repeated use of clethodim (Select®) on those resistant populations.

Crop rotation will not delay weed resistance if herbicides with similar modes of action are used in the rotation crop. In the example just mentioned, rotation from cotton to soybeans would not help control resistant johnsongrass because many of the same herbicides are used in both crops. But, rotation to corn and use of nicosulfuron (Accent®) or primisulfuron (Beacon®) for johnsongrass control would alternate the herbicide modes of action.

Use of herbicides that contain more than one active ingredient in the formulation, or premixes, may help control certain herbicide-resistant weeds. This will be an effective treatment alternative only if both ingredients were initially effective on that particular weed.

Lastly, if a resistant-weed population has been detected, one should use all available control methods to avoid seed deposition in the field. Hand-removal following cultivation may be economical if the end result is to avoid spread of a herbicide-resistant weed population.

Table 1 contains many of the herbicides routinely used in crop production in Mississippi, along with the modes of action of these herbicides. This information can be useful to plan weed control tactics that include herbicide rotation so that herbicides with similar modes of action, or in the same families, are not repeatedly used year after year.

By **John D. Byrd, Jr.**, Ph.D., Extension Weed Specialist, **William L. Barrentine**, Ph.D., Plant Physiologist, Delta Research and Extension Center, Stoneville, and **David R. Shaw**, Ph.D., Professor of Weed Science

Publication 1907
Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. HIRAM D. PALMERTREE, Director
(2M-9-93)

1993

Publication 1907

Roundup Ready SOYBEANS
FOR OVER THE TOP APPLICATION

January 29, 1996

1996

ANNOUNCING

THE MARKET APPROACH FOR ROUNDUP READY™ SOYBEANS

Monsanto is pleased to announce the market approach for Roundup Ready™ soybeans.

Roundup Ready soybeans received final U.S. approvals last May, when the Environmental Protection Agency (EPA) announced it would allow Roundup® herbicide application over the top of Roundup Ready soybeans. Roundup Ready soybean seed will be available to U.S. growers this spring.

Roundup Ready soybeans free growers from the limitations of currently available weed control options in soybeans. With Roundup Ready soybeans, growers will have the widest window of application, broad-spectrum control of large and small weeds, including perennials, and outstanding crop safety with no carryover and maximum yield.

Roundup Ready soybeans contain patented seed technology, which creates a new relationship among the grower, the seed company and Monsanto. Growers who purchase Roundup Ready soybean seed will sign an agreement to ensure they understand the benefits and responsiblities associated with this new technology before making their purchase decisions. The enclosed brochure and press release provides you with detailed information about the Monsanto Roundup Ready Soybean Grower Agreement.

We appreciate any assistance you can provide in helping soybean growers learn more about the Roundup Ready market approach and use of this new technology. Your role is important in positioning to growers the new responsibilities and benefits that come with biotechnology products. Should you have any questions, or if we can help you further, feel free to contact your local Monsanto Product Development Manager or your Monsanto Local Market Manager.

Sincerely,

B. A. Alesii
Manager, Roundup Ready Soybean Technology

P.S. We are also enclosing Roundup® and Roundup® Ultra Supplemental Labels For Use In Soybeans.

/enclosures (3)

Specimen Label

RESTRICTED USE PESTICIDE

May Injure (Phytotoxic) Susceptible, Non-Target Plants. For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification. Commercial certified applicators must also ensure that all persons involved in these activities are informed of the precautionary statements.

PICLORAM	GROUP	4	HERBICIDE
2,4-D	GROUP	4	HERBICIDE

CORTEVA™ agriscience

GrazonPD3™

HERBICIDE

Causes Substantial but Temporary Eye Injury • Harmful If Swallowed

Do not get in eyes or on clothing. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

Personal Protective Equipment (PPE)

Some materials that are chemical-resistant to this product are barrier laminate, butyl rubber ≥ 14 mils, nitrile rubber ≥ 14 mils, neoprene rubber ≥ 14 mils, polyvinyl chloride ≥ 14 mils, or viton ≥ 14 mils.

All mixers, loaders, applicators, flaggers and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- Protective eyewear (goggles, face shield, or safety glasses)
- Chemical-resistant gloves, when applying with any handheld nozzle or equipment, mixing or loading, cleaning up spills or equipment, or otherwise exposed to the concentrate.
- Chemical resistant apron when mixing or loading, cleaning up spills or equipment, or otherwise exposed to the concentrate

See Engineering Controls for additional requirements.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them.

Engineering Controls

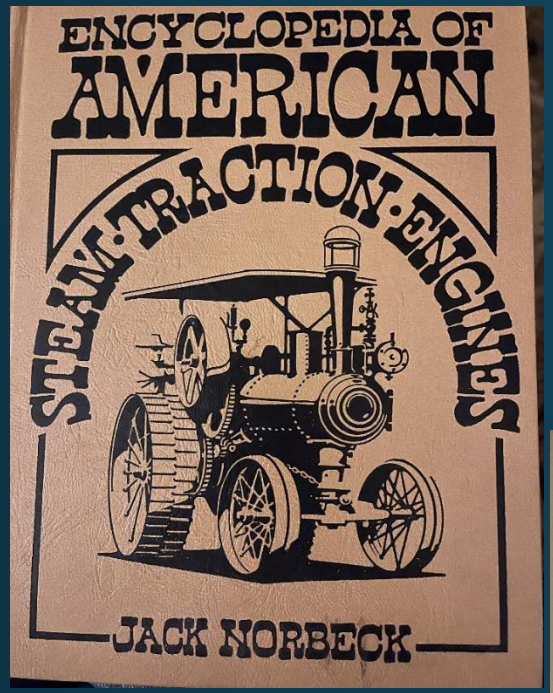
When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240(d)(4-6), the handler PPE requirements may be reduced or modified as specified in the WPS.

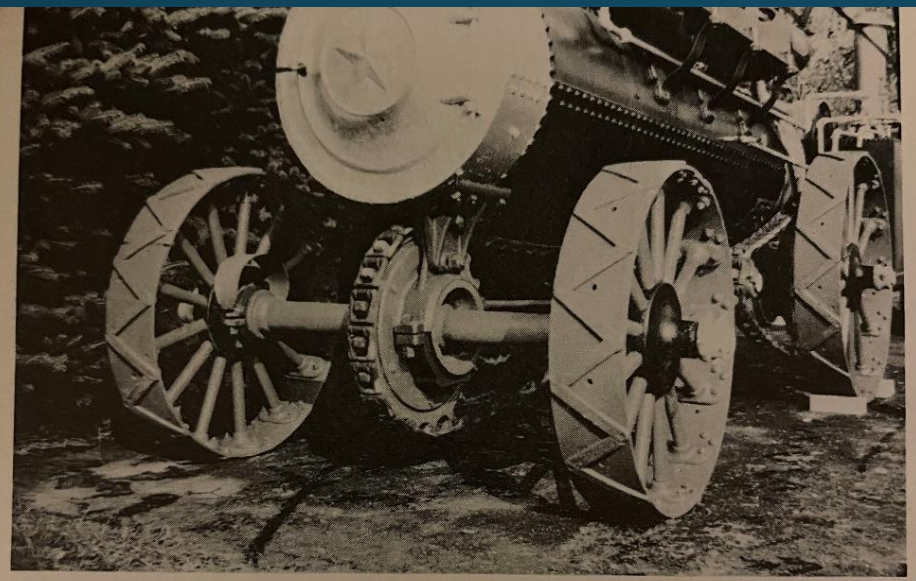
Pilots must use an enclosed cockpit that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)].

User Safety Recommendations:

Users should:

- Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet





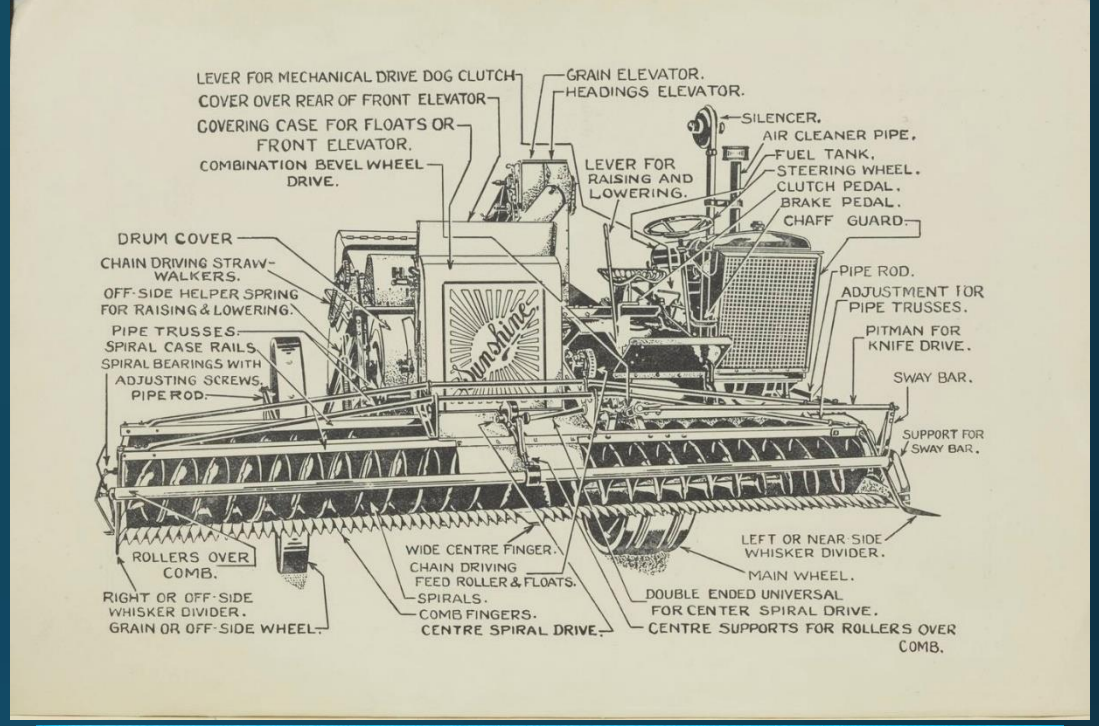
This is the front-wheel-drive system used on the 12 H.P. Lansing of 1897. The solid front axle could pivot within the large sprocket, thus allowing the front wheels to steer in a conventional manner even while under power. However, on a turn it is obvious that the inner wheel would have to spin while the outer wheel would drag, to compensate for the difference in the radius of the turn. This engine, the only known example of a Lansing, was owned by the late Rev. Elmer Ritzman, a Methodist minister for 42 years, and founder and publisher of "Iron-Man Album Magazine," and "Gas Engine Magazine." The engine is now residing in North Carolina.

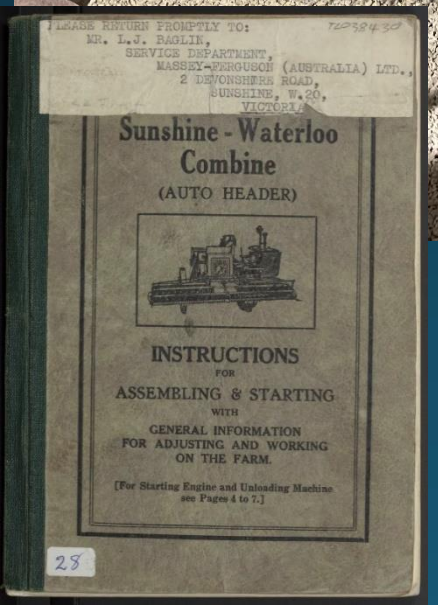
Photo credit: John Deere

Once transported to the field, a farmer configures the machine for autonomous operation. Using the John Deere Operations Center mobile app, a simple swipe starts the autonomous tractor. While it works, a farmer can leave the field to focus on other tasks, yet still monitor the machine remotely from a mobile device. Access to live video, images, data, and metrics allows a farmer to adjust speed, depth, and more.

• **READ MORE:** Deere says its robo-tractors are ready to till the fields

Should an anomaly or an issue appear in the field, a farmer will be alerted and be able to adjust, so the machine's performance is optimized. The autonomous 8R tractor can prep 225 acres in 24 hours




PLEASE RETURN PROMPTLY TO:
MR. L.J. BAGLIN,
SERVICE DEPARTMENT,
MASSEY-FERGUSON (AUSTRALIA) LTD.,
2 DEVONSHIRE ROAD,
SUNSHINE, W.20,
VICTORIA.

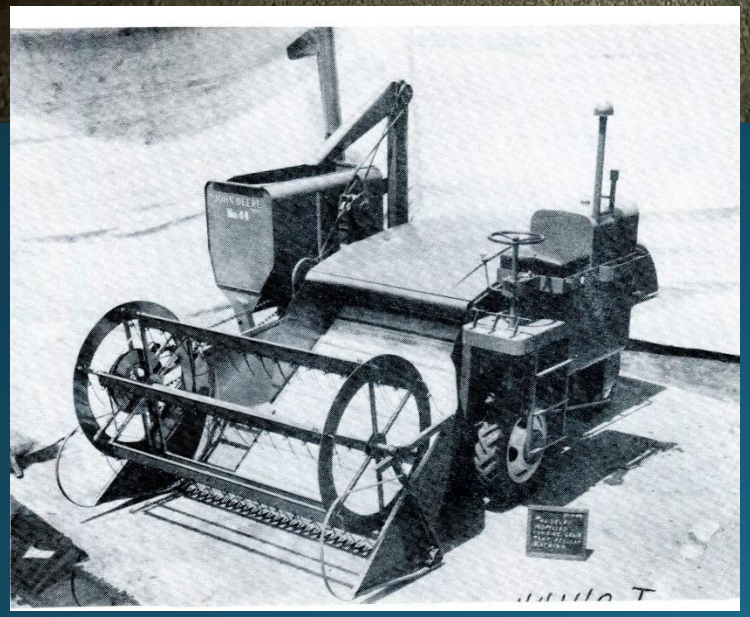
Sunshine - Waterloo Combine

(AUTO HEADER)

INSTRUCTIONS
FOR
ASSEMBLING & STARTING
WITH
GENERAL INFORMATION
FOR ADJUSTING AND WORKING
ON THE FARM.

[For Starting Engine and Unloading Machine see Pages 4 to 7.]

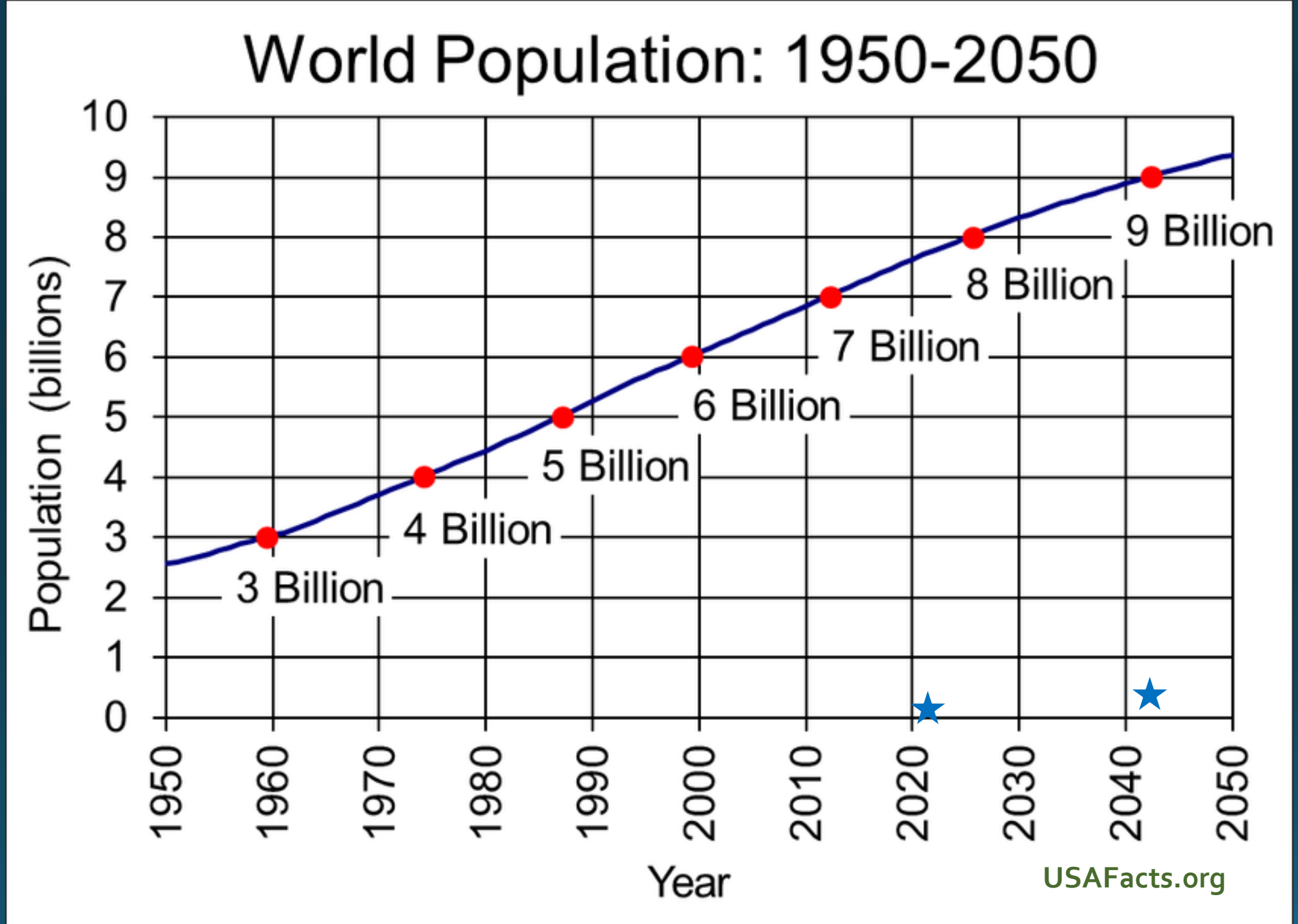
28



Developed by Corps of Engineers in 1940 to reduce US reliance on foreign oilseed rape (ie canola), a key component of synthetic rubber.


