



WEED MANAGEMENT

The Organic Farming Research Foundation **2022 National Organic Research Agenda (NORA)** is a report informed by surveys and focus groups conducted in 2020 with over 1,100 certified organic farmers and ranchers across North America.

What Farmers Said

- In the NORA report, two-thirds of survey respondents (67%) cited weed management as a substantial production challenge.
- Specific feedback from organic farmers also underscores the need for additional research on controlling weeds such as bindweed, Canadian thistle, giant ragweed, foxtail, and nutsedge.

Knowing Your Weeds

Farmers and researchers alike acknowledge that weeds pose the greatest barrier to building healthy soils in organic cropping systems. Management of weeds in an organic cropping system involves integration of many separate management tactics. Which tactics you use will depend on the weed species present, the crop, the time of year the crop is planted, the type of equipment you have available, other crops in the rotation, and other site and operation-specific factors. This is why understanding how weeds operate as species is so critical: Only through understanding can you effectively match your tactics to your site, your goals, and the weed problem at hand.

A crop rotation, cultivation tool, or integrated strategy that works wonders for one producer may require modification or fail entirely at another farm with a different soil, climate, weed flora, land base, and production system. So it is important to consider the following to guide the suite of practices for your farm:

- What are your top five or ten weed species? Get to know their life cycles - when they emerge and flower, ecological niche and nutrient responses, and weak points that can be exploited.
- What is your soil type, texture and condition; topography; climate and rainfall regime?
- What is your land base, scale of operation, enterprise mix, equipment, labor, and other resources?
- What crop rotation opportunities and constraints do you have based on production goals and market needs?

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<http://www.ofrf.org/research/nora>

***Controlling Weeds
is the #1 challenge
among organic
producers.***

OUTSMART THE WEEDS

Exclude weeds

- » Avoid weedy manure and mulch hay.
- » Plant cover crop on harvest day or sooner.

Confuse weeds

- » Vary crops, tillage, and timing.

Starve weeds

- » Feed crops in row.
- » Avoid surplus plant-available N and P.
- » Mop up leftover nutrients with cover crops.

KEYS TO SOIL HEALTH

- » Keep the soil covered.
- » Maximize living roots in the soil profile.
- » Minimize soil disturbance.
- » Energize the system with biodiversity.

YELLOW NUTSEDGE and PURPLE NUTSEDGE

<i>Family</i>	Sedge family, Cyperaceae
<i>Other common names</i>	chufa, rush nut, nut grass, northern nutgrass, coco sedge, edible galingale
<i>Habit</i>	<p>Grass-like perennial, spreading by rhizomes and tubers</p> <p>Yellow Nutsedge (<i>Cyperus esculentus</i>) has bright green to yellow-green foliage, straw-colored or golden-yellow inflorescence and tubers that are single at the tips of short rhizomes. It occurs throughout the United States and into southern Canada, and is most troublesome in irrigated or moist soils.</p> <p>Purple nutsedge (<i>Cyperus rotundus</i>) has dark green foliage and purple to brown flower heads. Purple nutsedge foliage tends to be shorter than yellow nutsedge foliage, with tips blunt compared to the elongated tips of yellow nutsedge. Purple nutsedge tubers are produced along the length of the rhizome, not just at the tips. It is most problematic in tropical and warm-temperate climates, including the southern United States and California.</p>
<i>Germination</i>	<p>Seeds: Seeds will germinate at temperatures above 70°F, and germinate more readily in light. However, the spread of nutsedge by seed is rare: no seeds are produced by about 90% of populations because they are composed of a single clone.</p> <p>Tubers: Nutsedges reproduce primarily by tubers. A rhizome emerges from the tuber and forms a basal bulb. After several weeks' shoot growth, new rhizomes grow laterally from basal bulbs, creating new basal bulbs and shoots (daughter plants). Tubers may form as deeply as 18", the vast majority of tubers are found in the top 6" of soil.</p>
<i>Season of emergence</i>	Mid-spring to early summer. In temperate regions, new growth begins after the spring frost date. The shoots that emerge later in the summer are usually from upturned rhizomes.
Source: SARE Manage weeds on your farm: a guide to ecological strategies, 2021	

MANAGEMENT

Nutsedge is a highly competitive and persistent weed in a wide range of crops and extreme measures are often taken to manage it. In conventional and organic systems alike, the most common method for controlling nutsedge is to desiccate the tubers by timely, repeated tilling. During the warm, dry period of late spring and early summer after the tubers have sprouted but before daughter plants or new tubers have formed the soil is tilled to the depth of the deepest tubers. In systems that work to enhance soil health it is recommended to reduce the frequency of tillage, which can be at odds with management strategies for nutsedge infested fields.

