Sunset 2025
Meeting 1 - Request for Public Comment
Crops Substances § 205.601 & § 205.602
April 2023

Introduction

As part of the Sunset Process, the National Organic Program (NOP) announces substances on the National List of Allowed and Prohibited Substances (National List) that are coming up for sunset review by the National Organic Standard Board (NOSB). The following list announces substances that are on the National List which must be reviewed by the NOSB and renewed by the USDA before their sunset dates. This document provides the substance's current status on the National List, annotation, references to past technical reports, past NOSB actions, and regulatory history, as applicable. If a new technical report has been requested for a substance, it is noted in this list. Substances included in this document may also be viewed in the NOP's Petitioned Substances Index.

Request for Comments

While the NOSB will not complete its review and any recommendations on these substances until the Fall 2023 public meeting, the NOP is requesting that the public provide comments about these substances to the NOSB as part of the Spring 2023 public meeting. Written public comments will be accepted through April 5, 2023 via www.regulations.gov. Comments received after that date may not be reviewed by the NOSB before the meeting.

These public comments are necessary to guide the NOSB's review of each substance against the criteria in the Organic Foods Production Act (see 7 U.S.C. 6518(m)) and the USDA organic regulations (7 CFR 205.600). The current substances on the National List were originally recommended by the NOSB based on evidence available to the NOSB at the time of their last review, which demonstrated that the substances were: (1) not harmful to human health or the environment, (2) necessary because of the unavailability of wholly nonsynthetic alternatives, and (3) consistent and compatible with organic practices.

Public comments should clearly indicate the commentor's position on the allowance or prohibition of substances on the National List and explain the reasons for the position. Public comments should focus on providing relevant new information about a substance since its last NOSB review. Such information could include research or data that may support a change in the NOSB's determination for a substance (*e.g.*, scientific, environmental, manufacturing, industry impact information, etc.). Public comment should also address the continuing need for a substance or whether the substance is no longer needed or in demand.

For Comments that Support the Continued Use of §205.601 Substances in Organic Production:

If you provide comments supporting the allowance of a substance at §205.601, you should provide information demonstrating that the substance is:

1. not harmful to human health or the environment;
2. necessary to the production of the agricultural products because of the unavailability of wholly nonsynthetic substitute products; and
3. consistent with organic crop production.

For Comments that Do Not Support the Continued Use of §205.601 Substances in Organic Production:
If you provide comments that do not support a substance at §205.601, you should provide reasons why the use of the substance should no longer be allowed in organic production. Specifically, comments that support the removal of a substance from the National List should provide new information since its last NOSB review to demonstrate that the substance is:

1. harmful to human health or the environment;
2. unnecessary because of the availability of alternatives; and/or
3. inconsistent with organic crop production.

For Comments that Support the Continued Prohibition of §205.602 Substances in Organic Production:
If you provide comments supporting the prohibition of a substance on the §205.602 section of the National List, you should provide information demonstrating that the substance is:

1. harmful to human health or the environment; and
2. inconsistent with organic crop production.

For Comments that Do Not Support the Continued Prohibition of §205.602 Substances in Organic Production:
If you provide comments that do not support the prohibition of a substance at §205.602, you should provide reasons why the use of the substance should no longer be prohibited in organic production. Specifically, comments that support the removal of a substance from the §205.602 section of the National List should provide new information since its last NOSB review to demonstrate that the substance is:

1. not harmful to human health or the environment; and/or
2. consistent with organic crop production.

For Comments Addressing the Availability of Alternatives:
Comments may include information about the viability of alternatives for a substance under sunset review. Viable alternatives include, but are not limited to:

1. Alternative management practices or natural substances that would eliminate the need for the specific substance;
2. Other substances that are on the National List that are better alternatives, which could eliminate the need for this specific substance; and/or
3. Other organic or nonorganic agricultural substances.

Your comments should address whether any alternatives have a function and effect equivalent to or better than the allowed substance, and whether you want the substance to be allowed or removed from the National List. Assertions about alternative substances, except for those alternatives that already appear on the National List, should, if possible, include the name and address of the manufacturer of the alternative. Further, your comments should include a copy or the specific source of any supportive literature, which could include: product or practice descriptions, performance and test data, reference standards, names and addresses of organic operations who have used the alternative under similar conditions and the date of use, and an itemized comparison of the function and effect of the proposed alternative(s) with substance under review.

Written public comments will be accepted through April 5, 2023, via www.regulations.gov. Comments received after that date may not be reviewed by the NOSB before the meeting.