JOHN DEERE
X9


JOHN DEERE


World Population: 1950-2050
Population (billions)
10
9
8
7
6
5
4
3
2
1
0
3 Billion
4 Billion
5 Billion
6 Billion
7 Billion
8 Billion
9 Billion
1950
1960
1970
1980
1990
2000
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2020
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2040
2050
Year
USAFacts.org

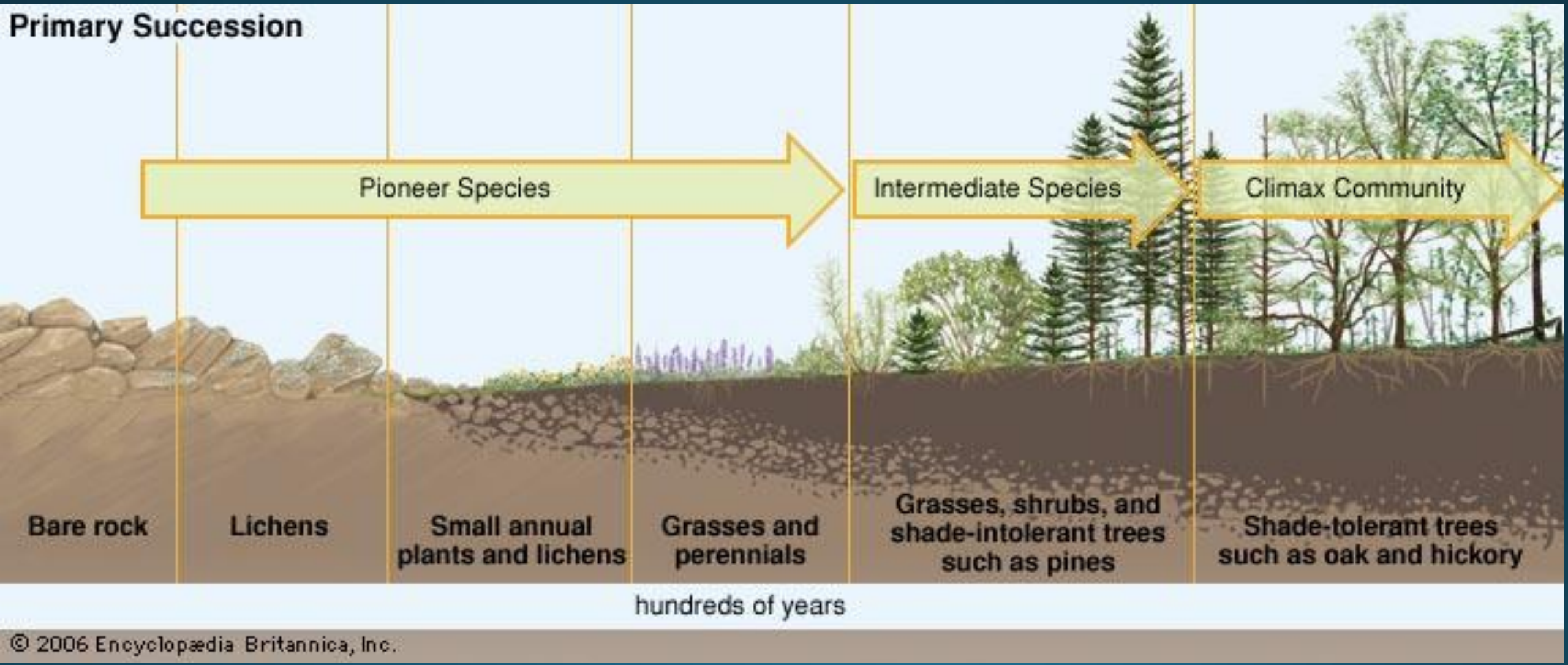
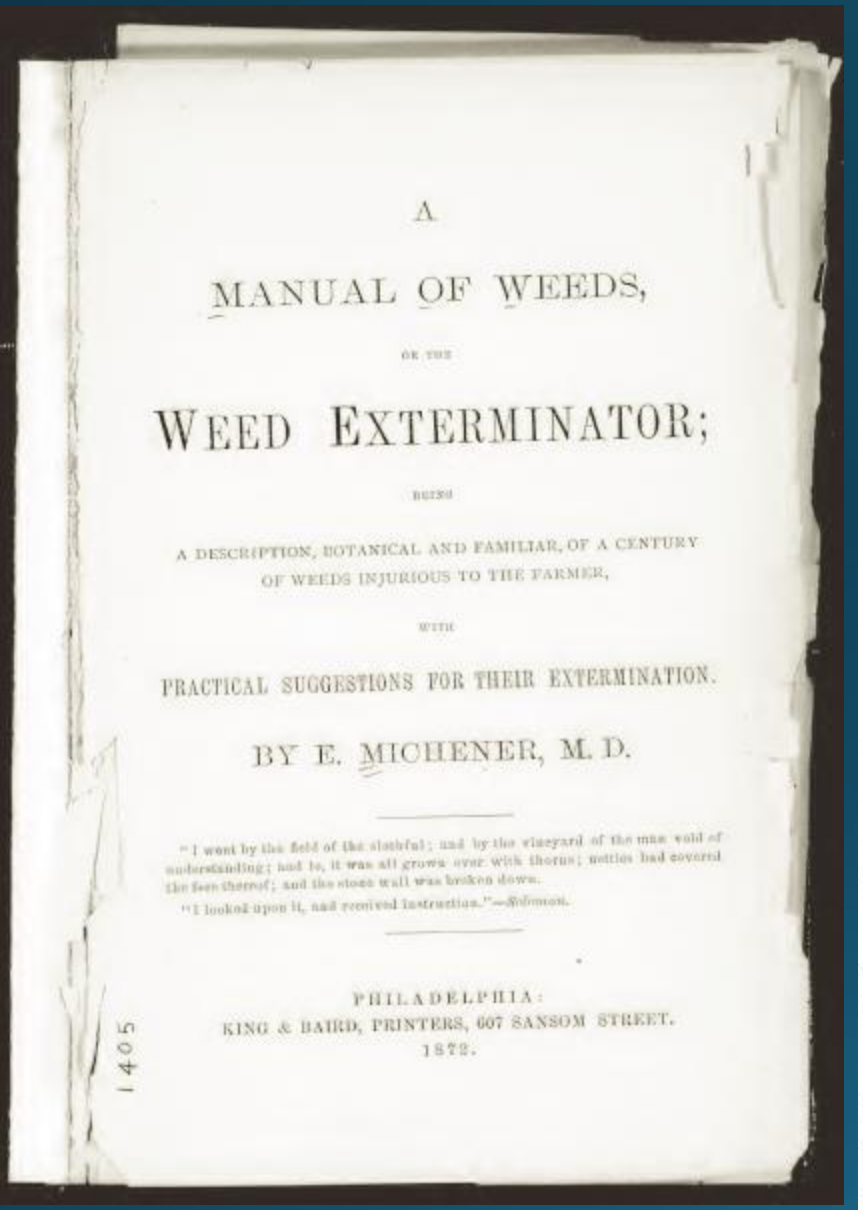

Primary Succession
Pioneer Species
Intermediate Species
Climax Community
Bare rock
Lichens
Small annual plants and lichens
Grasses and perennials
Grasses, shrubs, and shade-intolerant trees such as pines
Shade-tolerant trees such as oak and hickory
hundreds of years
© 2006 Encyclopædia Britannica, Inc.

Table 2. Eminently pernicious weeds from Agricultural Botany: An Enumeration and Description of Useful Plants and Weeds, Which Merit the Notice, or Require the Attention, of American Agriculturalists (Darlington 1847) with proposed and popular common names of the period and current nomenclature and common names. Blank cells indicate no name provided.

https://doi.org/10.1017/wet.2023.64

Scientific name	Proposed common name	Popular common name(s)	Current scientific name	Current common name
Darlington (1847)			(USDA NRCS 2023)[a]	
Lychnis githago Lam.		Cockle, corn cockle	*Agrostemma githago* L. (WFO 2023c)	Common corn cockle
Daucus carota L.	Carot daucus	Carrot, wild carrot	*Daucus carota* L.	Queen Anne's lace
Xanthium spinosum L.	Spinose xanthium	Thorny clot-bur	*Xanthium spinosum* L.	Spiny cocklebur
Leucanthemum vulgare Lam.	Common leucanthemum	Daisy, oxeye daisy, white weed	*Leucanthemum vulgare* Lam.	Oxeye daisy
Cirsium arvense Scop.	Field cirsium	Canada thistle, cursed thistle	*Cirsium arvense* (L.) Scop.	Canada thistle
Linaria vulgaris Mill.	Common linaria	Toad-flax, ranstead-weed, butter and eggs	*Linaria vulgaris* Mill.	Butter and eggs
Echium vulgare L.	Common echium	Blue-weed, viper's bugloss, blue devils	*Echium vulgare* L.	Common viper's bugloss
Convolvulus arvensis L.	Field convolvulus	Bind-weed	*Convolvulus arvensis* L.	Field bindweed
Solanum carolinense L.	Carolinian solanum	Horse nettle	*Solanum carolinense* L.	Carolina horsenettle
Amaranthus spinosus L.	Thorny amaranthus		*Amaranthus spinosus* L.	Spiny amaranth
Ornithogalum umbellatum L.	Umbellate ornithogalum	Ten o'clock	*Ornithogalum umbellatum* L.	Star of Bethlehem
Cyperus repens Ell.	Creeping cyperus	"Nut-grass" of Florida	*Cyperus esculentus* L. (WFO 2023h)	Yellow nutsedge
Cyperus hydra Mx.	Hydra cyperus	"Nut-grass" of South Carolina, "coco-grass"	*Cyperus rotundus* L. (WFO 2023i)	Purple nutsedge
Cenchrus tribuloides L.	Tribulus-like cenchrus	Bur-grass, hedge-hog grass	*Cenchrus tribuloides* L.	Sanddune sandbur
Triticum repens L.	Creeping triticum	Couch-grass, quitch-grass	Elymus repens (L.) Gould	Quackgrass

[a]Unless otherwise stated.



A

MANUAL OF WEEDS,

OR THE

WEED EXTERMINATOR;

BEING

A DESCRIPTION, BOTANICAL AND FAMILIAR, OF A CENTURY OF WEEDS INJURIOUS TO THE FARMER,

WITH

PRACTICAL SUGGESTIONS FOR THEIR EXTERMINATION.

BY E. MICHENER, M. D.

"I went by the field of the slothful; and by the vineyard of the man void of understanding; and lo, it was all grown over with thorns; nettles had covered the face thereof; and the stone wall was broken down.
"I looked upon it, and received instruction."—*Solomon.*

PHILADELPHIA:
KING & BAIRD, PRINTERS, 607 SANSOM STREET.
1872.

1405

SYNOPSIS OF THE MANUAL, &c.

It is not the wish of the writer, that this small, and unpretentious volume, should supersede the larger and more complete, AGRICULTURAL BOTANY, of his excellent friend, the late Dr. William Darlington. It, and the more elaborate FLORA CESTRICA, will continue to be, an honorable memento of his Botanical acumen, and scientific attainments.

To me is allotted the humbler task; to place in the hands of the young, and intelligent, culturist, whether on the farm, or in the garden, a cheap, and reliable HANDBOOK OF WEEDS.

To paint, in strong colors, a *finger-board*, which shall continually, direct his attention to the noxious plants which everywhere encumber his path.

To suggest means, based upon a practical study of the natural history, and habits, of the weeds themselves, for their successful extermination.

In the fulfilment of this important purpose, no apology will be required, for following closely, and copying largely, from the works referred to.

Nor can I too strongly recommend, to every one who desires to obtain a practical knowledge of the subject, to study, carefully, the elementary works of Prof. Asa Gray, especially his "HOW PLANTS GROW," and his "BOTANICAL TEXT-BOOK."

"…to place in the hands of the young, and intelligent culturist…

HANDBOOK OF WEEDS…..

…To suggest means, based upon a practical study of the natural history, and habits, of the weeds themselves, for their successful extermination…."

Ezra Michener 1872

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when each piece which retains a bud, soon vegetates, and forms a new plant (*Cirsium, or Canada thistle*).

Bulbs, annually, form a corona of small *bulblets*, around the parent (*Allium, or garlic*). These bulblets are easily separated, and dispersed, where they speedily form new plants.

Tubers are sometimes produced even in much greater abundance (*Cyperus, or Coco grass*). From a kindred species of *Cyperus*, I collected 500 tubers, which were about the half of the annual product of one such tuber, planted in the spring.

A few general propositions of a practical character may not be out of place, in relation to weeds in general; but more especially, to those of the present division (*Bi-per-annuals*).

1. Never permit a noxious weed to mature, and sow, its seeds.

2. Whenever the *leprosy spot* appears, no matter whether it is measured by inches, or by acres; immediately circumscribe it, in such a way, that no process of tillage, no agricultural implements; or other means can carry its roots into healthy ground.

3. Whenever practicable, thorough hand-digging, and the destruction of the roots; should precede all other operations. Carefully watching for, and promptly removing, any remaining plants, as soon as they appear.

4. Vegetable physiology teaches, that the leaves of plants, are the essential organs of digestion, assimilation, and respiration. They are the vitalizing, life-sustaining organs of the plant. Hence it follows, as an obvious *corollary*, that the leaves, as they are the most accessible; so they are also, the most *vulnerable* part of the organism;

"Never permit a noxious weed to mature, and sow, its seeds."

Yearbook of Department of Agriculture 1895

SOME ADDITIONS TO OUR VEGETABLE DIETARY.

By Frederick V. Coville,
Botanist, U. S. Department of Agriculture.

Up to the present time chemistry has shown in a general way what substances are required for building and repairing the body, for keeping it warm, and for making it work. It has shown, too, approximately, what amount of lean meat, fat meat, flour, sugar, etc., ought to produce the desired result, but it has not yet shown in detail what kinds of these various types of food will suit the taste, digestion, and physiological needs of particular persons or particular conditions. An exclusive diet of salt meat and beans in the arctic region produces the physiological condition known as scurvy. In some parts of the country a diet of corn bread, bacon, and molasses has been persisted in to such an extent as to produce a widespread and almost chronic condition of biliousness. The conclusion from such cases is that in the selection of foods we must take into account the appetite, power of digestion, and physiological peculiarities of the individual; in these matters each man is necessarily his own judge. There seems little doubt, in general, that a wider use of green vegetables in the dietaries of most of our people, particularly those with healthy digestion, would be a marked benefit.

In the year's diet of wild herbivorous animals, the fats and the carbohydrates, principally stored in seeds in the form of oil and starch, furnish the chief foods in autumn, and on them the animals fatten, providing themselves with the necessary store of bodily fuel for the winter. In the spring, when they have usually exhausted this stored fat, their principal food is green herbage, and upon this they renew their muscular vigor and general vitality. A similar yearly routine prevails among savage races, as illustrated by many tribes of our Western Indians. So far as the naturalness of a diet of green vegetables is concerned, there can be no doubt that it formerly was and that it still is adapted to the requirements of the human body. But since the beginning of civilization the food of mankind has come to be more and more artificial in character, until foods are now selected more by custom than by instinct. The habit of eating salads and boiled green vegetables, commonly referred to as pot herbs or

Tartary and shows no tendency to become established as a weed.

Fig. 44.—Pigweed (*Amarantus palmeri*).

Pigweed (*Amarantus palmeri*).—None of the common pigweeds introduced from tropical America and common in our cultivated fields, such as *A. retroflexus* and *A. chlorostachys*, appear to have come into use as pot herbs, although a variety of *A. gangeticus* is commonly cultivated by the Chinese in California for this purpose. Among our Southwestern Indians, both in Arizona and in northern Mexico, as well as among the Mexicans themselves, a native species, *A. palmeri*, is used largely in a similar manner (fig. 44). In the markets of Guaymas, in the State of Sonora, it is sold in large quantities, the young plants growing each year from seed and being gathered when they are from 6 to 10 inches high. No attempt seems to be made to cultivate the plant, the Mexicans trusting entirely to the natural supply. From the suggestive use of these species of pigweed among the Chinese and the Mexicans, a trial of some of our other species may well be made.

Pokeweed (*Phytolacca decandra*).—This is a native plant of the United States, growing throughout almost all parts, except the extreme north, as far westward as the Great Plains. It occurs commonly in rich, uncultivated ground, in open places in woods, or in

PESTICIDES

Following several fallow decades, herbicide companies are searching for new modes of action

Scientists hope new tools will help them kill weeds that have evolved to tolerate existing chemicals

by **Matt Blois**

June 17, 2022 | A version of this story appeared in **Volume 100, Issue 22**

THE HERBICIDE DROUGHT

Steve Duke, an herbicide researcher at the University of Mississippi, blames the lack of new modes of action on three main factors: the introduction of crops that were genetically modified to tolerate glyphosate, increased regulatory costs, and industry consolidation.

Monsanto, now owned by Bayer, first introduced Roundup Ready soybean seeds in 1996. Plants grown from these seeds are genetically modified to survive applications of glyphosate, the active ingredient in Roundup herbicide. Farmers can spray entire fields with glyphosate without harming their own crops. The Roundup Ready system worked so well that it didn't make sense for chemical companies to try to discover something better.

"Some companies quit doing herbicide discovery," Duke says. "Others reduced the amount of herbicide discovery they were doing dramatically."

In a **2011 paper**, Duke cited patent data showing that the number of patents issued in the US for herbicides dropped from more than 432 in 1997 to 65 by 2009. At the height of enthusiasm for glyphosate, Duke says, crop protection companies likely had herbicides with new modes of action in development but didn't advance them because executives worried they wouldn't be competitive. "People weren't willing to take that risk," he says.

At the same time, the cost of complying with regulations was rising. A **2018 study** funded by the industry group CropLife International estimated that registration-related costs for a new active ingredient more than doubled between 1995 and 2014 globally. It also found that the introduction of active ingredients for herbicides peaked in the 1990s, with nearly 60 new products that decade. Fewer than 20 ingredients were introduced in the 2010s.

Steve Duke, retired USDA plant physiologist

1) Roundup Ready crops
2) Increased regulatory costs
3) Industry consolidation

CropLife International study

1) Registration costs doubled 1995-2014
2) New herbicide active ingredients peaked 1990s (nearly 60); fewer than 20 2000-2010

John Deere Enters Joint Venture with Autonomous Sprayer Company

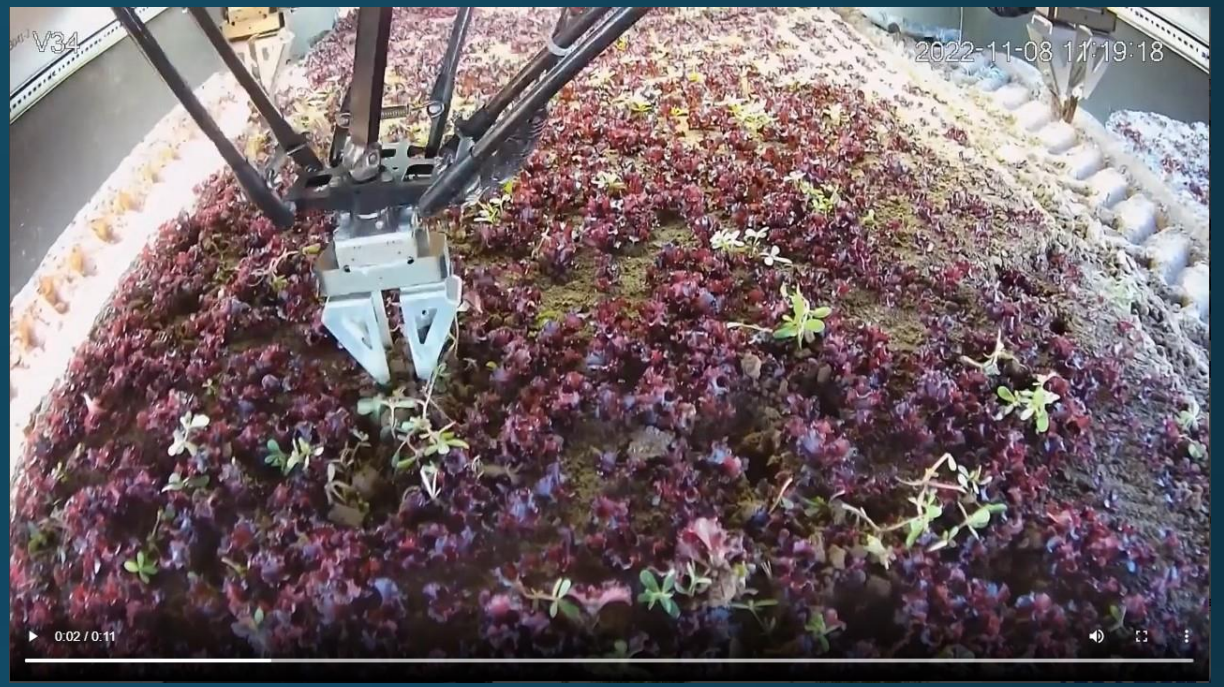
GUSS is based in Kingsburg, California and has engineered a semi-autonomous orchard and vineyard sprayer.
(GUSS)

By **MARGY ECKELKAMP** April 21, 2022

On the heels of announcing a joint venture with SureFire Ag Systems, John Deere announces a joint venture with GUSS Autonomation.