Farmers working toward sustainable conservation tillage systems may first need to take steps to control a current infestation of weeds such as nutsedge before returning to reduced tillage practices. Once control of nutsedge is achieved, efforts should return to restoring soil health with reduced soil disturbances.

Images, Left to Right: Yellow Nutsedge (*Cyperus esculentus*) and Purple Nutsedge (*Cyperus rotundus*)



	<i>Yellow Nutsedge</i>	<i>Purple Nutsedge</i>
<i>Drought tolerance</i>	Moderate to high	Very high
<i>Heat tolerance</i>	High	Very high
<i>Flood tolerance</i>	Very high (thrives in wet soil)	High (goes dormant)
<i>Cold tolerance</i>	Moderate (tubers ~20°F)	Low (all parts frost tender)
<i>Shade tolerance</i>	Low–moderate	Low (shoots die back, tubers persist)
<i>Ability to penetrate organic mulch</i>	Very high	Very high
<i>Ability to penetrate black plastic</i>	Moderate (mulch slows spread)	Very high (mulch stimulates spread)
<i>Ability to penetrate clear plastic</i>	Low (leaves open and are trapped)	Low (leaves open and are trapped)

Table adapted from Weed Profile: Yellow Nutsedge (Cyperus esculentus) and Purple Nutsedge (C. rotundus) by Dr. Mark Schonbeck.

Timed Tilling

For mechanical control of nutsedge it is recommended to repeat cultivation every 2–3 weeks, before plants reach the 6-leaf stage in late spring or early summer emergence.

Image right: Purple nutsedge regrowth photographed 13 days after initial tillage. This is the time to cultivate. The small shoot on the right has drawn down underground reserves to its low point. The larger plant to the left has already begun to rebuild below-ground biomass.

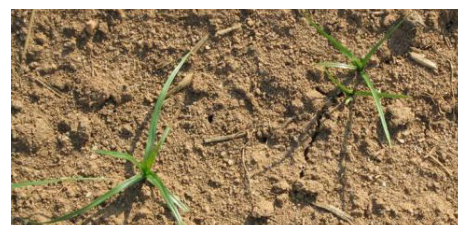


Photo credit: Mark Schonbeck, Virginia Association for Biological Farming

Drying

During the middle of summer, purple nutsedge can be controlled by cultivating an infested area and then withholding all moisture to allow the sun to dry the tubers. Repeated tilling and drying are required to give good control. This method is effective only in areas where other plants don't need irrigation.

- In the southeastern United States a peanut digger can be used to bring the tubers to the soil surface to dry them out.

Drying is not effective for controlling yellow nutsedge.

Shading

Nutsedges don't grow well in shade, so exploiting their short stature and shade intolerance may help reduce their prevalence.

- Choose vigorous, adapted varieties of heavy-canopy crops like potato, bush bean, and sweet potato; and tall crops like sweet corn or trellised tomato.
- Canadian potato growers have found that growing a potato variety with particularly heavy foliage can substantially reduce yellow nutsedge populations in the following season, compared to fields with less-competitive varieties.

Crop Rotation and Cover Crop Considerations

- Allelopathic substances from sweet potatoes, wild radish and rye can reduce yellow nutsedge density and vigor. Suppression of yellow nutsedge by rye is most effective if the rye root system is present as well as the straw.
- Design crop rotation and planting dates so that the late spring flush of nutsedge emerges beneath a dense crop canopy or can be knocked out by tillage after harvest of an early spring vegetable like spinach or salad greens.
- Disrupt the onset of tuber production in late summer by providing heavy shade with crops such as snap bean or sweet potato or through tillage after a midsummer vegetable harvest.
- Follow spring vegetables with aggressive, fast-growing, summer cover crops that will shade out emerging nutsedge. Use optimal seeding rates and methods to maximize cover crop weed suppression.
 - » A dense buckwheat planting that provides rapid canopy can suppress weeds during brief (30–50 day) fallow periods in frost-free, moderately warm weather.
 - » For longer fallow or hotter conditions, combine a tall grass (sudangrass, sorghum-sudangrass hybrid, or pearl millet) with a heavy-canopy summer legume (cowpea, forage soybean, velvetbean, or lablab bean) for maximum competition.