§205.601 Sunsets: Synthetic substances allowed for use in organic crop production:

- Alcohols: Ethanol
- Alcohols: Isopropanol
- Sodium carbonate peroxyhydrate
- Newspaper or other recycled paper, without glossy or colored inks (§205.601(b) - mulch)
- Newspaper or other recycled paper, without glossy or colored inks (§205.601(c) - compost feedstock)
- Plastic mulch and covers
- Aqueous potassium silicate (§205.601(e) - insecticide)
- Aqueous potassium silicate (§205.601(i) - plant disease control)
- Elemental sulfur (§205.601(e) - insecticide; §205.601(i) - plant disease control; §205.601(j) - plant or soil amendment
- Lime sulfur (§205.601(e) - insecticide)
- Lime sulfur (§205.601(i) - plant disease control)
- Hydrated lime
- Liquid fish products
- Sulfurous acid
- Ethylene gas
- Microcrystalline cheesewax

§205.602 Sunsets: Nonsynthetic substances prohibited for use in organic crop production:

- Potassium chloride

Alcohols: Ethanol

Reference: 205.601(a) As algicide, disinfectants, and sanitizer, including irrigation system cleaning systems. (1) Alcohols. (i) Ethanol.
Technical Report(s): 1995 TAP; 2014 TR
Petition(s): N/A
Past NOSB Actions: 11/1995 NOSB minutes and vote (pg. 17-18); 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
Ethanol is used in organic crop production as an algicide, disinfectant, and sanitizer, including irrigation system cleaning.

Manufacture
Ethanol can be produced by fermentation and chemical synthesis through direct or indirect hydration of ethylene. Fermentation to produce ethanol can use starch, sugar, or cellulose using either natural or genetically engineered strains of bacteria or yeast.

International Acceptance

Canadian General Standards Board Permitted Substances List
Ethanol is listed as a synthetic for organic crop and livestock production.

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Ethanol is listed as a synthetic for organic crop and livestock production.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Ethanol is listed as a synthetic for organic crop and livestock production.

International Federation of Organic Agriculture Movements (IFOAM)
Ethanol is listed as a synthetic for organic crop and livestock production.

Japan Agricultural Standard (JAS) for Organic Production
Ethanol is listed as a synthetic for organic crop and livestock production.

Environmental Issues
According to the United States Environmental Protection Agency (EPA), the agency that regulates all non-food applications of ethanol, ethanol is practically non-toxic based on acute oral and inhalation

toxicity tests. Ethanol is biodegradable in air, soil, and water. Ethanol can contribute to smog but would be minimal in the quantities used.

Discussion
The Crops Subcommittee noted there is little to no environmental or human health impacts associated with the use of ethanol.

In the 2017 sunset review, the NOSB voted unanimously to keep ethanol on the National List. Public comments during 2017 were mainly in favor of keeping ethanol on the National List, but one commenter did suggest that organic ethanol sources should be investigated.

Questions to our Stakeholders
1. Should there be an annotation requiring organically produced ethanol if sufficient quantities are available for organic production?

Alcohols: Isopropanol

Reference: 205.601(a) As algicide, disinfectants, and sanitizer, including irrigation system cleaning systems. (1) Alcohols. (ii) Isopropanol.
Technical Report(s): 1995 TAP; 2014 TR
Petition(s): N/A
Past NOSB Actions: 11/1995 NOSB minutes and vote (pg. 17-18); 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/20 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
Isopropanol is used for a variety of industrial and consumer uses. In organic crop production, isopropanol can be used as an algicide, disinfectant, and sanitizer. Isopropanol has broad-spectrum antimicrobial activity against vegetative bacteria, viruses, and fungi.

Manufacture
Isopropanol is a synthetic compound that is manufactured by hydration of petroleum-derived propylene. Acetone can also be used as a hydrated base chemical over a metal catalyst.

International Acceptance
Canadian General Standards Board Permitted Substances List
Canadian organic production standards permit the use of isopropanol for a number of agricultural applications.

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008

Alcohols, presumably including isopropanol, may be used for cleaning and disinfecting livestock building installations and utensils.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
"Need recognized by certification body or authority"

International Federation of Organic Agriculture Movements (IFOAM)
No information found

Japan Agricultural Standard (JAS) for Organic Production
No information found

Environmental Issues
The United States Environmental Protection Agency (EPA) considers isopropanol slightly toxic to practically non-toxic on acute oral and inhalation toxicity tests. The alcohol can contribute to smog and ozone formation, but large-scale releases are unlikely based on prescribed use in organic agriculture.

Discussion
The Crops Subcommittee reviewed the use, manufacturing, and environmental concerns of isopropanol, and previous NOSB reviews.