GUSS is based in Kingsburg, California and has
orchard and vineyard sprayer. With its


New Technology for Weed Identification and Control
Copy link
Steven Mirsky
Robotti
Weeding Robots
are here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Picture in picture


naïo
#1
ORIO Agriculture Robot from NAIO Technologies
ORIO is our largest and most versatile Agriculture Robot designed for vegetable row crops and orchards. Like all our units, it is f...

Weed Science

www.cambridge.org/wsc

Exploring the potential of electric weed control: a review

Miranda J. Slaven[1], Maximilian Koch[2] and Catherine P. D. Borger[1]

[1]Research Scientist, Department of Primary Industries and Regional Development, Northam, WA, Australia and [2]Head of Research and Development, Zasso GmbH, Aachen, Germany

Review

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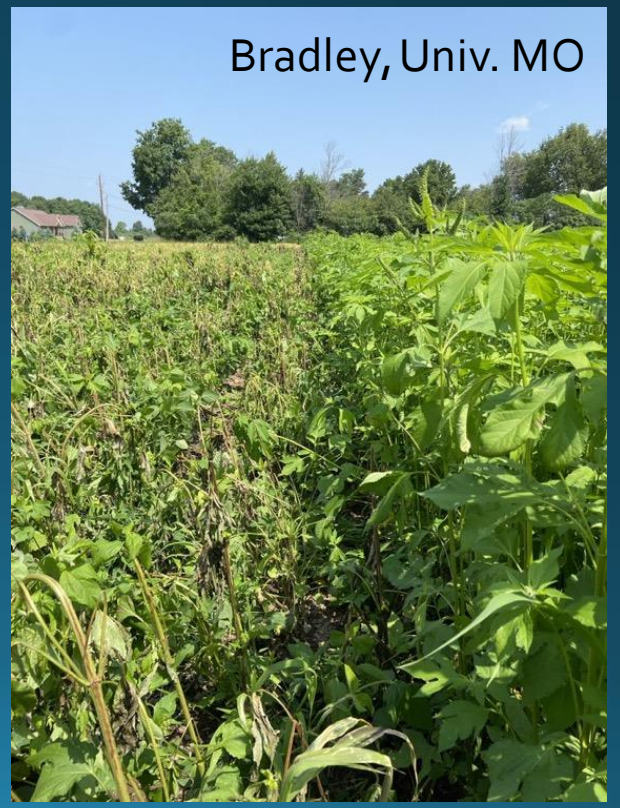
Abstract

Weed management is a significant challenge that must be addressed both globally and in Australia, where traditional methods of control have become limited. The avoidance of mechanical practices has resulted in reduced erosion but has also led to an increased reliance on chemicals and a subsequent increase in rates of herbicide resistance. To address this challenge, alternative forms of weed management, such as electric weed control (electro-weeding), need to


Photo George Mullendore


LASCO
LIGHTNING WEEDER
Photo George Mullendore


Bradley, Univ. MO

2022 MODELS SOLD OUT · ACCEPTING 2023 PRE-ORDERS · RESERVE YOURS TODAY

LASERWEEDER

carbonrobotics.com

NEW FOR '22! 20-FT WIDE IMPLEMENT

CARBON ROBOTICS

PERFORMANCE	TECHNOLOGY	PHYSICAL SPECS
KILLS UP TO 200,000 WEEDS/HOUR	30X 150W CO_2 10.6µm LASERS WITH TRACKING CAMERAS	LIFTABLE WEEDING IMPLEMENT WITH 20-FT COVERAGE WIDTH
SUB-MILLIMETER ACCURACY	9X LED BEDTOP LIGHTING BARS & 12X HI-RES PREDICT CAMERAS	PULLS BEHIND ROW TRACTORS WITH CAT3 3-POINT HITCH
KILLS UP TO 99 PERCENT OF WEEDS	AI/ML DYNAMIC DEEP LEARNING MODELS	60-84" ADJUSTABLE ROW SPACING
COVERS 2 ACRES/HR AT 1MPH	PRECISION COMPUTER VISION SOFTWARE	PTO OR GENERATOR POWER SUPPLY
INCREASES CROP YIELD, QUALITY, AND CONSISTENCY	ISOBUS TOUCHSCREEN DISPLAY (TIM OPTIMIZATION IN 2023)	OVERALL DIMENSIONS 240"W X 117"L X 106"H
WORKS DAY OR NIGHT IN ALL CONDITIONS		

CLASS 4 LASER PRODUCT
DANGER - INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

22-08

MADE IN THE USA · DESIGNED IN SEATTLE · BUILT IN DETROIT

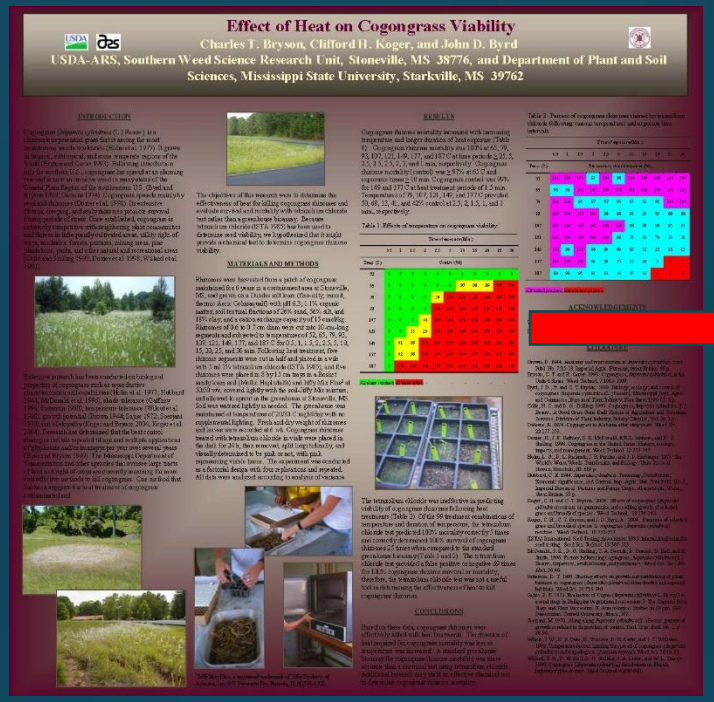
Photo credit: John Deere

Once transported to the field, a farmer configures the machine for autonomous operation. Using the John Deere Operations Center mobile app, a simple swipe starts the autonomous tractor. While it works, a farmer can leave the field to focus on other tasks, yet still monitor the machine remotely from a mobile device. Access to live video, images, data, and metrics allows a farmer to adjust speed, depth, and more.

• **READ MORE:** Deere says its robo-tractors are ready to till the fields

Should an anomaly or an issue appear in the field, a farmer will be alerted and be able to adjust, so the machine's performance is optimized. The autonomous 8R tractor can prep 225 acres in 24 hours.


0:04 / 0:30



Effect of Heat on Cogongrass Viability

Charles T. Bryson, Clifford H. Koger, and John D. Byrd
USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776, and Department of Plant and Soil Sciences, Mississippi State University, Starkville, MS 39762

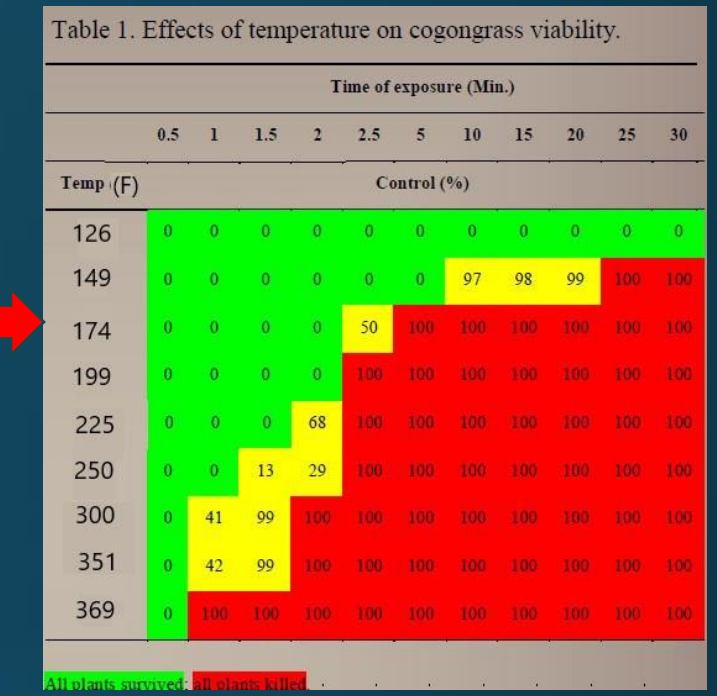


Table 1. Effects of temperature on cogongrass viability.

	Time of exposure (Min.)										
	0.5	1	1.5	2	2.5	5	10	15	20	25	30
Temp (F)	Control (%)										
126	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	97	98	99	100	100
174	0	0	0	0	50	100	100	100	100	100	100
199	0	0	0	0	100	100	100	100	100	100	100
225	0	0	0	68	100	100	100	100	100	100	100
250	0	0	13	29	100	100	100	100	100	100	100
300	0	41	99	100	100	100	100	100	100	100	100
351	0	42	99	100	100	100	100	100	100	100	100
369	0	100	100	100	100	100	100	100	100	100	100

All plants survived; all plants killed

Fennimore 2023

158 °F

How soil steaming works

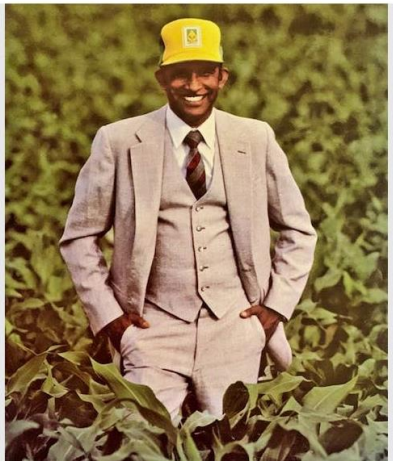
1. Inject steam into the soil to raise soil temperature to 70° C for 20 minutes
2. Steam transfers heat from heat source to target soil particles
3. When steam contacts cool soil particles, the steam molecules condense releasing heat to the soil particles
4. Steam kills the pathogens in an around the soil particle
5. Steam also kills weed seeds and nutsedge tubers

Aqua Heat Technology's Soil-Sterilizing System

Innovator: Harry Rajamannan

Purely by accident, in 1989 Harry Rajamannan came up with a system for killing weeds: he sprayed them with hot water. Hot water, it seems, dissolves the leaves' waxy coating, allowing the moisture inside to escape. Although the method worked well enough, Rajamannan admits it was not a major discovery. The entrepreneur was looking for a green method of killing bugs, not weeds.

A.H.J. 'Dr. Harry' Rajamannan, DVM, Ph.D.



In 1992, however, the Environmental Protection Agency decided to ban methyl bromide, a cheap, widely used pesticide, as of the year 2000. As it turns out, the substance is one of the most potent ozone depleters known to science, and each year American farmers use 64 million pounds of the gas to sterilize soil and kill the nematodes and fungi that attack strawberries, tomatoes, and other fruits and vegetables. Without a clean alternative, billions of dollars in crops could be threatened.

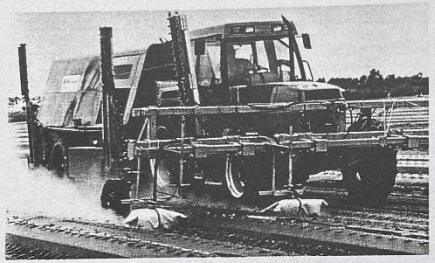
Nothing could be cleaner, of course, than hot water. So Rajamannan, president and founder of Aqua Heat Technology of Minneapolis, took his weed-killing machine, equipped with a

DIFFERENT APPLICATIONS

The Aqua Heat machine is university tested and proven effective in many applications:

AGRICULTURAL

- All Fruit & Nut Trees
- Orchard Floor Management
- Row Crops &Vegetables Crops
- White Fly & Other Insect Control (post harvest)
- Grapes
- Alfalfa (dodder control)
- Potato Vine Desiccation
- Cotton Desiccation
- Small Organic Farms - Weed Control (small unit available mid 1994)



In-row vegetable application

MUNICIPAL

- Highways /Roadsides
- Parks & Walking Paths
- School Playgrounds
- Athletic Fields
- Golf Courses

RAILROADS

- Railways, Railroad Yards, Crossings and Other Urban Areas

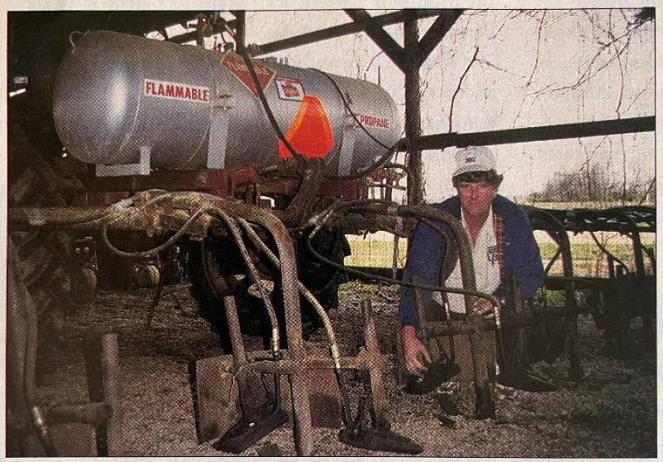
State and local transportation departments are some of the largest herbicide users. The Aqua Heat machine gives DOT's an effective alternative to chemicals.

Roadside demonstration for California DOT

48 hours after Aqua Heat treatment


AVERY CO
AVERY CO
PEORIA ILL.
Club Car

They're "flame-kissing" their weeds good-bye



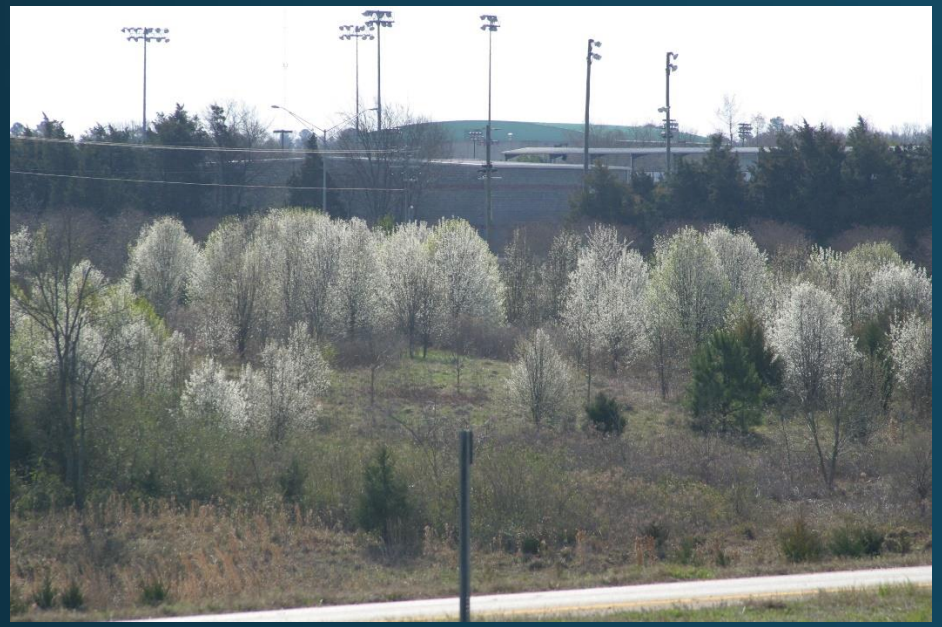
Pete Hunter, manager of Stovall Farms near Clarksdale, Miss., checks the condition of the flame cultivators which will be used this season in cotton. The cultivator is pulled by a high clearance tractor and fed by a 250-gallon propane gas tank and a 250-gallon water tank. Photo by Klink Cook.

BY KLINK COOK

Weed problems and problem weeds are causing a number of Mid-South farmers to bring back one of the popular control methods of nearly a half century

a cost of 70 cents a gallon, or $2.80 to $3.50 an acre. One trip with a herbicide can be $7 per acre or more.