- » In fields with nutsedge populations too heavy to allow successful production of summer vegetables, grow high biomass summer cover crops and follow with cool-season vegetables in fall, winter, or early spring, when nutsedge is dormant.

Cautiously Consider Solarization or Occultation

The large food storage in the tubers allows yellow nutsedge to penetrate even very thick layers of organic mulch materials.

- The sharp points of the newly emerged shoots easily pierce thin, opaque horticultural plastic film but not clear plastic film, where light induces leaf expansion and blunts the sharpness of the emerging shoot.
- Thicker plastic mulch, whether opaque or clear, can suppress yellow nutsedge, as can heavier materials such as landscape fabric. Tuber production and patch expansion also are suppressed by plastic film.



Image above: Nutsedge has penetrated the plastic film mulch and is interfering with the pepper crop.

Photo credit: Theodore Webster, Agricultural Research Service, Bugwood.org

Consider Grazing

Try using swine, hens, or weeder geese to consume nutsedge.

- Laying hens confined in small fenced areas at densities equivalent to 480 birds per acre have been reported to clean up a heavy nutsedge infestation in one season.
- Weeder geese at 8 to 16 birds per acre can help reduce nutsedge populations.
- Swine will root out and consume nutsedge tubers and 60-75 hogs have been reported to remove purple nutsedge tubers from a 2.5 acre field in one day in India ([Open Source for Weed Assessment in Lowland Paddy Fields](#)). The eradication of tubers will be quicker and more complete if the soil is tilled before hogs are set to the field.

Preventive Measures

- Populations of nutsedge can be established from tubers brought in on tillage and cultivating machinery. Sources of new populations include root balls of nursery stock and topsoil that is spread after construction. If uprooted nutsedge plants are composted at low temperatures, the resulting compost can potentially spread the weed.
- Use an integrated strategy that combines multiple preventive and control measures.
- Bring heavy infestations under control before attempting summer vegetable and perennial crop production
- Be vigilant and proactive to keep small populations from exploding.

A good time to use livestock or poultry for nutsedge control is immediately after crop harvest and before planting a cover crop.

This infosheet was informed by free resources available for download:

- **[Manage Weeds on your Farm.](#)** (SARE Guidebook, 2021.) Provides in-depth information about dozens of agricultural weeds and the best ways to manage them. Part One describes the strengths and limitations of the most common cultural management practices, physical practices and cultivation tools. Part Two is a reference section that describes the identification, ecology and management of 63 of the most common and difficult-to-control weed species found in the U.S.
<https://www.sare.org/resources/manage-weeds-on-your-farm/>
- **[Conservation Tillage Systems in the Southeast.](#)** (SARE Guidebook, 2020.) Provides an overview of conservation tillage systems, detailed chapters examining the different core components of conservation tillage systems, and specific recommendations for adopting and operating conservation tillage systems for crop production in different regions of the southeastern United States.
https://www.sare.org/wp-content/uploads/Conservation-Tillage-Systems-in-the-Southeast_compressed.pdf

- **Weed Profile. Yellow Nutsedge (*Cyperus esculentus*) and Purple Nutsedge (*C. rotundus*)** (2019.)
This resource on eOrganic by Dr. Mark Schonbeck outlines the nutsedge varieties, life cycle, and management practices.
<https://eorganic.org/node/5131>

Other Select Resources

- **Weed Management - an ecological approach.** (OFRF Report, 2017.)
An analysis of ecological weed management challenges, best practices, resources, and ongoing research of ecological weed management.
<https://ofrf.org/soil-health-and-organic-farming-reports/weed-management-an-ecological-approach/>
- **"Researchers use pigs to root out problem weeds."** (University of Florida Institute of Food and Agricultural Sciences, 2015.)
Back before chemical pesticides and herbicides, farmers had to come up with ways to kill the weeds that took over their fields. One method used "back in the day" was letting pigs loose in fields that were not being used for crops for a season and allowing the pigs to do what they do naturally: dig up the roots of weeds and fertilize the land.
<http://www.sciencedaily.com/releases/2015/07/150727120542.htm>

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