When isopropanol was reviewed for the 2017 sunset, the vote by the NOSB was unanimous in retaining it on the National List. Public comments from stakeholders were mainly in favor of keeping it on the National List as an example of why multiple sanitizers and disinfectants are needed and listed for organic use.

Questions to our Stakeholders
None

Sodium carbonate peroxyhydrate

Reference: 205.601(a) As algaecide, disinfectants, and sanitizer, including irrigation system cleaning systems. (8) Sodium carbonate peroxyhydrate (CAS #-15630-89-4)—Federal law restricts the use of this substance in food crop production to approved food uses identified on the product label.
Technical Report: 2006 TR; 2014 TR
Petition(s): 2005
Past NOSB Actions: 11/2007 NOSB recommendation; 10/2014 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 12/13/2010 (75 FR 77521); Sunset renewal notice published 06/19/2015 (80 FR 35177); Sunset renewal notice published 05/07/2020 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
According to the 2014 TR and previous reviews by the Board, sodium carbonate peroxyhydrate has been used in organic production as an algaecide in rice fields, ponds, ditches, and irrigation lines. It was added to the National List in 2007 as an alternative to materials such as copper and chlorine; it has been registered for use in rice since 2010. In wider legal uses of the substance, "In its primary registration by the US Environmental Protection Agency (EPA) as a biopesticide, use sites for sodium carbonate peroxyhydrate include ornamental plants, turf grasses, terrestrial landscapes, commercial greenhouses, garden centers, nurseries, and storage areas. Target pests included algae, moss, liverworts, slime molds and their spores. There was no food use authorized." (TR 104-107)

Manufacture
According to the 2014 TR, "Sodium carbonate peroxyhydrate is the chemical name for an addition product produced by drying hydrogen peroxide in the presence of sodium carbonate (CAS No. 497-19-8). The pure substance contains 32.5 % hydrogen peroxide and 67.5 % sodium carbonate (based on weight)" (TR 51-53).

The TR lists three common manufacturing processes via drying, crystallization, and a spray granulation process. "The dry process involves spraying an aqueous stabilized hydrogen peroxide solution on solid sodium carbonate with continuous agitation. A solid-liquid reaction yields sodium carbonate peroxyhydrate" (TR 232-33). "In the spray granulation process, solutions of sodium carbonate and aqueous stabilized hydrogen peroxide are sprayed onto a bed of sodium carbonate peroxyhydrate nuclei in a fluid-bed granulator. The product bed is kept in movement by a stream of heated air. Product is continuously withdrawn from the dryer and the desired grain-size fraction is obtained by classification" (TR 235-238). "The crystallization process takes advantage of the high solubility of sodium carbonate peroxyhydrate. In this method, sodium carbonate peroxyhydrate is salted out of aqueous solutions with sodium chloride. A sodium carbonate/NaCl suspension is reacted with stabilized hydrogen peroxide under stirring and cooling. The crystallized sodium carbonate peroxyhydrate is separated from the mother liquor by centrifugation, and drying in a fluid-bed dryer" (TR 240-244).

International Acceptance
Canadian General Standards Board Permitted Substances List
As per the 2014 TR: "Hydrogen peroxide is on the Canadian Organic Production Systems Permitted Substances Lists (CAN/CGSB-32.311-2006). It is listed for use as a fungicide. Sodium carbonate (soda ash) is considered a natural substance in the Canadian system. Sodium carbonate peroxyhydrate is not included in any of the Canadian permitted substance lists" (TR 168-171).

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
As per the 2014 TR: "Sodium carbonate peroxyhydrate is not listed as a permitted substance for organic production"(TR 187)

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)
As per the 2014 TR: "Although Codex Alimentarius permits the use of sodium carbonate peroxyhydrate as an anti-bactericide in raw milk, it is not included in any list for organic use" (TR 176-77).

International Federation of Organic Agriculture Movements (IFOAM) Norms
As per the 2014 TR: "Sodium carbonate peroxyhydrate is not listed or discussed for use in the IFOAM norms" (TR 201).

Japan Agricultural Standard (JAS) for Organic Production
As per the 2014 TR: "Sodium carbonate peroxyhydrate, hydrogen peroxide and sodium carbonate are not specifically listed in the Japanese Agricultural Standard for Organic Plants" (TR 195-196).