"We can kill running morninglories with a flame cultivator when we can't kill them with anything else," says Hunter. "We've been very happy with it, even



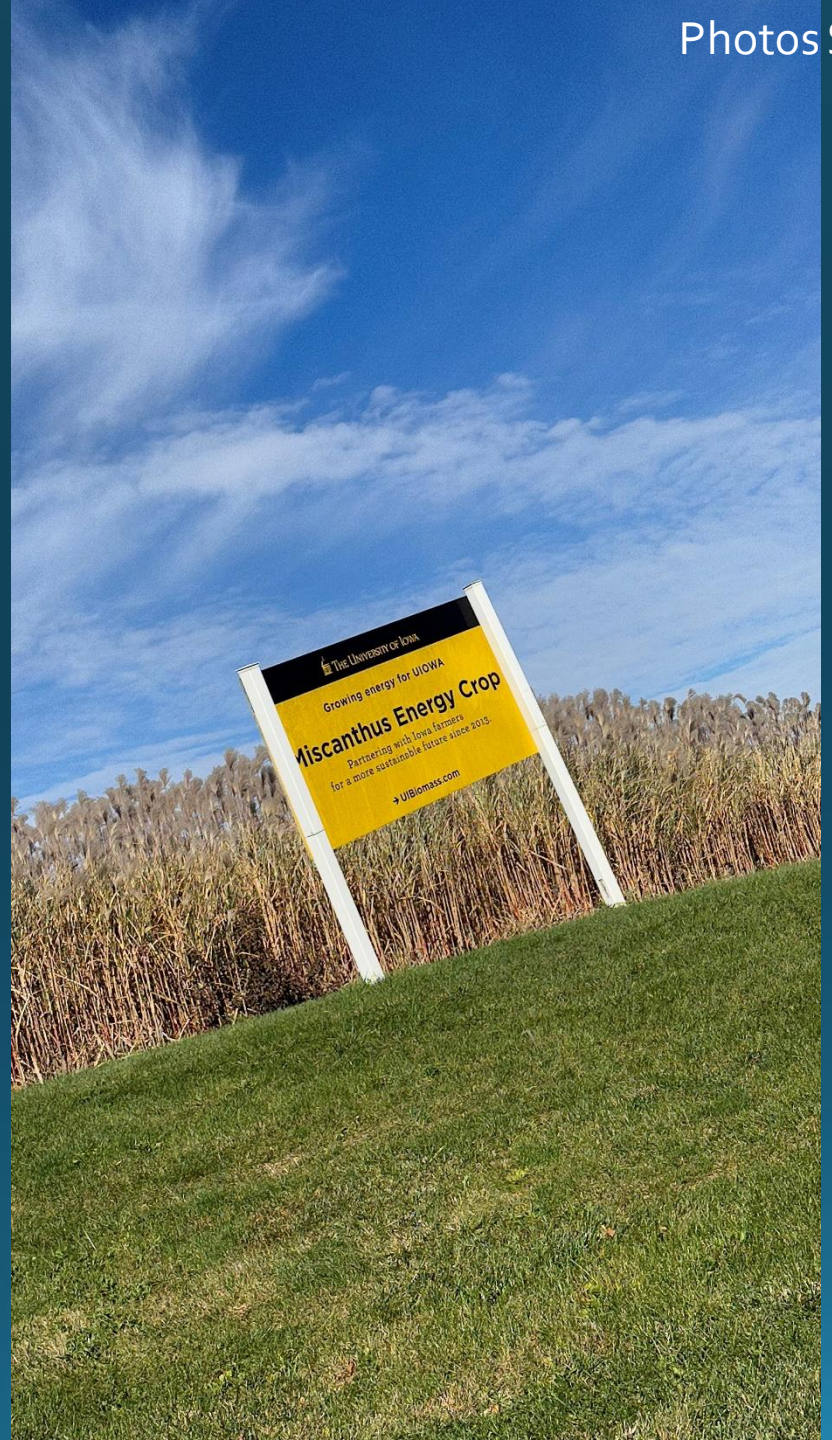

CATERPILLAR

Biofuels: Illinois Researchers Receive $1 Mln to Study Bioenergy Crops

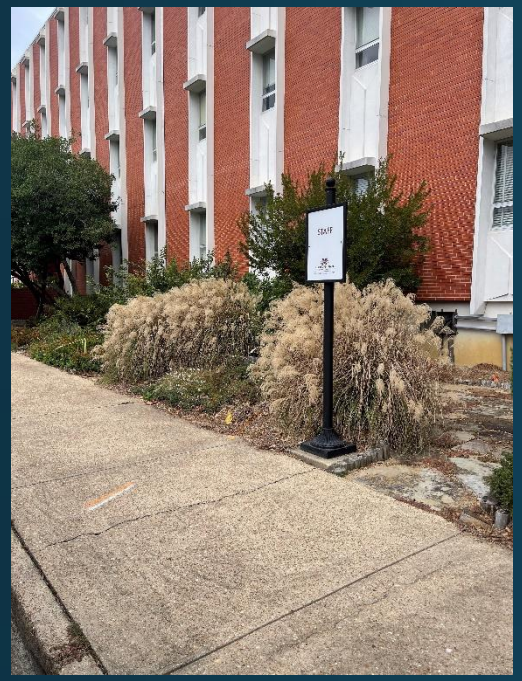
Posted on April 2, 2018
By Lauren Quinn, University of Illinois

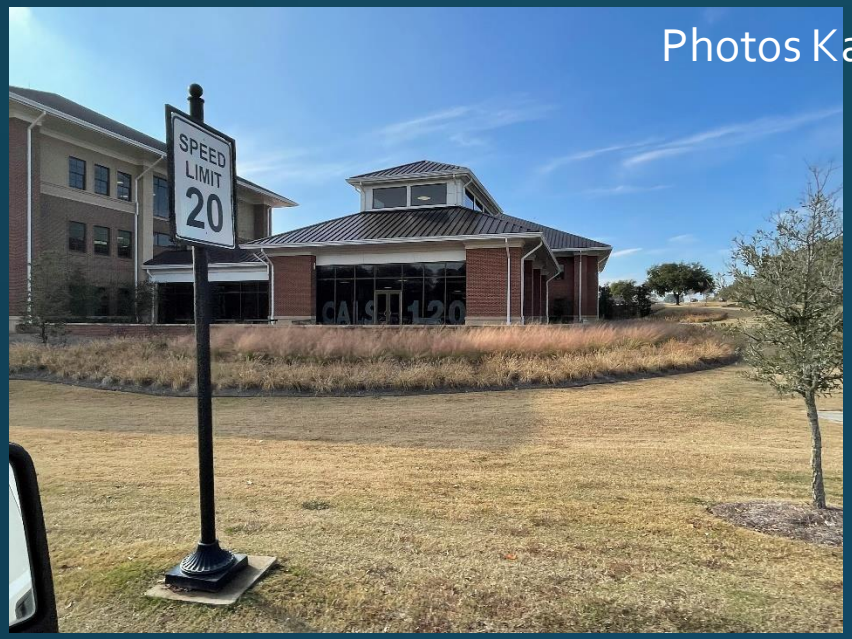
The USDA National Institute of Food and Agriculture has announced a grant for $1 million to support research led by a University of Illinois scientist. The research will address the need for better-adapted and higher-yielding biomass cultivars ready to plug into the biofuel supply chain in the United States.

Photos Sarah Clark

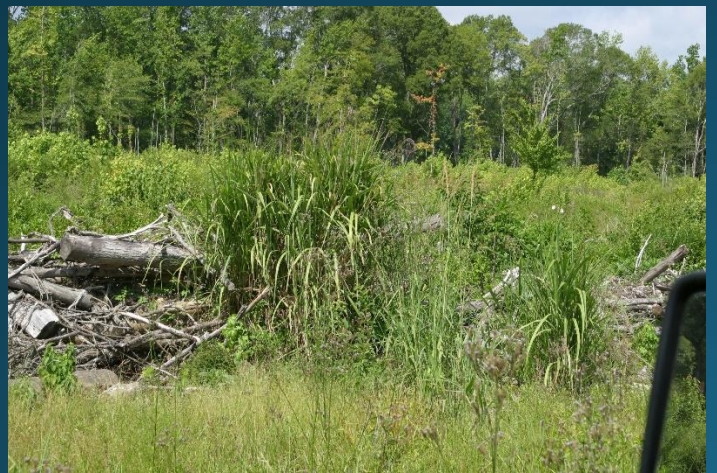


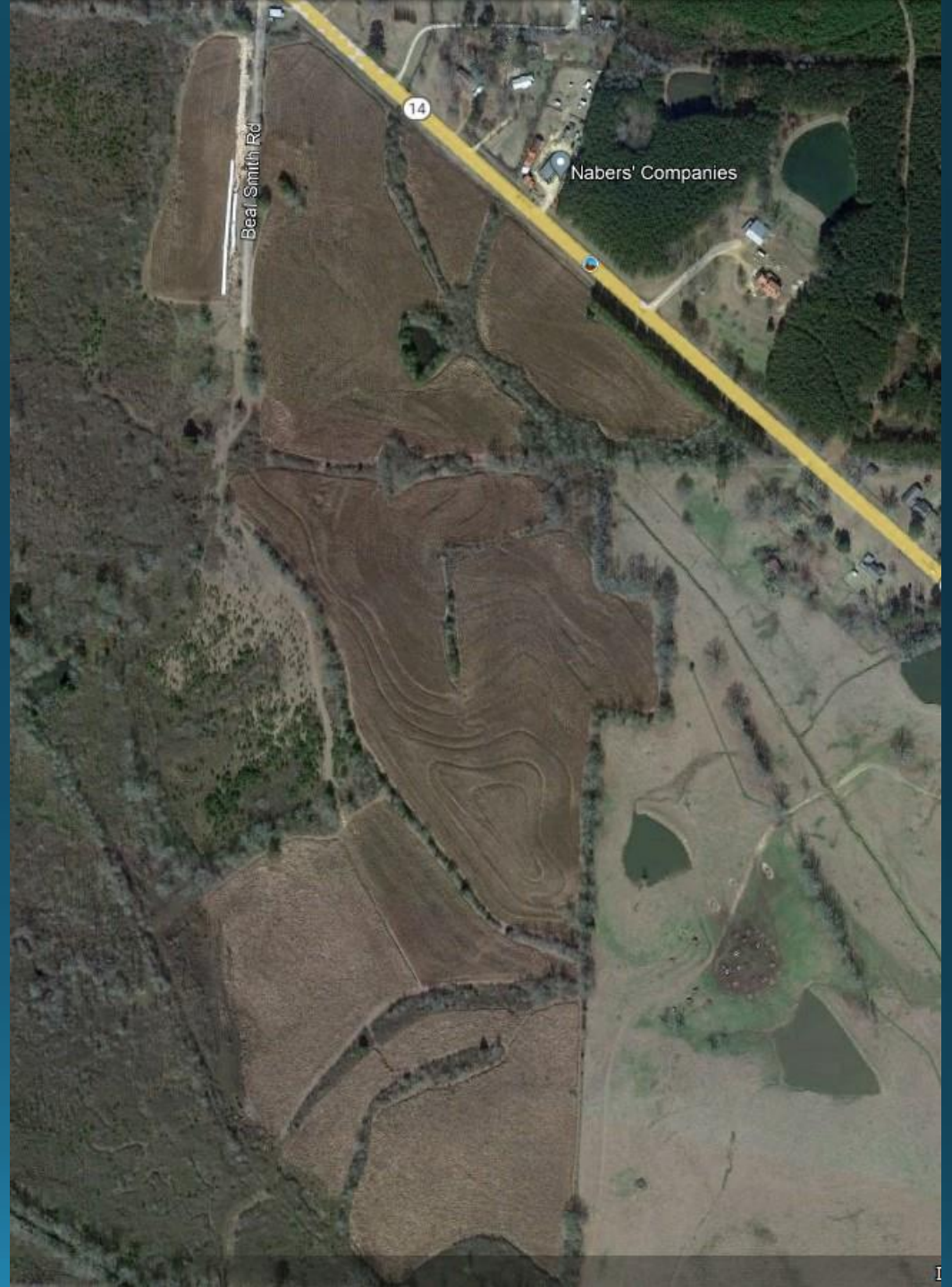
Photos Kayla Broster





Miscanthus escapes on Biltmore forest, NC, and along I-26 and I-40 ROWs

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Beal Smith Rd
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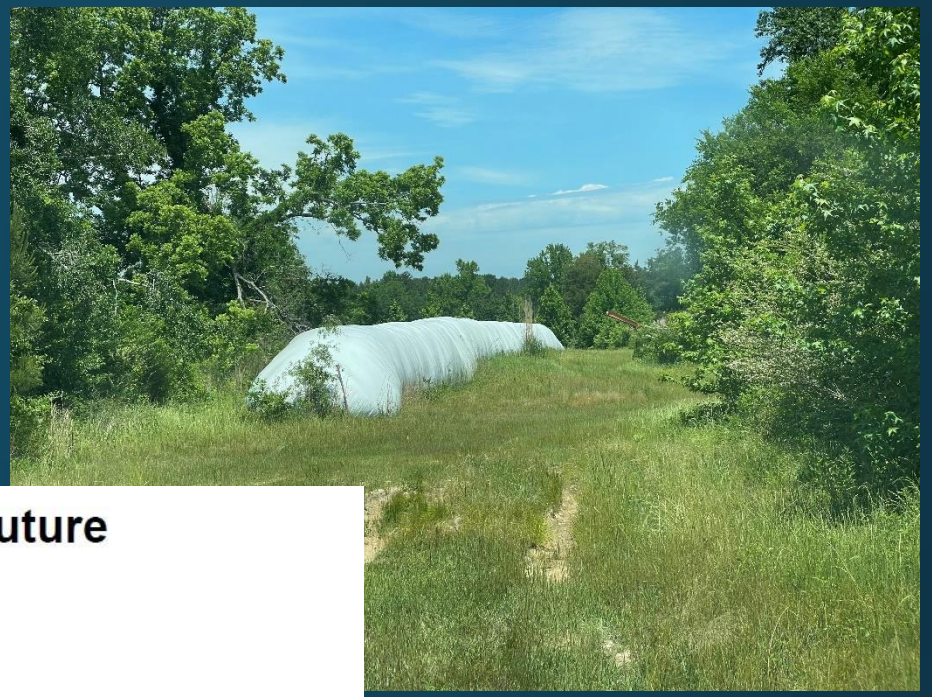


KiOR has 'substantial doubts' about future

William Browning
March 18, 2014 10:35:44 AM

KiOR may be done in Columbus.

The Texas-based alternative fuel company shut down operations at its local biomass conversion facility in December. In January, Fred Cannon, the company's president and CEO, said the plan was to spend the first three months of 2014 implementing improvements at the $225 million plant, which sits on 30 acres on The Island.

On Monday, however, the company filed its end-of-the-year financials with the Securities and Exchange Commission. The 257-page report paints a bleak picture of the company's future.

"We have substantial doubts about our ability to continue," the company states in the filing.

KiOR officials said the company needs to secure additional capital to continue operating. Until that happens the plant will remain in a "safe, idle state," KiOR officials said.

Last week, Vinod Khosla, an investor from California, committed up to $25 million to the company. That commitment will be made in monthly installments of no more than $5 million each month "and will be conditioned on the achievement of certain performance milestones to be mutually agreed between Mr. Khosla and us," the filing states.

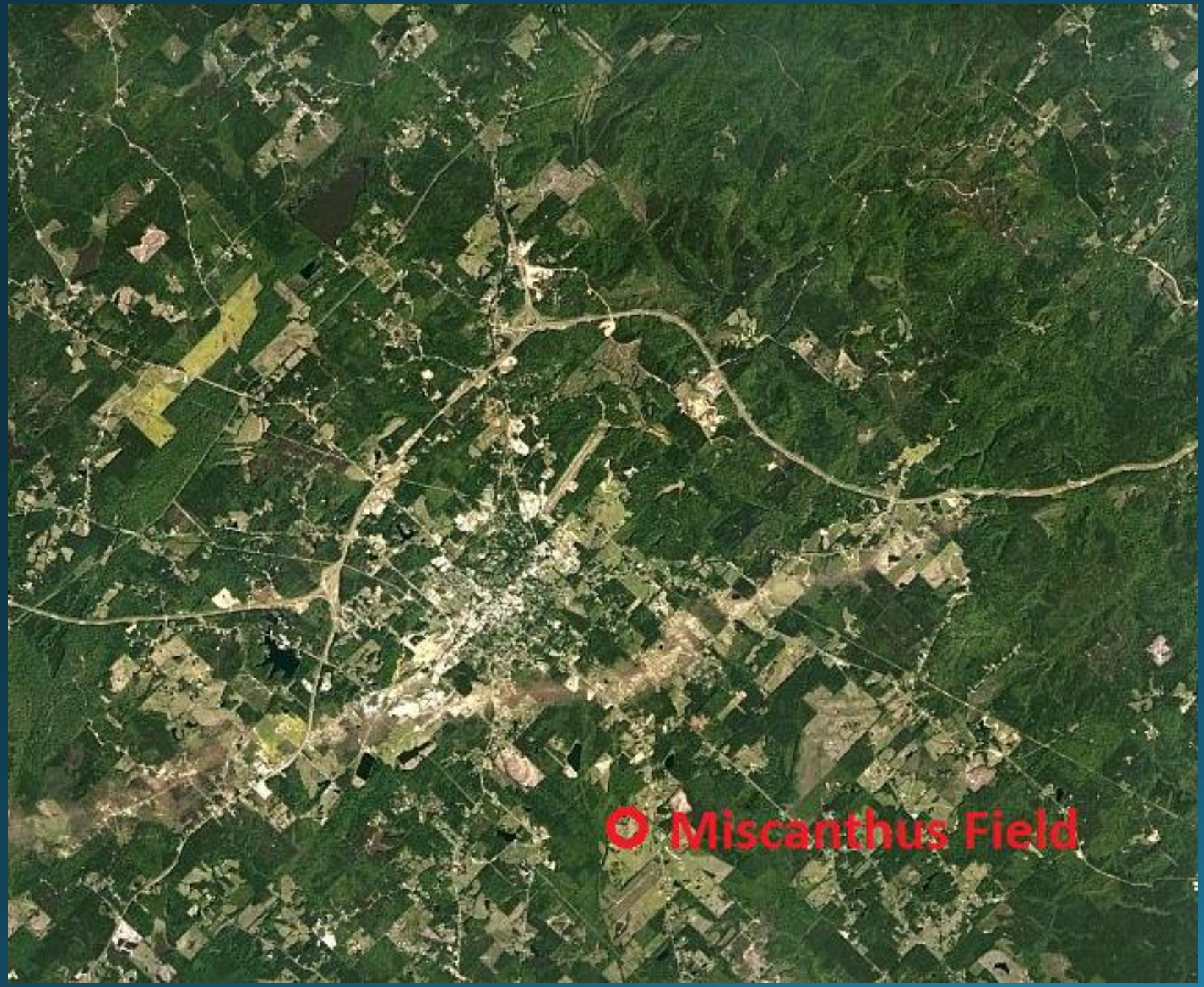
The following related files and links are available.

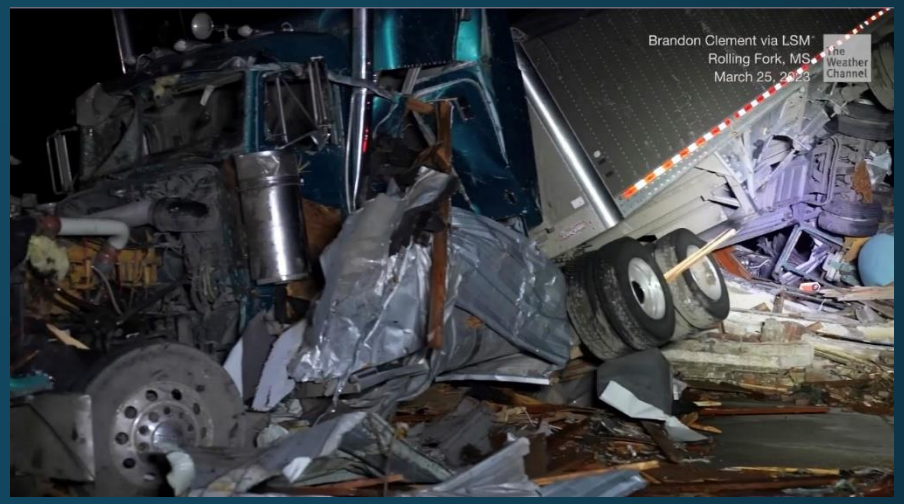
File: View the end-of-year financial report KiOR filed with the Securities and Exchange Commission.

The Dispatch
03/18/2014

Best treatments to control Miscanthus

Summer			Fall		
Chemical	**Rate**	**% Control**	**Chemical**	**Rate**	**% Control**
Glyphosate	4 lb ae/A	100%	Metsulfuron	1 oz/100gal	49%
Glyphosate	2 lb ae/A	94%	Sulfometuron	0.09 lb ai/A	43%
Glyphosate	2% v/v	90%	Quinclorac	0.75 lb ai/A	43%
Glyphosate	6.5 lb ae/A	85%	Glyphosate	4 lb ae/A	40%
Sulfosulfuron	0.07 lb ai/A	41%	Fluaziflop	0.38 lb ai/A	38%

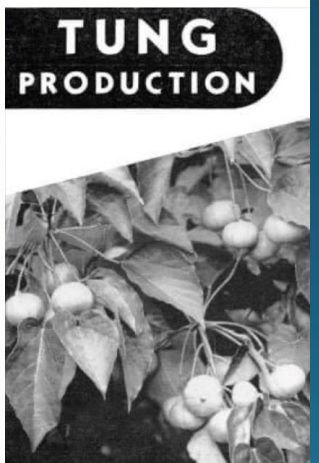

Miscanthus Field


Brandon Clement via LSM
Rolling Fork, MS
March 25, 2023
The Weather Channel

Mississippi History and Architecture

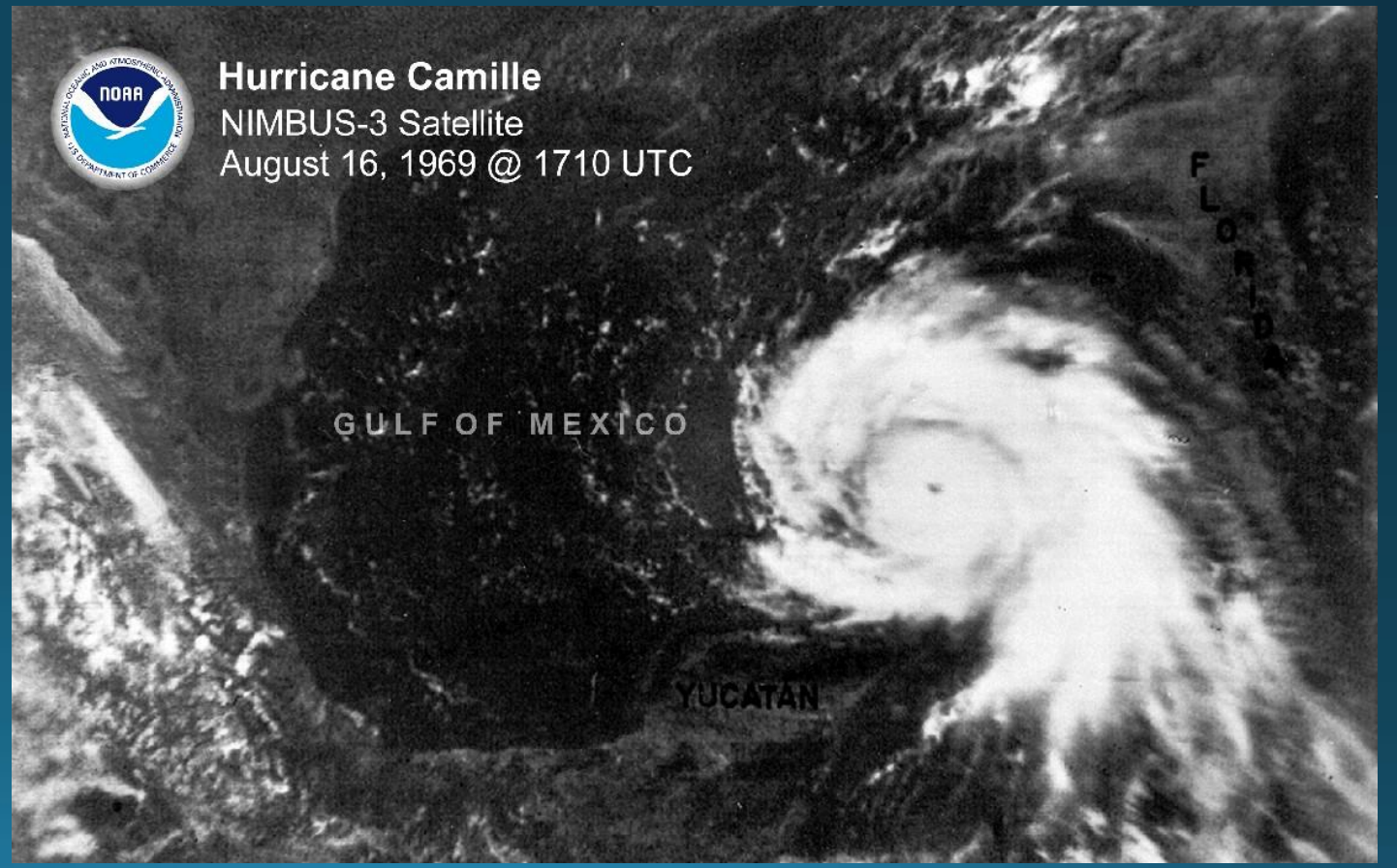
Michael Laughlin · 2h ·

MISSISSIPPI TUNG OIL INDUSTRY: The first tung trees arrived in the Gulf South from China in 1905. O.L. Crosby (left) of Picayune was a pioneer in the growing and processing of the nuts which are used in paints and varnishes. By 1950 South Mississippi had 80,000 acres of the trees. Competition from petroleum based products and Hurricane Camille in 1969 doomed the industry in the State.




MISSISSIPPI STATE COLLEGE
Agricultural Experiment Station
CLAY LYLE Director
STATE COLLEGE MISSISSIPPI

TUNG HARVESTER PASSES TESTS



What is sunn hemp and how is it used in agronomy?

ON OCTOBER 7, 2021 • (LEAVE A COMMENT)

Let's talk about a crop that can grow in inhospitable environments and still provide numerous benefits. It can increase soil organic matter and provide lots of nitrogen. It suppresses plant parasitic nematodes and improves soil health.

Yes, **sunn hemp** is a superhero in the plant world. And it is a powerful solution to many agricultural challenges related to degradation of natural resources and food security.

Sunn hemp growing in Brazil. This leguminous crop has multiple uses: cover crops, biofuels and more. Credit: Antonio Luis Santi

Photo Josh White

Weed Seed

116 No seed shall be sold, exposed for sale, or offered for sale in Mississippi which contain more than 1 percent by weight of weed seed including noxious weed seed.

Source: *Miss. Code Ann.* §69-3-17.

Noxious Weeds

117.01 The following is a list of noxious weeds and their maximum permitted rates of occurrence per pound of agricultural or vegetable seed.

NAME	ALLOWED PER POUND
1. Crotalaria (*Crotalaria spp.*)	Prohibited
2. Field Bindweed (*Convolvulus arvensis*)	Prohibited
3. Hedge Bindweed (*Calystegia sepium*)	Prohibited
4. Hemp(*Cannabis sativa*) (except when sold as a variety of hemp; none allowed in other seed)	Prohibited

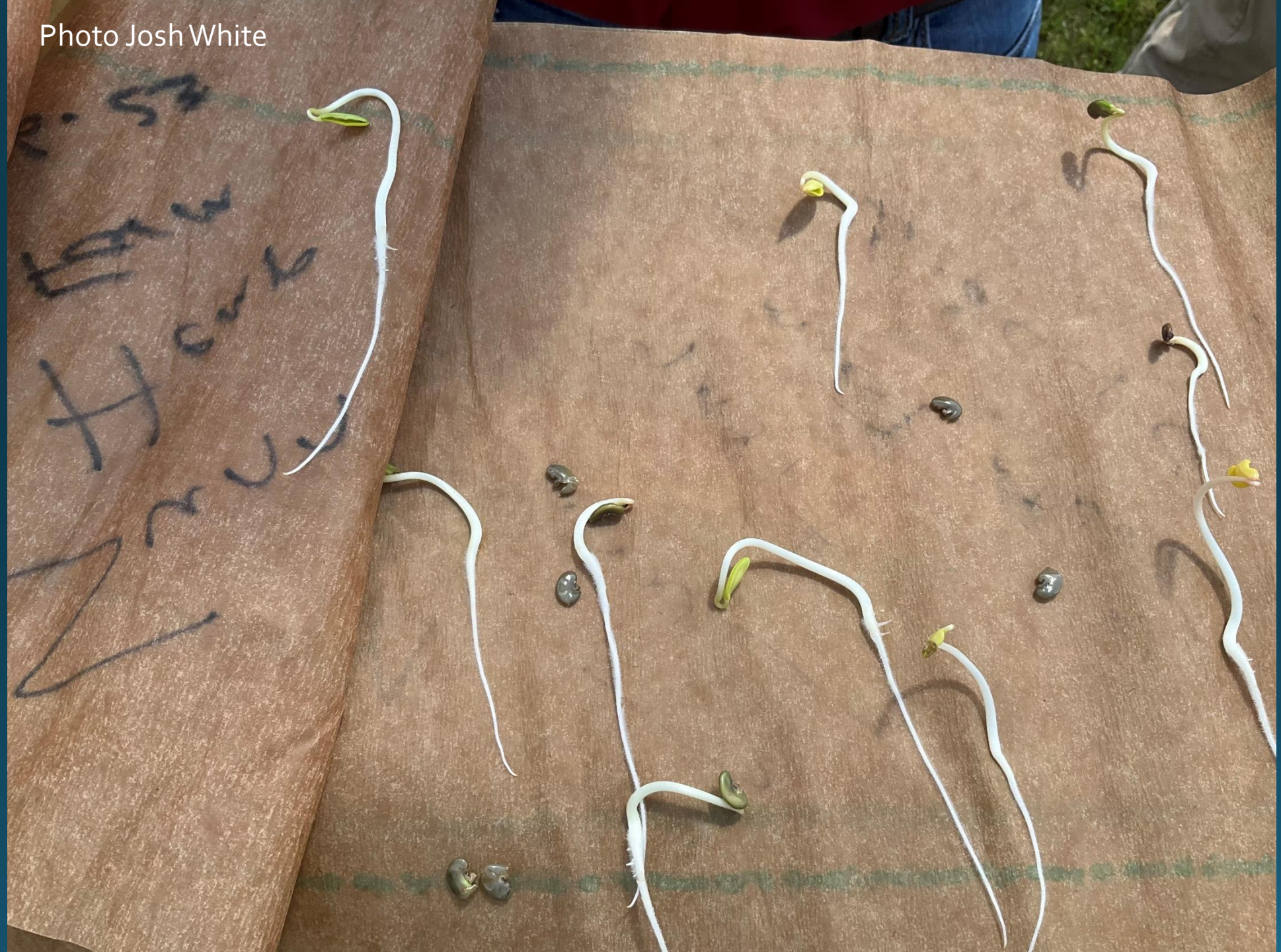


Photo Josh White

Weed Science. 1987. Volume 35:476–481

Occurrence, Concentration, and Toxicity of Pyrrolizidine Alkaloids in *Crotalaria* Seeds[1]

M. COBURN WILLIAMS and RUSSELL J. MOLYNEUX[2]

Abstract. Seed of 41 accessions of *Crotalaria* representing 35 species were analyzed for the concentration of total pyrrolizidine alkaloids (PAs) and for oral toxicity to 1-week-old chicks. All accessions were assayed for the presence of monocrotaline and spectabiline by thin-layer chromatog-

mals become weak and ur
mortem include atrophic ci
the intestinal wall, and dege
atous organs. Petechial hem
fowl and livestock. PAs ar

fiber, which is used in twine, canvas, paper, and other products (3). The seed is fed to horses in the Soviet Union and to pigs in Rhodesia. The seed has been shown to be poisonous to sheep under experimental conditions when fed for 26 days at high doses (14). The large amount required for toxicosis indicated a low toxicity and that poisoning would be unusual under field conditions. A cultivar of sunn hemp, 'Tropic Sun,' has recently been released

species of crotalaria that contained less than 1% PAs might be potentially harmful to poultry if consumed in sufficient amounts for prolonged periods. All species for which development and release is contemplated should undergo a careful toxicological examination before developmental research begins.

and concentration of individual PAs in the plant.

The fatal dose of *Crotalaria* seed is difficult to predict since symptoms of poisoning may not appear for weeks or months after consumption of the seed ceases. The most practical way to assess potential PA damage under chronic

A STUDY OF THE PALATABILITY AND POSSIBLE TOXICITY OF 11 SPECIES OF CROTALARIA, ESPECIALLY OF C. SPECTABILIS ROTH[1]

By R. B. BECKER, *dairy husbandman*; W. M. NEAL, *associate in animal nutrition*; P. T. DIX ARNOLD, *assistant in dairy investigations*, and A. L. SHEALY, *animal husbandman, Department of Animal Husbandry, Florida Agricultural Experiment Station.*[2]

INTRODUCTION

not the same in all species. Dessey and Stalker (*2*) showed *C. sagittallis* L. to cause "Missouri River bottom disease", which resulted in death among horses. Seeds of *C. juncea* L., or sunn-hemp (*1*) were fed to a healthy mature sheep in amounts of one-fourth pound daily for 14 days, and one-half pound for 12 additional days. Weakness, a tucked-up appearance, and catarrh developed shortly after the fourteenth day. Death occurred on the twenty-sixth day. According to Burtt-Davy (*3*), cattle fed *C. burkeana* Benth for 5 days became stiff in the joints, moved slowly, and were unable to stand ultimately. The hoofs lengthened and broke, and death resulted from starvation.

[1] Received for publication Feb. 11, 1935; issued July.

[2] This study is an outgrowth of a cooperative investigation of the feeding value of crotalarias conducted jointly by the Division of Forage Crops and Diseases, Bureau of Plant Industry, U. S. Department of Agriculture, and the Departments of Agronomy and Animal Husbandry, Florida Agricultural Experiment Station. Feeding trials were conducted by the Department of Animal Husbandry, with forages grown and provided by the Agronomy Department and by the Division of Forage Crops and Diseases, U. S. Department of Agriculture. G. E. Ritchey was in charge locally for the Division of Forage Crops and Diseases.

[3] Reference is made by number (italic) to Literature Cited, p. 922.

"The seed does not cause acute toxicity to domestic animals..... However, sunn hemp seed should not be incorporated in animal diets, because, depending on the amount in the diet and the length of time that the diet is fed, it may cause weight loss and potential death."

The Facts about Sunn Hemp Toxicity

Jorge A. Mosjidis,* Joan M. Burke, and Joseph B. Hess

Crop Science · July 2012
DOI: 10.2135/cropsci2011.11.0583

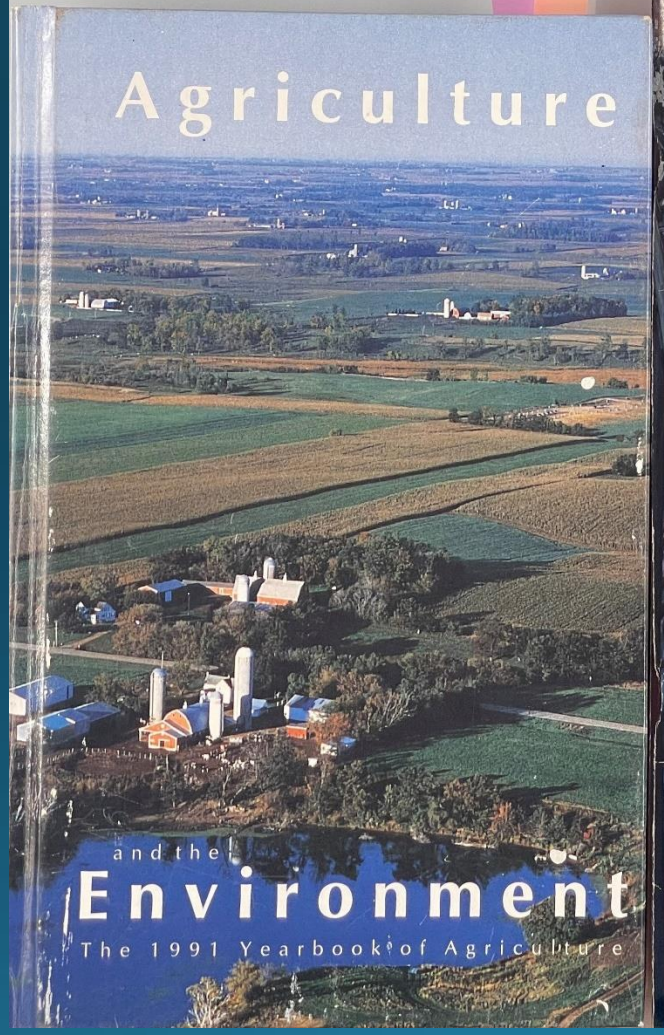
ABSTRACT

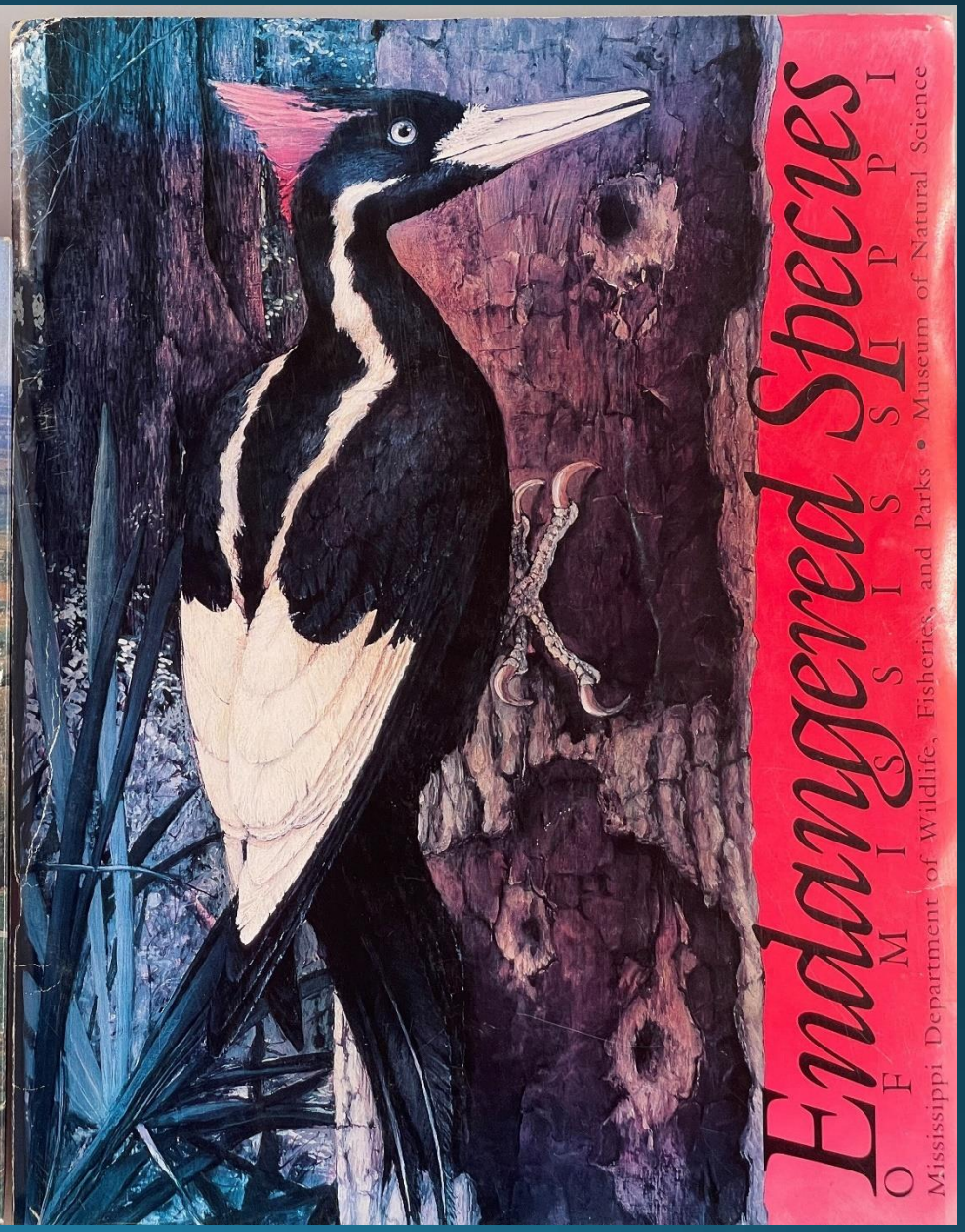
Sunn hemp (*Crotalaria juncea* L.) is an annual plant widely grown in the tropics. The genus *Crotalaria* includes some species known to be toxic to animals. Development of seed-producing cultivars for the continental United States at Auburn University, AL, has raised the question of whether its seeds and forage are toxic. This review will present the evidence reported in the literature on the presence of toxic compounds in sunn hemp seed and foliage and other *Crotalaria* species found in the United States and their effect on animals. Results from research on sunn hemp demonstrate it is a valuable source of forage without toxic effects. The seed does not cause acute toxicity to domestic animals because it has only a small amount of the toxic pyrrolizidine alkaloids characteristic of the genus *Crotalaria*. Therefore, its presence as a feed contaminant does not pose a problem. However, sunn hemp seed should not be incorporated in animal diets because, depending on the amount in the diet and the length of time that the diet is fed, it may cause weight loss and potential death. Conflicting reports found in the literature