Environmental Issues
An emission of sodium carbonate peroxyhydrate to the environment could occur during production, formulation, and use of the substance (TR lines 323-24). Sodium, carbonate, and hydrogen peroxide do not adsorb to sediment (TR line 333). No new concerns were raised about human health or environmental effects since the earlier review in 2006; however, the substance can have negative impacts on fish, birds, and bees. "Aquatically, toxic effects of sodium carbonate peroxyhydrate on fish have been reported, but the sensitivity of different fish species depends on final hydrogen peroxide concentration, water temperature, and life stage" (TR 395-397). "Undissolved sodium carbonate peroxyhydrate is toxic to birds when ingested. However, once applied and dissolved in water, sodium carbonate peroxyhydrate is not expected to be toxic to birds. Sodium carbonate peroxyhydrate is also highly toxic to bees and it should not be allowed to drift to flowering plants or used when contact with bees might occur" (TR 404-407).

Discussion
The Crops Subcommittee considered previous reviews of this substance. In the last review, the Subcommittee sought input comparing this material with copper sulfate for control of algal scum in rice production and asked if it could replace copper sulfate for that use. Limited and conflicting comments were received. Points raised in favor of renewing the substance stated that it provides better control of algae, and its breakdown components of water and oxygen are more favorable than the accumulation of elemental copper associated with copper sulfate. Additionally, when utilized in irrigation ponds sodium carbonate peroxyhydrate has fewer corrosion issues with irrigation equipment than copper sulfate.

The Subcommittee recognizes the value in the continued presence of the substance on the National List, even if it is not a commonly used material. Additionally, the potential for inadvertent use as a fungicide in branded products marketed for both uses was discussed by the Subcommittee.

Questions to our Stakeholders
1. Is there potential for misuse as a fungicide when sodium carbonate peroxyhydrate is applied as an algaecide? Additionally, should the NOSB consider expanding the listing to an allowance for use as a fungicide?
2. Is this substance being used as an effective alternative to copper sulfate in rice production to control algae?

Newspaper or other recycled paper, without glossy or colored inks

Reference: 205.601(b) As herbicides, weed barriers, as applicable. (2) Mulches. (i) Newspaper or other recycled paper, without glossy or colored inks.
Technical Report: 1995 TAP; 2006 TR; 2017 TR
Petition(s): N/A
Past NOSB Actions: 11/1995 NOSB minutes and vote (pg. 19); 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation

Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/20 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
Newspaper and other recycled paper is commonly used in organic agriculture as a non-chemical means of weed management and soil moisture retention, soil temperature moderation, and boosts to soil organic matter. It is also used to shade out plant growth; it then degrades into the soil.

Manufacture
A 2017 TR on this material reports that one-third to one-half of all paper in the United States is recycled into other paper products, and reports EPA figures from 2013 data that paper is recycled at a rate of 63% in the United States.

Recycled paper comes from a number of different sources that affect the grade of the recycled paper product; old corrugated containers, mixed paper, old newspapers, high grade de-inked paper, and pulp substitutes. These larger categories are further segmented into as many as 50 different sub-grades of recycled paper. Paper recovered for recycling is ultimately shredded and pulped to produce new paper products.

Some recycled paper cannot be made into other paper products but can become a feedstock for compost products, while some recycled paper carries too many contaminants – some of it toxic -- including plastics, motor oil, paint, glass, and other non-paper materials.

An important consideration of newspaper and recycled paper in organic production relates to the inks that are printed onto the paper. Black ink has historically been derived from vegetable- or petroleum-based sources that involve the use of solvents that can damage the environment in a variety of ways. Increasingly, black inks have become water-based, though not 100% solvent-free. The use of various heavy metal compounds in colored ink has been an important consideration in excluding colored inks from use in organic production. Similarly, while glossy inks can gain their functional components from nonsynthetics like bentonite or kaolinite, those functions can also come from petrochemical synthetic polymers like acrylonitrile, polyethylene (LDPE), styrene, butadiene, vinyl acetate, and polyvinyl chloride, excluding them from any use in organic production.

Adhesives, glues, waxes, and resins are also among the materials that could be found in newspaper and recycled paper products and raise similar questions to those posed during prior reviews of biodegradable biobased mulch film.

Paper mulches are not regulated as an herbicide by the EPA and are considered inert.

It is worth noting that virgin, or non-recycled paper, comes from a variety of plant materials, including wood, trees, straw, hemp, sugarcane bagasse, bamboo, reeds, and kenaf, with the majority coming from wood fibers. As noted in the 2017 TR , most of the wood fibers derived from trees used for paper

production do not incorporate methods considered to be excluded from organic production. However, some genetically modified trees are being produced that could potentially be used in paper production in the future. Some sources have reported that as many as 200 different chemicals can be used to make it possible to use tree fiber as a feedstock for paper production (Discover Magazine, April 4, 2014).

International Acceptance

Canadian General Standards Board Permitted Substances List
Permitted for use but only "without glossy paper and coloured ink."