J.A. Mosjidis, Dep. of Agronomy and Soils, Auburn U
AL 36849-5412; J.M. Burke, USDA-ARS, Boonevill
J.B. Hess, Poultry Science Dep., Auburn Univ., Aubur
Received 2 Nov. 2011. *Corresponding author (mosjija@

SUNN HEMP (*Crotalaria juncea* L.) is a tall herbaceous
widely grown in the tropics that probably originate
Pakistani subcontinent (Mosjidis and Wang, 2011). In I
use is for fiber production but it is also used for hay pr
as green manure and the seeds are used in ethno-me
and Singh, 1936; Duke, 1983; Jagtap et al., 2006). I
of the world, such as Southeast Asia, southern Afric
Hawaii, sunn hemp is mainly grown as green manu
crop (National Academy of Science, 1979; Romin a
Rotar and Joy, 1983). Recent interest in sunn hemp in
tal United States stems from the need to find summe
that can be used as green manure (Mansoer et al., 1997

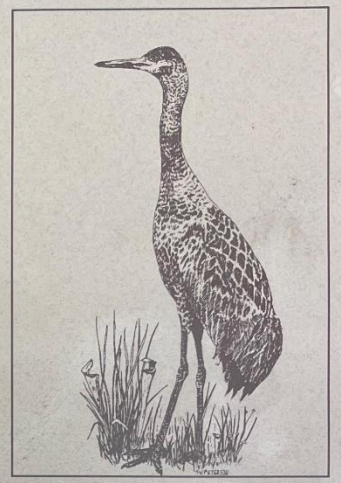
Several *Crotalaria* species were introduced in the
in 1899 from Brazil for their ability to grow under
conditions, their nematode resistance, and their capaci
organic matter and improve soil quality (McKee et al.
hemp, reported to have fast growth, did not get as m
as other crotalarias because of establishment problem
in the continental United States was restricted by its l
to produce seed in subtropical and/or temperate clim





HANDBOOK: RESOURCE GUIDE

Mississippi Threatened And Endangered Species



Sandhill Crane

EACE

Environmental & Agricultural Chemical Education Unit

COOPERATIVE EXTENSION SERVICE

Mississippi State University

ENDANGERED SPECIES ACT

EXTENSION ADVISORY COMMITTEE

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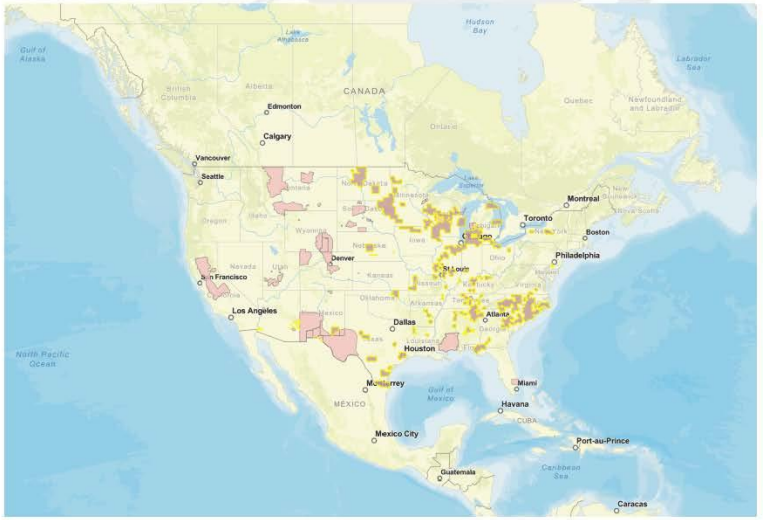
Dr. Clarence Collison	Professor & Head, Entomology & Plant Pathology Dept, MSU
Murray Elmo Collum	Pesticide Impact Assessment Program Asst., EACE Unit, CES, MSU
Rusty Crowe	Coordinator, Ground Water, Endangered Species & WPS, Bureau of Plant Industry, MDAC
Dr. Andy Ezell	Extension Forestry Specialist, Forestry, CES, MSU
Todd Freeman	Farm Bureau Federation
Harry Fulton	Director, Pesticide Division/Bureau of Plant Industry . MDAC
Dr. Jim Hamer	Leader, EACE Unit, CES, MSU
Robert McCarty	Director, Bureau of Plant Industry, MDAC
Tommy McDaniel	Pesticide Coordinator, Bureau of Plant Industry, MDAC
E. Ruth Morgan	Pesticide Coordinator & Pesticide Impact Assessment Spec., EACE Unit, CES, MSU
Dr. J. L. Peeples	North Central Area Director, CES, MSU
Dr. Dennis Reginelli	County Agent, Acting County Coordinator - Noxubee County
Trent Spencer	Extension Program Assistant, Agri Engineering Dept, MSU
Dean Stewart	Extension Wildlife Specialist, Wildlife & Fisheries, CES, MSU
Dr. David Tatum	Commercial Nursery Specialist/Horticulture, CES, MSU
Dr. David Young	Mississippi Association Agricultural Consultants

Funding to support the preparation of this handbook was provided by The Bureau of Plant Industry, Mississippi Department of Agriculture and Commerce.

Endangered Species Protection Bulletin

Application Month: June 2022
Product: All products with limitations in selected area

1 Areas where pesticide use must be limited are identified on the map. A legend is located beside the map to help pinpoint these locations.

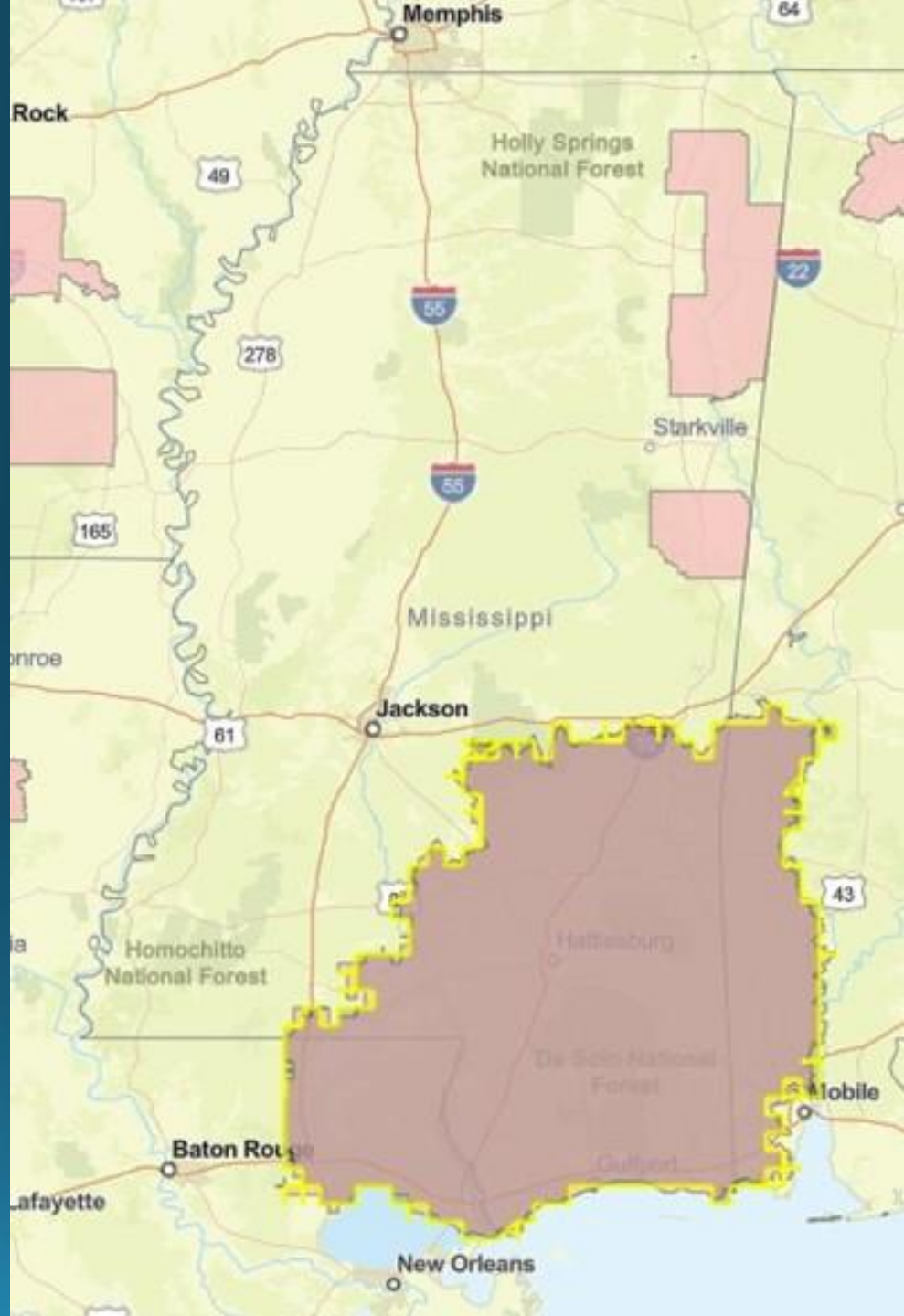


2 Look below at the Pesticide Use Limitation Summary Table. This table lists the user selected Active Ingredient(s) (ALs) or Product(s) with pesticide use limitations on the printed map. Locate the Active Ingredient (AI) or Product you intend to apply in this table and identify the code in the last column. This code indicates the specific limitation associated with that AI or Product. A limitation description for each code can be found below in the Codes and Limitations Table. If multiple Pesticide Use Limitation Areas (PULAs) are visible on the map, these tables provide information for the highlighted PULA.

If you are applying a pesticide that contains more than one Active Ingredient, or multiple Products, then multiple codes may apply. Follow the limitations for all codes when using this pesticide.

This document contains legal requirements for the use of certain pesticides.
Do not modify any text, graphics or coloration or otherwise alter this document.
ESPP Contact: ESPP@epa.gov Phone: 1-844-447-3813

EPA's Bulletin Live! Two map



https://ecos.fws.gov/ecp/

U.S. Fish & Wildlife Service

Search ECOS

ECOS Environmental Conservation Online System

Conserving the Nature of America

ECOS / Home

Public Applications

- Conservation Plans
- Wildlife & Environmental Contaminants Mapper
- Information for Planning and Consultation (IPaC)
- Species Reports
- Web Services

Secure Applications

- Secure Login

Related Sites

- FWS Endangered Species Program
- National Wildlife Refuge System

Threatened & Endangered Species

ECOS serves a variety of reports related to FWS Threatened and Endangered Species. A selection of our most popular reports is listed below. See the Species Reports for the complete list.

- All Threatened and Endangered Animals
- All Threatened and Endangered Plants
- Critical Habitat Report
- Section 7 Consultation Issued Biological Opinions
- Delisted Species
- Listed Species Summary (Boxscore)
- Reclassified Species

OBTAINING AN OFFICIAL SPECIES LIST:

Use IPaC to identify your project location and receive an official species list (pursuant to 50 CFR 402.12) of T&E species that should be considered when evaluating the potential impacts of a project.

ADDITIONAL SEARCH TOOLS:

Search for a Listed species by name:

Search for a Listed species by County name:

Wildlife & Environmental Contaminants Mapper

The Wildlife & Environmental Contaminants Mapper displays the locations of over 100,000 samples from the "Environmental Contaminants Database Management System" (ECDMS). Click on sample collection locations to view the details about the samples, and download available results from laboratory tests performed.

- Use the Wildlife & Environmental Contaminants Mapper

https://ecos.fws.gov/ecp/species/7422

» Range Information

Current Range

Last Updated: 03-22-2018 *- Entire*

Zoom in! Some species' locations may be small and hard to see from a wide perspective. To narrow-in on locations, check the state and county lists (below) and then use the zoom tool.

Want the FWS's current range for all species? Click here to download a zip file containing all individual shapefiles and metadata for all species.

* For consultation needs do not use only this current range map, please use IPaC.

Current range maps are only shown within the jurisdictional boundaries of the United States of America. The species may also occur outside this region.

- **Listing status:** **Threatened**
  - **States/US Territories** in which this population is known to or is believed to occur: Alabama, Kentucky, Mississippi, Tennessee
  - **US Counties** in which this population is known to or is believed to occur: View All
  - **USFWS Refuges** in which this population is known to occur: Sauta Cave National Wildlife Refuge

» Candidate Information

/ecp/species/7422#

» Range Information

Current Range

Last Updated: 03-04-2022 - *Wherever found*

Zoom in! Some species' locations may be small and hard to see from a wide perspective. To narrow-in on locations, check the state and county lists (below) and then use the zoom tool.

Want the FWS's current range for all species? Click here to download a zip file containing all individual shapefiles and metadata for all species.

* For consultation needs do not use only this current range map, please use IPaC.

Current range maps are only shown within the jurisdictional boundaries of the United States of America. The species may also occur outside this region.

- **Wherever found**

  Listing status: **Threatened**

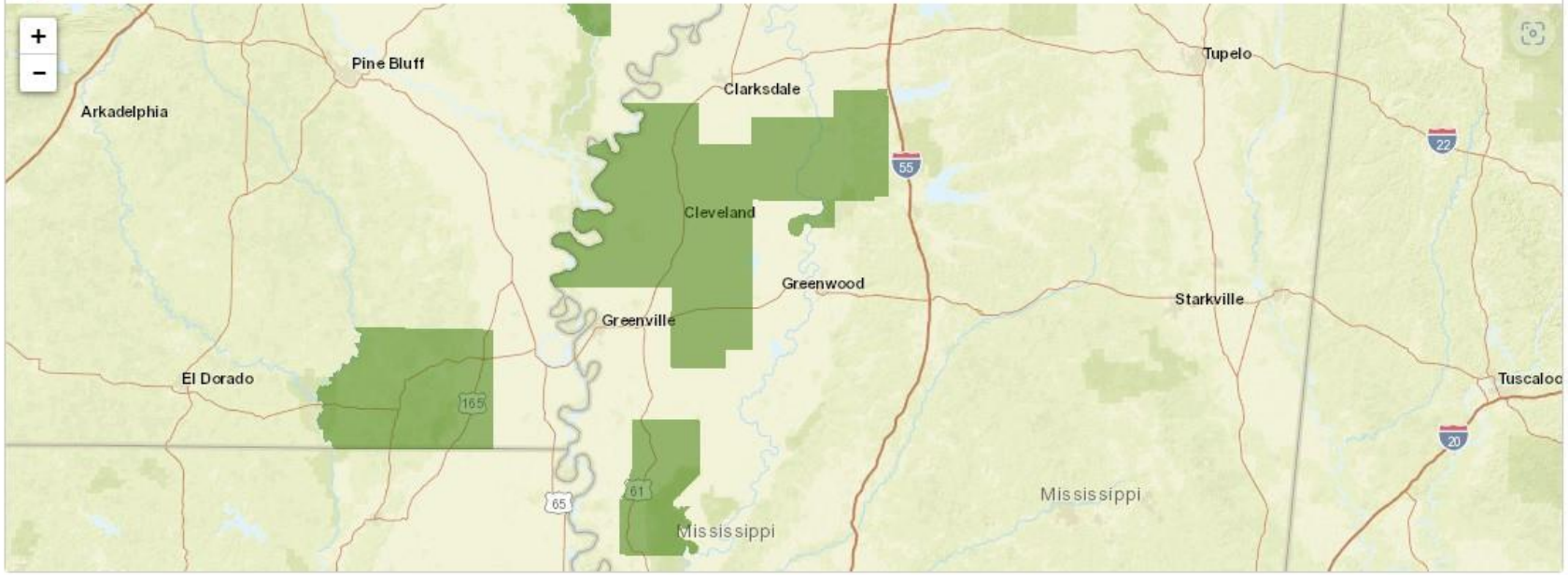
  - **States/US Territories** in which this population is known to or is believed to occur: Alabama, Mississippi
  - **US Counties** in which this population is known to or is believed to occur: View All
  - **USFWS Refuges** in which this population is known to occur:

» Candidate Information

Want the FWS's current range for all species? Click here to download a zip file containing all individual shapefiles and metadata for all species.

* For consultation needs do not use only this current range map, please use IPaC.

Current range maps are only shown within the jurisdictional boundaries of the United States of America. The species may also occur outside this region.



- **Wherever found**

  Listing status: **Endangered**

  - **States/US Territories** in which this population is known to or is believed to occur: Alabama, Arkansas, Georgia, Mississippi, Missouri, North Carolina, South Carolina
  - **US Counties** in which this population is known to or is believed to occur: View All
  - **USFWS Refuges** in which this population is known to occur: Cache River National Wildlife Refuge, Morgan Brake National Wildlife Refuge, Wapanocca National Wildlife Refuge

» Candidate Information

No Candidate information available for this species.

No Candidate Assessments available for this species.
No Candidate Notice of Review Documents currently available for this species.
No Uplisting Documents currently available for this species.

MARCH 4, 2023

5pm-11pm GMT / 12pm-6pm EST / 3pm-9pm PST

Presented By: Children's Health Defense TV
live.childrenshealthdefense.org

CHD.TV

Host: Meryl Nass, M.D.

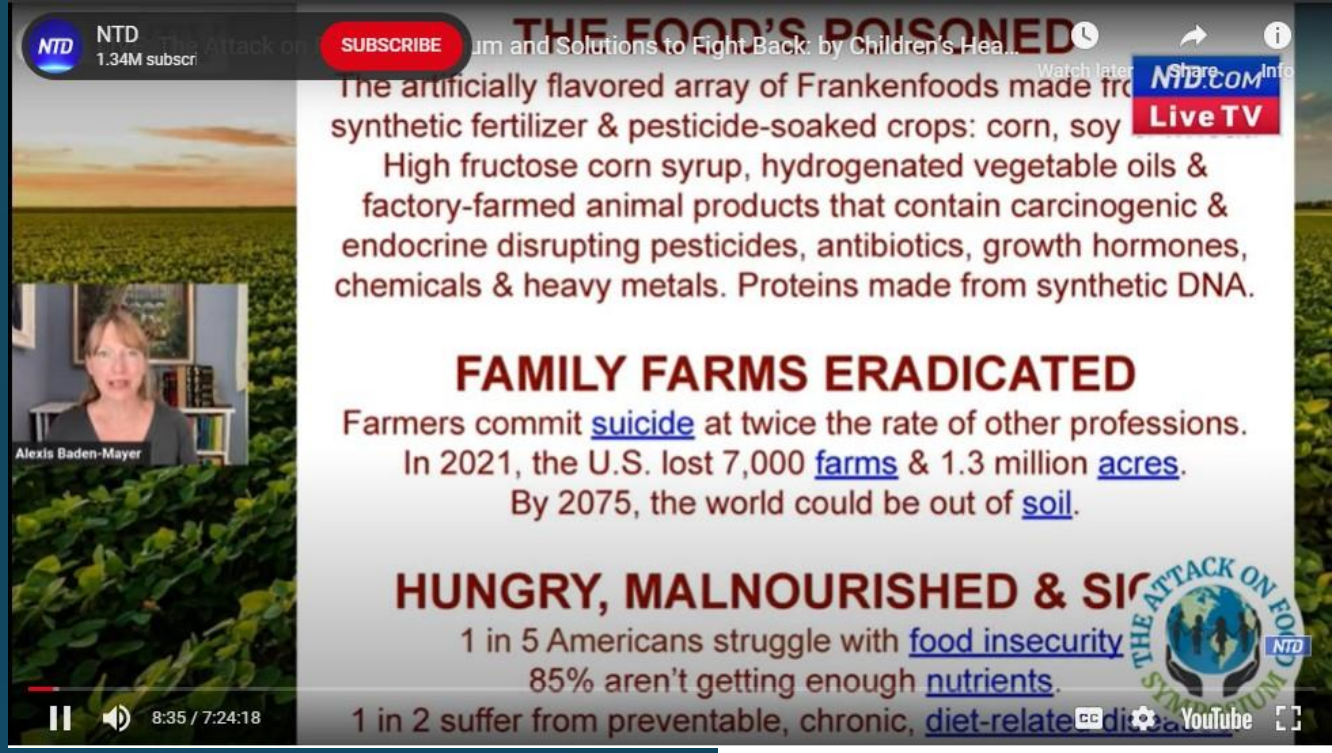

Meryl Nass, M.D.

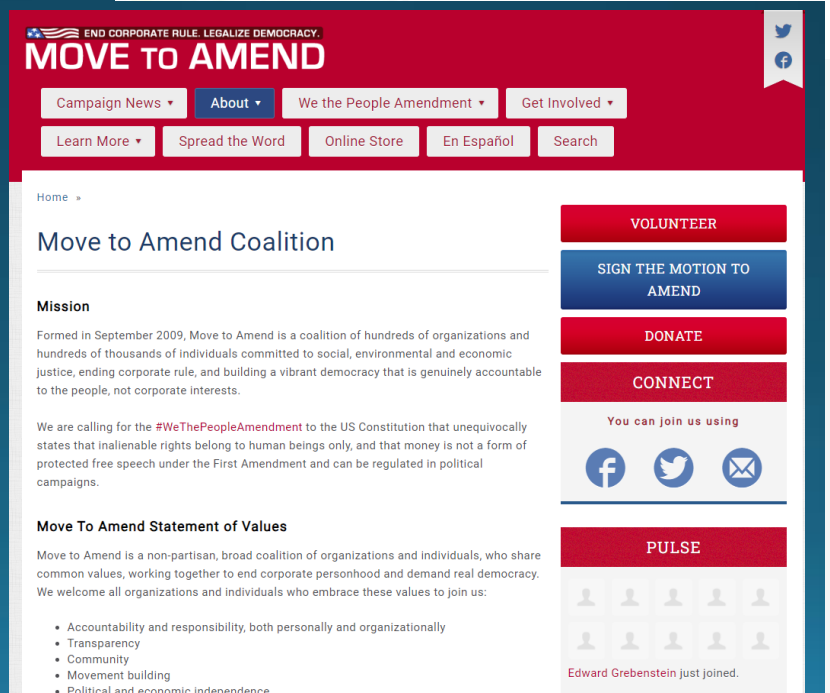
Session 1 *Attacks on Food & Agriculture*

Session 2 *Solutions for Farmers*

Session 3 *Solutions for Individuals*

Session 4 *Societal Solutions*

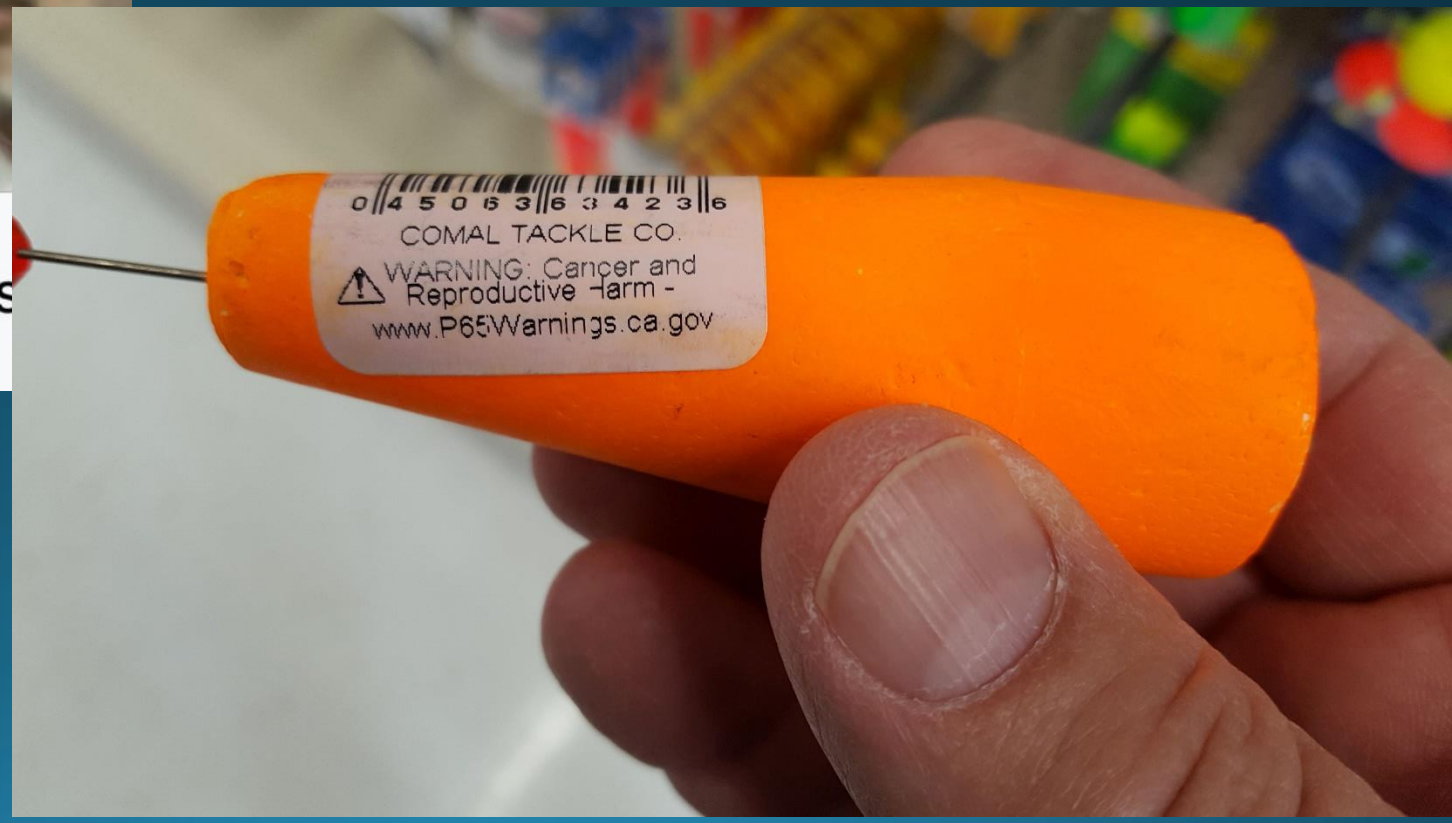


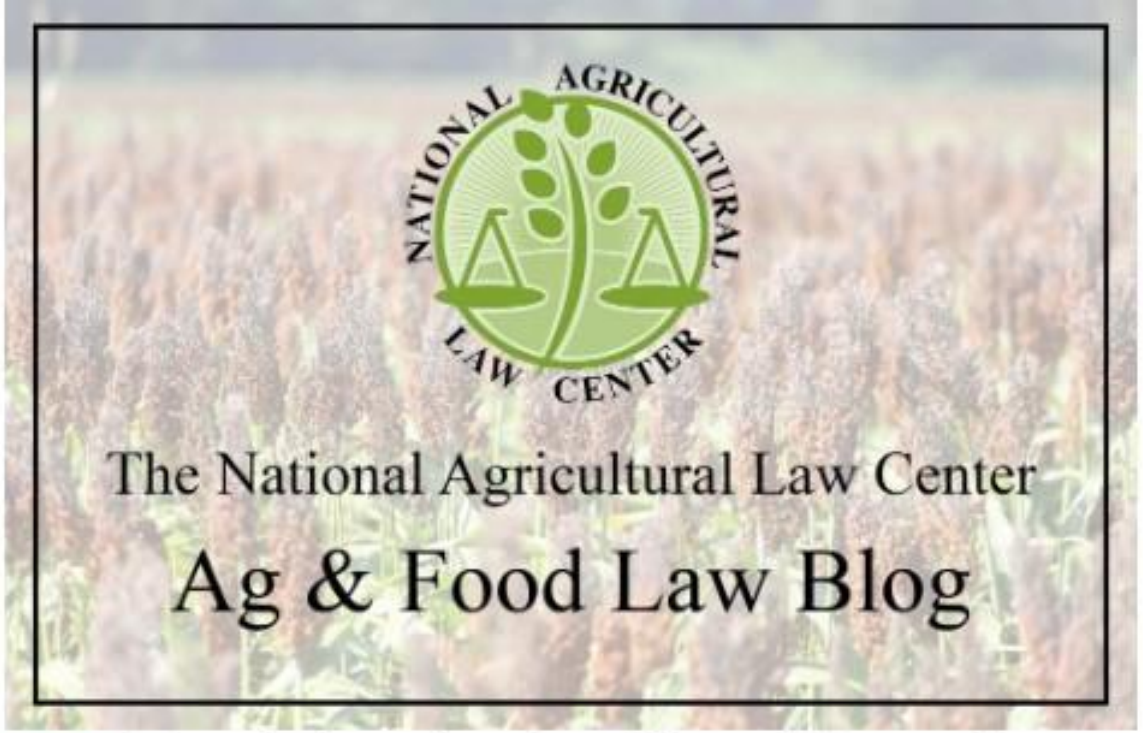


According to USA Today, men are better at being women than women are.

MRCTV.ORG

**Tough Luck, Ladies: USA TODAY Names Trans HHS S
'Woman of The Year'**





17 JAN

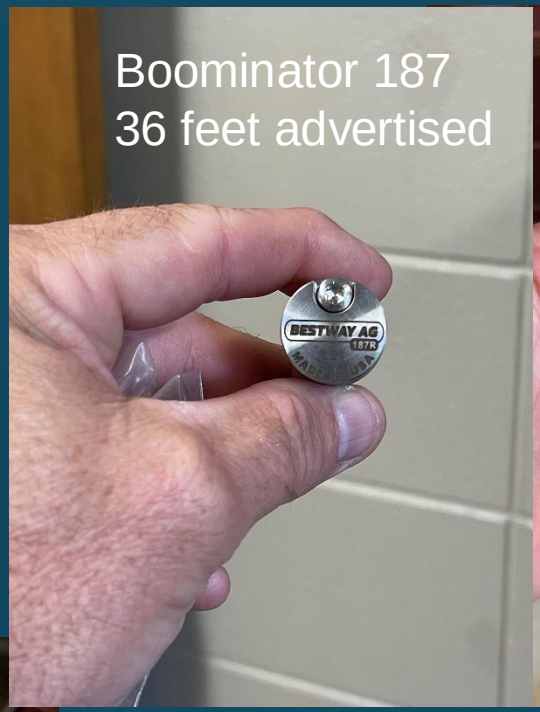
Top Ten Agricultural Law Issues in 2019

Categorized Ag & Food Law Update, Clean Water Act, Endangered Species Act, Environmental Protection Agency, Food Labeling, Hemp, International Trade, Pesticides, Right to Farm, Underserved Communities, BIPOC

- In August, the Department of Interior announced host of new rules that made a series of changes to the **Endangered Species Act (ESA).** The new rules affect what species receive ESA protections, the designation of critical habitats, and the amount of protection afforded to threatened species. Changes included repealing the "blanket 4(d)" rule, restricting the area that can be designated as critical habitat only to areas that are currently occupied by a species, and restructuring what factors will be considered when listing a species as threatened. The changes quickly prompted backlash, and a lawsuit was filed against the Secretary of Interior soon after the rules were announced. To read more about the changes to the ESA, click here.

Boominator 1400ST

Boominator 187
36 feet advertised



Boombuster 187
38 feet advertised

Hamilton 10
50 feet advertised

Nozzle	Advertised Total Swath (ft)	Measured Total Swath (ft)		
		1 MPH	2 MPH	4 MPH
Hamilton #10	50	49*	46*	45*
Boominator 1870	36	38	37	36
Boominator 1400 ST	N/A	42	41	38
Boom Buster 187	38	42*	40*	37

* Indicates a difference at α=0.05

Advertised Total and Recommended Swaths obtained from www.protankequipment.com, boominator.com, evergreenproductsusa.com

Perilla Mint
(*Perilla frutescens*)

Perilla mint is an erect, herbaceous annual weed originally from eastern Asia. Also known as beefsteak plant, common mint, or Chinese basil, this plant has a history of use in the culinary, medicinal, and ornamental markets. In Mississippi, perilla mint has escaped cultivation and frequently occurs in natural areas, including pastures. When populations occur on grazing lands or fields harvested for hay, perilla mint poses serious health risks to livestock. It is considered a noxious weed throughout much of the eastern United States.

Description

Vegetative Growth

A member of the Lamiaceae, or mint, family, perilla mint usually reaches an average height of 2 feet at maturity. However, plants may reach up to 5–6 feet, especially in shaded, fertile areas. Leaves are coarsely serrated and are opposite each other on a square stem (**Figure 1**). Upper leaf margins and undersides of leaves are frequently purple (**Figure 2**). Like other plants in the mint family, leaves are highly aromatic when crushed. In Mississippi, seedlings may be seen as early as mid-May or when soil temperatures are between 68 and 77°F.

Flowering

A self-pollinating species, perilla mint typically begins flowering in late July to August, producing flower spikes up to 6 inches long (**Figure 3**). Each spike contains many small, white to purple flowers. Plants are prolific seeders, having the potential to produce 1,000–1,500 seeds per plant. Seed viability often remains high, with germination studies indicating greater than 60 percent after more than 4 years of room-temperature storage.

Dispersal

Seed is spread by disturbance, birds, or surface water movement. Late-season hay harvests tend to retain mature seed, which are likely transported across farms. Seed readily germinates in highly disturbed conditions. Length of seed viability under normal field conditions is unknown.

Figure 1.

Figure 2.

Figure 3.

Habitat

Perilla mint is highly adaptable, but populations are most often dense and found in semi-shaded wooded understories, along streamside areas, and in damp swales (**Figure 4**). Disturbed areas of fertile soil around hay rings (**Figure 5**), feedlots, and barns tend to encourage healthy populations. In pastures, the invasive perilla competes with beneficial forage species, especially during intervals of limited rainfall.

Threat

Several volatile compounds, like perilla ketones, exist in perilla mint and cause atypical interstitial pneumonia (AIP) in cattle and other domestic animals. Fluid accumulates in the lungs, resulting in lower oxygen levels and shortness of breath. Plants are more toxic during flowering and fruiting, which coincides with periods of lower forage quantity and quality, excessive temperatures, and stress caused by insects. As a result, livestock congregate in shaded areas that may be infested with perilla mint (**Figure 6**). This means exposed livestock are at a greater risk of plant consumption when its toxicity is greatest.

Figure 4.

Figure 5.

Figure 6.

Control Methods

Several herbicides are highly effective for controlling perilla mint. Some preemergence options include picloram, aminopyralid, dicamba, and imazapic (**Table 1**). These treatments should be applied before seedling emergence and just before rain to incorporate the chemical into the soil. Postemergence options include picloram, 2,4-D, glyphosate, and dicamba (**Table 2**). These may be applied to emerged plants from seedling through the early flowering stage for effective control. If treating large populations, it is suggested that livestock be removed from the treated area to reduce risk of ingestion, especially if desirable forage is limited.

Additional control methods include mowing or hand pulling. These physical control techniques are suggested before flowering in late summer to avoid seed production and new plants in the following years.

Table 1. Suggested preemergence herbicide treatments and rates to be soil-applied broadcast before perilla mint seedling emergence.