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Not specified as permitted for use.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)
Not specified as permitted for use.

International Federation of Organic Agriculture Movements (IFOAM) Norms
Not specified as permitted for use.

Japan Agricultural Standard (JAS) for Organic Production
Not specified as permitted for use.

Environmental Issues

While recycled paper production is assumed to have fewer environmental impacts than virgin paper production, it still presents issues. Sodium hydroxide and other chemical additives and surfactants may be introduced into the process. The de-inking sludge – or wastewater byproduct – that is produced from paper recycling can contain a number of synthetic materials and is typically landfilled, burned, or co-composted with sewage and poultry litter.

That said, the use of recycled paper ensures that trees are not harvested for the production of paper, a process that has much more far-reaching impacts including the loss of habitat, disturbance or destruction of soils, and the destabilization of carbon sinks.

Discussion

At the 2015 NOSB sunset review, it came to the attention of both the NOSB and the public that there are new, less toxic materials used in production of newspaper and other recycled paper products which could stimulate the NOSB to consider a change to the annotation for this material. A technical report (TR) was requested and subsequently completed in summer 2017. The TR revisited the ingredients and colored inks in newspaper as well as their effect on the environment.

While there has been progress towards less toxic materials used in inks, and more recycling of paper products since the original listings and annotation of newspaper and recycled paper, it is difficult-to-impossible to determine if the inks present in the newspaper are ones that are less problematic. There is no methodology to distinguish between color inks that might be more acceptable for direct application to organic land and those that are not. When reviewing the 2017 TR, the Crops Subcommittee decided the current annotation for newspaper and recycled paper, which prohibits glossy or colored inks, should remain. This conclusion was presented as an update to the full NOSB at the Fall 2017 NOSB meeting. The NOSB unanimously voted to continue this listing at 205.601(b) in 2018.

There was continued support for this material to remain on the National List with the current annotation. Certifiers, grower groups, and individual growers all submitted comments in favor of retaining this material in both locations on the National List. While some stated there was currently not much use of this material in organic crop production, they also stated it should continue to be allowed for those who wish to continue using it. One certifier noted that newspaper could be included in manure that is cleaned out of livestock barns, supporting the relisting as a compost feedstock.

Questions to our Stakeholders

1. Should there be an annotation for this listing that attempts to further clarify what uses are acceptable within organic production?
2. How widely used are these materials in organic production?

Newspaper or other recycled paper, without glossy or colored inks

Reference: 205.601(c) As compost feedstocks—Newspapers or other recycled paper, without glossy or colored inks.
Technical Report: 1995 TAP; 2006 TR; 2017 TR
Petition(s): N/A
Past NOSB Actions: 11/1995 NOSB minutes and vote (pg. 19); 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
Newspaper and other recycled paper is commonly used in organic agriculture as a compost feedstock. Effectively, the newspaper or recycled paper is a carbon source – or food -- for active compost processing.

Manufacture
A 2017 TR on this material reports that one-third to one-half of all paper in the United States is recycled into other paper products, and reports EPA figures from 2013 data that paper is recycled at a rate of 63% in the United States.

Recycled paper comes from a number of different sources that affect the grade of the recycled paper product: old corrugated containers, mixed paper, old newspapers, high grade de-inked paper, and pulp substitutes. These larger categories are further segmented into as many as 50 different sub-grades of recycled paper.

Some recycled paper cannot be made into other paper products but can become a feedstock for compost products, while some recycled paper carries too many contaminants – some of it toxic -- including plastics, motor oil, paint, glass, and other non-paper materials.

An important consideration of newspaper and recycled paper in organic production relates to the inks that are printed onto the paper. Black ink has historically been derived from vegetable- or petroleum-based sources that involve the use of solvents that can damage the environment in a variety of ways. Increasingly, black inks have become water-based, though not 100% solvent-free. The use of various heavy metal compounds in colored ink has been an important consideration in excluding colored inks from use in organic production. Similarly, while glossy inks can gain their functional components from nonsynthetics like bentonite or kaolinite, those functions can also come from petrochemical synthetic polymers like acrylonitrile, polyethylene (LDPE), styrene, butadiene, vinyl acetate, and polyvinyl chloride, excluding them from any use in organic production.

Adhesives, glues, waxes, and resins are also among the materials that could be found in newspaper and recycled paper products and raise similar questions to those posed during prior reviews of biodegradable biobased mulch film.

Composting is not federally regulated therefore, neither is the use of paper as a compost feedstock. However, components of paper feedstock, such as heavy metals, could be regulated at the state level.