Herbicide	Trade Name	Rate (amount product/A)
picloram + 2,4-D	Grazon P+D	32 fl oz
aminopyralid + 2,4-D	GrazonNext HL	19 fl oz
dicamba + 2,4-D	Weedmaster	32 fl oz
imazapic	Plateau	6 fl oz

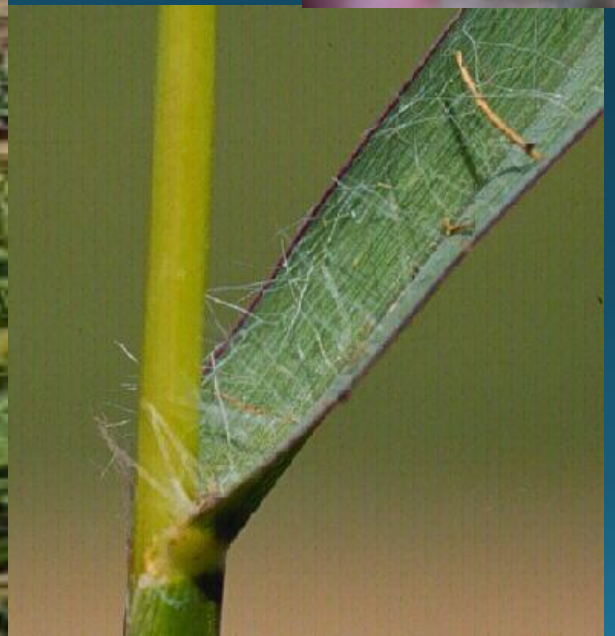
Table 2. Suggested postemergence herbicide treatments and rates to be foliar-applied broadcast to perilla mint until early flower stage.

Herbicide	Trade Name	Rate (amount product/A)
picloram + 2,4-D	Grazon P+D	16 fl oz
aminopyralid + 2,4-D	GrazonNext HL	19 fl oz
glyphosate	RoundUp (41% a.i.)	24 fl oz
dicamba + 2,4-D	Weedmaster	16 fl oz
2,4-D	2,4-D Amine 4	32 fl oz

All treatments include 0.25 percent v/v non-ionic surfactant.

Information Sheet 2018 (POD-10-15)

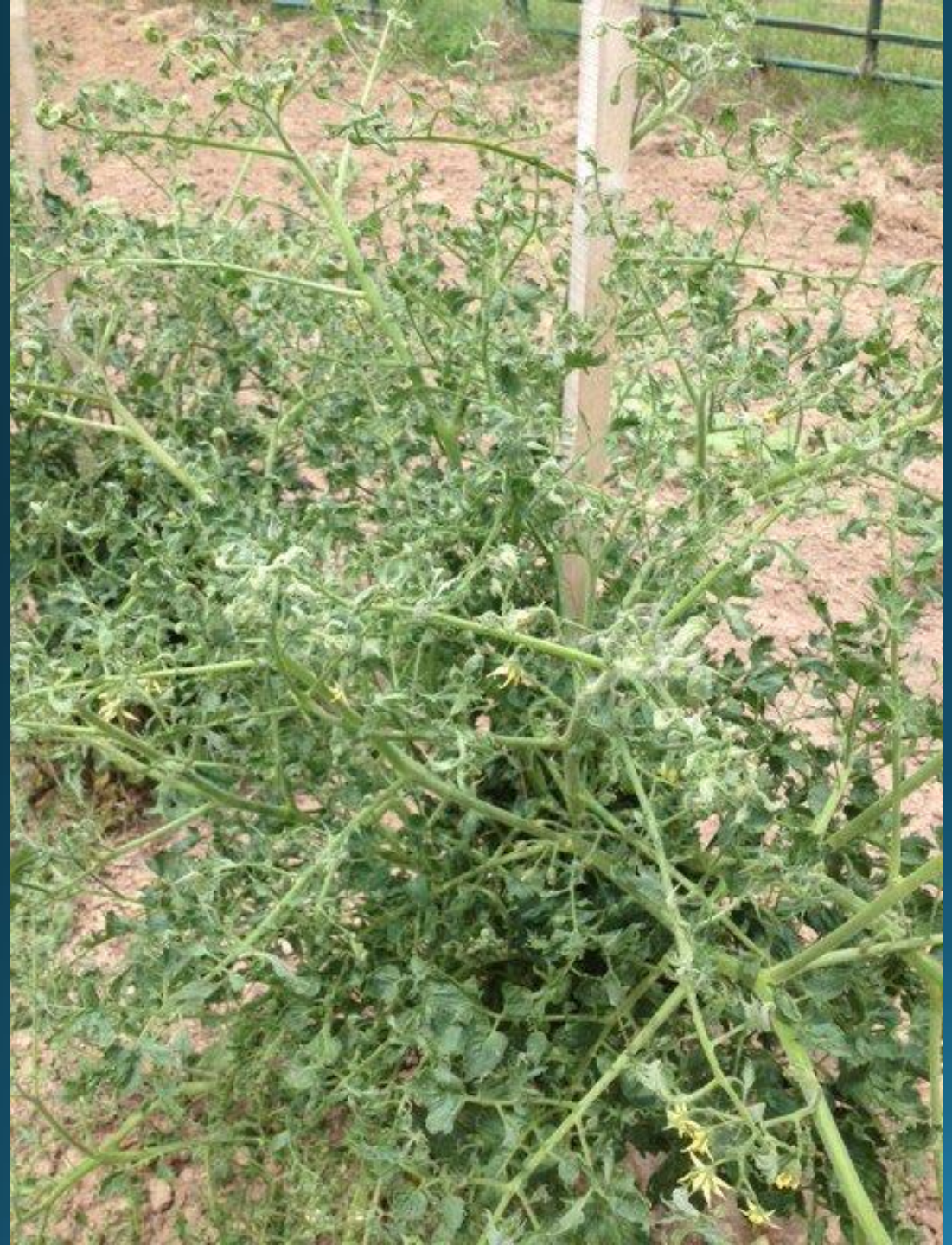
By **David Russell**, Extension Associate II, and **John Byrd**, Extension/Research Professor, Plant & Soil Sciences.

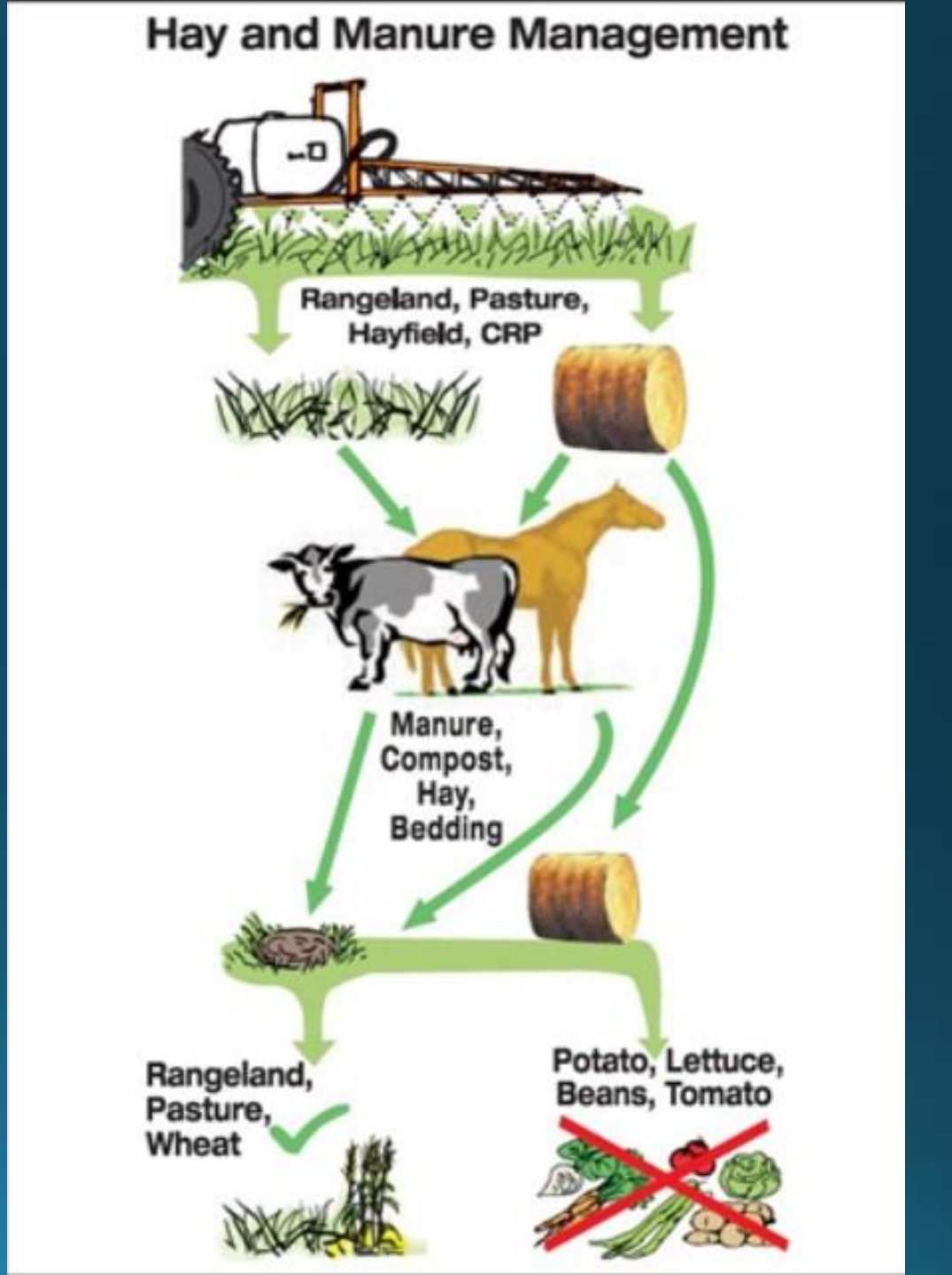


48 fl oz/A Velpar L
Applied June 16, 2022

Rainfall June 17


12




Hay and Manure Management
Rangeland, Pasture, Hayfield, CRP
Manure, Compost, Hay, Bedding
Rangeland, Pasture, Wheat
Potato, Lettuce, Beans, Tomato

Pasture and Rangeland Restrictions

- Do not use grasses treated with DuraCor in the preceding 18 months for hay intended for export outside the United States.
- Hay from areas treated with DuraCor in the preceding 18 months can NOT be distributed or made available for sale off the farm or ranch where harvested unless allowed by supplemental labeling.
- Hay from areas treated with this product in the preceding 18 months can NOT be used for silage, haylage, baylage, and green chop unless allowed by supplemental labeling.
- Do not move hay and silage made from grass treated with DuraCor within the preceding 18 months off farm unless allowed by supplemental labeling.
- Do not use hay from areas treated with DuraCor within the preceding 18 months or manure from animals feeding on hay treated with DuraCor in compost.
- Do not use grasses treated with DuraCor in the preceding 18 months for seed production.

Supplemental Labeling

CORTEVA™ agriscience

Dow AgroSciences 9330 Zionsville Road Indianapolis, IN 46268-1054 USA

DuraCor™

EPA Reg. No. 62719-739

For Distribution and Use Only in the States of:
AL, AR, AZ, CO*, FL, GA, ID*, KS, KY, LA, MO, MS, MT*, ND*, NE, NV*, NM, OK, SD*, TN, TX, UT, WY*

For Use on Grass Harvested for Hay
Intended for Distribution or Sale Off the Farm or Ranch

For Use on Grass Harvested for Silage, Haylage, Baylage, or Green Chop
Intended for Use On the Farm or Ranch

- **Do not use grasses treated with DuraCor in the preceding 18 months for hay intended for export outside the United States.**
- **Do not use hay or straw from areas treated with DuraCor within the preceding 18 months or manure from animals feeding on hay treated with DuraCor in compost.**
- **Do not use grasses treated with DuraCor within the preceding 18 months for seed production.**
- **Grazing and Haying Restrictions:** Do not harvest forage for hay within 7 days of DuraCor application. Cutting hay too soon after spraying weeds can compromise the weed control. Wait 14 days prior to cutting grass hay to allow for maximum herbicide activity.
- **Transfer of Animals Feeding on DuraCor-Treated Forage:** Do not transfer animals grazing or feeding on hay from areas treated with DuraCor to areas where sensitive broadleaf crops occur without first allowing 3 days of grazing on an untreated pasture. Otherwise, urine and manure may contain enough aminopyralid and florpyrauxifen-benzyl to cause injury to sensitive broadleaf plants.
- **Seeding Legumes**: Do not plant forage legumes until a soil bioassay has been conducted to determine if aminopyralid and florpyrauxifen-benzyl residues remaining in the soil will adversely affect the legume establishment.
- **Grazing Poisonous Plants:** Herbicide application may increase palatability of certain poisonous plants. Do not allow livestock to graze treated areas until poisonous plants are dry and no longer palatable to livestock.

This supplemental label expires November 22, 2022; other products April 7, 2023

- **Restrictions in Hay or Manure Use:**
  - Do not use treated plant residues, including hay or straw from areas treated within the preceding 18 months, in compost, mulch or mushroom spawn.
  - Do not use manure from animals that have grazed forage or eaten hay harvested from treated areas within the previous 3 days, in compost, mulch or mushroom spawn.
  - Do not spread manure from animals that have grazed or consumed forage or hay from treated areas within the previous 3 days on land used for growing broadleaf crops.
  - Manure from animals that have grazed forage or eaten hay harvested from aminopyralid-treated and florpyrauxifen-benzyl-treated areas within the previous 3 days may only be used on pasture grasses, grass grown for seed, wheat, and corn.
  - Do not plant a broadleaf crop in fields treated in the previous year with manure from animals that have grazed forage or eaten hay harvested from aminopyralid-treated and florpyrauxifen-benzyl-treated areas until an adequately sensitive field bioassay is conducted to determine that the aminopyralid and florpyrauxifen-benzyl residue in the soil is at a level that is not injurious to the crop to be planted.
  - To promote herbicide decomposition, plant residues should be evenly incorporated in the surface soil or burned. Breakdown of aminopyralid and florpyrauxifen-benzyl in plant residues or manure is more rapid under warm, moist soil conditions and may be accelerated by supplemental irrigation.
- **Preharvest Interval:** Do not cut forage for hay within 7 days of application. For program lands, such as CRP, consult program rules to determine whether grass or hay may be used. The more restrictive requirements of the program rules or this label must be followed.
- **Chemigation:** Do not apply this product through any type of irrigation system.
- **Crop Rotation:** Do not rotate to cropland for one year following an application of DuraCor. Do not plant a broadleaf crop until an adequately sensitive field bioassay shows that the level of aminopyralid and florpyrauxifen-benzyl present in the soil will not adversely affect that broadleaf crop.
- **Field Bioassay Instructions:** In fields previously treated with this product, plant short test rows of the intended rotational crop across the original direction of application in a manner to sample variability in field conditions such as soil texture, soil organic matter, soil pH, rainfall pattern, or drainage. The field bioassay can be initiated one year after the last application of aminopyralid and florpyrauxifen-benzyl in that field. Observe the test crop for symptoms of herbicidal activity, such as poor stand (effect on seed germination), chlorosis (yellowing), and necrosis (dead leaves or shoots), or stunting (reduced growth). If herbicidal symptoms do not occur, the test crop can be grown. If there is apparent herbicidal activity, do not plant the field to the intended rotational crop; plant only to wheat, forage grasses, native grasses, or grasses grown for hay.
- **DuraCor is highly active against many broadleaf plant species.** Do not use this product on areas where loss of desirable broadleaf forage plants, including legumes, cannot be tolerated.
- Trees adjacent to or in a treated area can occasionally be affected by root uptake of DuraCor through movement into the soil. Do not apply DuraCor within the root zone of desirable trees unless such injury can be tolerated. Use special caution near roses and leguminous trees such as locusts, redbud, mimosa, and caragana.

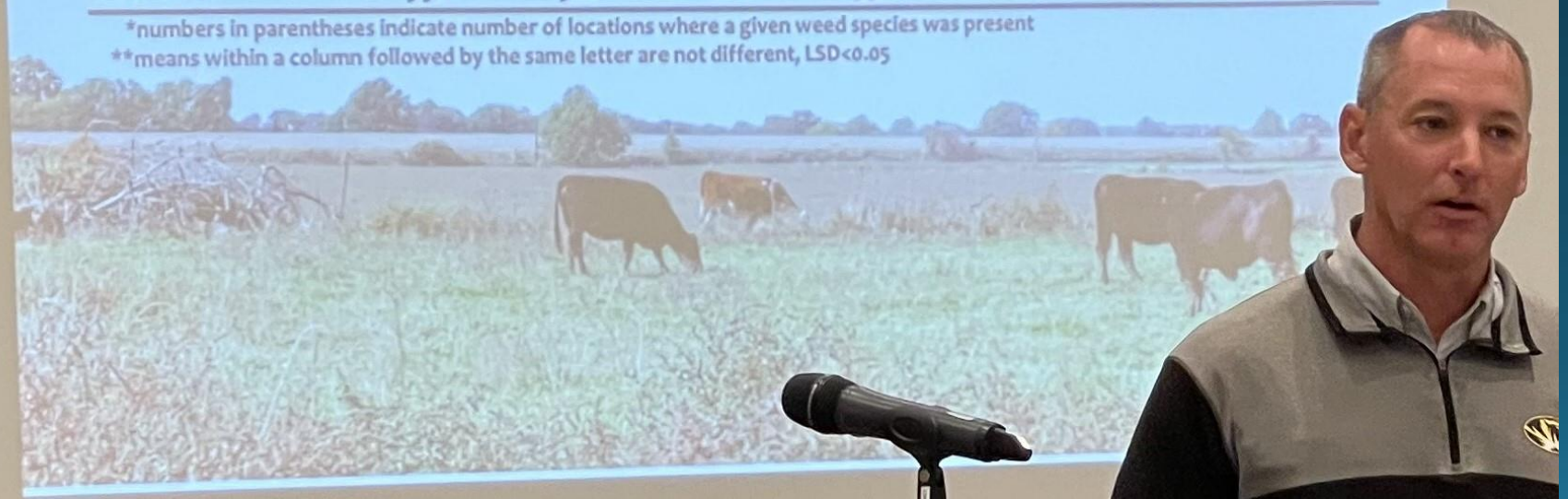
ProClover (2,4-D choline + Rinskor [florpyrauxifen-benzyl]) for broadleaf weed control in established white clover.

Evaluation of some New Pasture Weed Management Treatments in Missouri (7 locations, 2020-21)

	Weed Species*						
Treatments	Common Ragweed (5)	Common Cocklebur (1)	Musk Thistle (2)	Wild Carrot (2)	Annual Fleabane (3)	Tall Ironweed (4)	Vervain Species (1)
	% Control 2 Months After Treatment**						
Duracor	100 a	99 a	97 a	98 a	100 a	95 a	91 b
GrazonNext HL	100 a	99 a	97 a	96 a	100 a	92 a	94 a
ProClova	99 a	90 b	82 b	99 a	100 a	95 a	95 a

*numbers in parentheses indicate number of locations where a given weed species was present

**means within a column followed by the same letter are not different, LSD<0.05




BRASIL