It is worth noting that virgin, or non-recycled paper, comes from a variety of plant materials, including wood, trees, straw, hemp, sugarcane bagasse, bamboo, reeds, and kenaf, with the majority coming from wood fibers. As noted in a 2017 TR, most of the wood fibers derived from trees used for paper production do not incorporate methods considered to be excluded from organic production. However, some genetically modified trees are being produced that could potentially be used in paper production in the future. Some sources have reported that as many as 200 different chemicals can be used to make it possible to use tree fiber as a feedstock for paper production (Discover Magazine, April 4, 2014).

International Acceptance

Canadian General Standards Board Permitted Substances List
Permitted for use but only “without glossy paper and coloured ink.”

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Not specified as permitted for use.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)
Not specified as permitted for use.

International Federation of Organic Agriculture Movements (IFOAM) Norms
Not specified as permitted for use.

Japan Agricultural Standard (JAS) for Organic Production
Not specified as permitted for use.

Environmental Issues
While recycled paper production is assumed to have fewer environmental impacts than virgin paper production, it still presents issues. Sodium hydroxide and other chemical additives and surfactants may be introduced into the process. The de-inking sludge – or wastewater byproduct – that is produced from paper recycling can contain a number of synthetic materials and is typically landfilled, burned, or co-composted with sewage and poultry litter.
That said, the use of recycled paper ensures that trees are not harvested for the production of paper, a process that has much more far-reaching impacts including the loss of habitat, disturbance or destruction of soils, and the destabilization of carbon sinks.

Discussion
At the 2015 NOSB sunset review, it came to the attention of both the NOSB and the public that there are new, less toxic materials used in production of newspaper and other recycled paper products which could stimulate the NOSB to consider a change to the annotation for this material. A technical report (TR) was requested and subsequently completed in summer 2017. The TR revisited the ingredients and colored inks in newspaper as well as their effect on the environment.

While there has been progress towards less toxic materials used in inks, and more recycling of paper products since the original listings and annotation of newspaper and recycled paper, it is difficult to impossible to determine if the inks present in the newspaper are ones that are less problematic. There is no methodology to distinguish between color inks that might be more acceptable for direct application to organic land and those that are not. When reviewing the 2017 TR, the Crops Subcommittee decided the current annotation for newspaper and recycled paper, which prohibits glossy or colored inks, should remain. This conclusion was presented as an update to the full NOSB at the Fall 2017 NOSB meeting. The NOSB unanimously voted to reinstate continue this listing at 205.601(c) in 2018.

There was continued support for this material to remain on the National List with the current annotation. Certifiers, grower groups, and individual growers all submitted comments in favor of retaining this material in both locations on the National List. While some stated there was currently not much use of this material in organic crop production, they also stated it should continue to be allowed for those who wish to continue using it. One certifier noted that newspaper could be included in manure that is cleaned out of livestock barns, supporting the relisting as a compost feedstock.

Questions to our Stakeholders
1. Should there be an annotation for this listing that attempts to further clarify what uses are acceptable within organic production?
2. How widely used are these materials in organic production?

Plastic mulch and covers

Reference: 205.601(b) As herbicides, weed barriers, as applicable. (2) Mulches. (ii) Plastic mulch and covers (petroleum-based other than polyvinyl chloride (PVC)).
Technical Report: 1995 TAP
Petition(s): N/A
Past NOSB Actions: 11/1995 NOSB minutes and vote (pg. 20); 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
Plastic mulches and covers provide multiple functions in organic production including, but not limited to, weed barrier, soil, nutrient and water retention, soil warming, soil solarizing, high and low tunnels, and reflective barriers for insect pests.

Manufacture
Plastic mulches and covers are thermoplastic resins of high melt viscosity, usually polyethylene. Resin pellets are melted into an extruder and pumped or blown through a die or tube to form the plastic in the desired shape.

International Acceptance
Canadian General Standards Board Permitted Substances List
Plastic mulches: non-biodegradable and semi-biodegradable materials shall not be incorporated into the soil or left in the field to decompose. Use of polyvinyl chloride as plastic mulch or row cover is prohibited.

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
No reference

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)
No reference

International Federation of Organic Agriculture Movements (IFOAM) Norms
No reference

Japan Agricultural Standard (JAS) for Organic Production
Plastic mulch (limited to those to be removed after use)

Environmental Issues
Although there is significant support for its relisting, plastic mulch has many environmental concerns, most of which are related to disposal after each season. The recycling of plastic mulch seems to be a diminishing option. The product is easily damaged and contaminated, which makes recycling a less viable option. Other concerns include the breakdown of microplastics and litter from damaged product remaining in the field. These pieces are considered foreign materials and contaminate organic soils. The labor cost to remove plastic is very expensive and often is a challenge for growers. Because of this, many growers are excited for the development of biodegradable mulches.

Discussion
The Crops Subcommittee discussed the use, manufacturing, and environmental issues with plastic mulches. The expansiveness of the listing and annotations were reviewed, and it was noted that the term, "covers," can be in reference to high and low tunnels as well as ground coverings. Members of the subcommittee discussed the significance of recycling as a diminishing option and reviewed the social concerns about recycling of plastic mulches not being a viable option. The subcommittee also discussed § 205.206(c)(6) that requires plastic mulches to be removed at the end of the growing or harvest season and how it is applied with this listing.

Questions to our Stakeholders
1. Please describe in detail how this listing for plastic mulches is being applied in conjunction with the § 205.206(c)(6) requirement for removal, and specifically, how is the provision being applied in all areas of organic cropping systems?

Aqueous potassium silicate

Reference: 205.601(e) As insecticides (including acaricides or mite control). (2) Aqueous potassium silicate (CAS #-1312-76-1)—the silica, used in the manufacture of potassium silicate, must be sourced from naturally occurring sand.
Technical Report: 2003 TAP; 2014 TR; 2022 Limited Scope TR Pending
Petition(s): 2002; 2006 (Addendum #1)
Past NOSB Actions: 11/2007 NOSB recommendation; 10/2014 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 12/13/2010 (75 FR 77521); Sunset renewal notice published 06/19/2015 (80 FR 35177); Sunset renewal notice published 05/07/2020 (85 FR 27105).
Sunset Date: 6/22/2025

Subcommittee Review

Use
Aqueous potassium silicate is used as an insecticide for insects and mites. Formulations of aqueous potassium silicate are either sprayed on the foliage of plants or incorporated in the soil with the goal of plant uptake across root and leaf boundaries. The silica tetrahedra are purported to be incorporated in boundary cells (in roots and leaves) inhibiting insect feeding and the onset of plant disease infection. The action of applying potassium silicate in a foliar spray serves to induce production of phytoalexins, chitinases and that in turn strengthen stroma and cell walls.

Manufacture
Aqueous potassium silicate is manufactured by combining high purity silica sand and potassium carbonate (both mined materials) and heating to a high temperature (2000 degrees F). The potassium carbonate and silicon dioxide fuse to form a molten potassium silicate glass with the evolution of carbon dioxide gas. This glass can either be 1) cooled and ground into a powder or 2) dissolved in water to form a potassium silicate solution. The solution may subsequently be spray dried to form hydrous powder granules of potassium silicate.

International Acceptance

Canadian General Standards Board Permitted Substances List
Potassium silicate is listed as approved for crop protection.

European Economic Community (EEC) Council Regulation, EC No. *834/2007* and *889/2008*
No silicates were listed at this website.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Silicates allowed only as ground powders.

International Federation of Organic Agriculture Movements (IFOAM)
Silicates are allowed as plant protectants

Japan Agricultural Standard (JAS) for Organic Production
No information found

Environmental and Health Issues
The 2014 TR states that

- "Potassium silicate will not adversely affect birds."
- It is "practically non-toxic to fish."
- "Potassium silicate is not toxic to honeybees at the concentration administered for the foliar spray."
- "The overall toxicological risk from human exposure to potassium silicate is negligible."
- "Risks from aggregate exposure via oral, dermal and inhalation exposure are … considered negligible."

Discussion
Written comments in 2018 were heavily in favor of relisting. As an example, the Organic Produce Wholesalers Coalition wrote—

- The substance is taken up by plants and reinforces the plant's ability to defend itself against diseases and pests through enhanced activation of specific immune responses.
- The [TR] cites many articles and reviews that support positive and beneficial effects of soluble silicates in protecting plants from abiotic and biotic stresses. The most significant effect on plants, besides improving their fitness and increasing plant productivity, is the suppression of insect feeding and impacts from plant diseases.

- Aqueous potassium silicate is approved by the EPA as a biopesticide for use on agricultural crops, fruits, nuts, vines, turf, and ornamentals, making it useful for producers of many of the fruit and vegetable crops distributed by OPWC members.
- EPA notes that there is minimal potential for concern about exposure of insects, fish, and other non-target wildlife as a result of using potassium silicate for pest control. At the recommended concentration for potassium silicate foliar spray, reactivity with other substances used in organic crop, livestock or handling is not expected.

Based on information in the 2014 technical report (TR), concerns were raised in the 2018 sunset review regarding skin irritation from handling aqueous potassium silicate, effects on farmworkers making the foliar application, effects on human or animal consumers because of its reported effect of making forage plants less digestible, its reported effect of elongation and thickening of stems, delayed antithesis and flower deformation in some plant species, and whether it is essential to and compatible with organic production.

Following up on these concerns:

- Investigation of the effect of aqueous potassium silicate on flowers showed that the articles cited were greenhouse studies in soilless media. One study showed that applications of potassium silicate "either increased or decreased height, diameter, fresh weight, dry weight, flower diameter, and leaf thickness." The other study found that drenches with higher rates of potassium silicate resulted in stunted plants with deformed flowers. However, substrate pH was not carefully controlled with the addition of such high-pH drenches. These studies have little to do with use of aqueous potassium silicate as a foliar spray in organic agriculture.
- Similarly, the study showing that aqueous potassium silicate could make forages "more difficult to chew and digest" was unrelated to the use pattern of aqueous potassium silicate in organic agriculture. The study looked at forages harvested at different growth stages and showed that overmature grass forages contained high levels of silicon and were less digestible.
- A new, limited scope TR currently in review says that aqueous potassium silicate does not present an inhalation hazard to farmworkers.
- Aqueous potassium silicate products are used by some organic fruit and vegetable growers. They have not reported adverse effects on their produce, on the contrary, they advocated for its relisting. One grower reported that two early sprays of aqueous potassium silicate eliminated several late sprays of sulfur.

Questions to our Stakeholders

1. What is the efficacy of aqueous potassium silicate relative to available alternatives?
2. How would the removal of this product impact organic growers?
3. To what extent does listing aqueous potassium silicate result in reductions in use of sulfur-based products for pest management?

Aqueous potassium silicate

Reference: 205.601(i) As plant disease control. (1) Aqueous potassium silicate (CAS #-1312-76-1)—the silica, used in the manufacture of potassium silicate, must be sourced from naturally occurring sand.
Technical Report: 2003 TAP; 2014 TR; 2022 Limited Scope TR Pending
Petition(s): 2002; 2006 (Addendum #1)
Past NOSB Actions: 11/2007 NOSB recommendation; 10/2014 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 12/13/2010 (75 FR 77521); Sunset renewal notice published 06/19/2015 (80 FR 35177); Sunset renewal notice published 05/07/2020 (85 FR 27105).
Sunset Date: 6/22/2025

Subcommittee Review

Use
Aqueous potassium silicate is used as a crop protectant for disease control and suppression. Formulations of aqueous potassium silicate are either sprayed on the foliage of plants or incorporated in the soil with the goal of plant uptake across root and leaf boundaries. The silica tetrahedra are purported to be incorporated in boundary cells (in roots and leaves) inhibiting insect feeding and the onset of plant disease infection. The action of applying potassium silicate in a foliar spray serves to induce production of phytoalexins, chitinases and that in turn strengthen stroma and cell walls.

Manufacture
Aqueous potassium silicate is manufactured by combining high purity silica sand and potassium carbonate (both mined materials) and heating to a high temperature (2000 degrees F). The potassium carbonate and silicon dioxide fuse to form a molten potassium silicate glass with the evolution of carbon dioxide gas. This glass can either be 1) cooled and ground into a powder or 2) dissolved in water to form a potassium silicate solution. The solution may subsequently be spray dried to form hydrous powder granules of potassium silicate.

International Acceptance

Canadian General Standards Board Permitted Substances List
Potassium silicate is listed as approved for crop protection.

European Economic Community (EEC) Council Regulation, EC No. *834/2007* and *889/2008*
No silicates were listed at this website.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Silicates allowed only as ground powders.

International Federation of Organic Agriculture Movements (IFOAM)
Silicates are allowed as plant protectants

Japan Agricultural Standard (JAS) for Organic Production
No information found

Environmental (and Health) Issues
The 2014 TR states that

- "Potassium silicate will not adversely affect birds."
- It is "practically non-toxic to fish."
- "Potassium silicate is not toxic to honeybees at the concentration administered for the foliar spray."
- "The overall toxicological risk from human exposure to potassium silicate is negligible."
- "Risks from aggregate exposure via oral, dermal and inhalation exposure are … considered negligible."

Discussion
Written comments in 2018 were heavily in favor of relisting. As an example, the Organic Produce Wholesalers Coalition wrote—

- The substance is taken up by plants and reinforces the plant's ability to defend itself against diseases and pests through enhanced activation of specific immune responses.
- The [TR] cites many articles and reviews that support positive and beneficial effects of soluble silicates in protecting plants from abiotic and biotic stresses. The most significant effect on plants, besides improving their fitness and increasing plant productivity, is the suppression of insect feeding and impacts from plant diseases.
- Aqueous potassium silicate is approved by the EPA as a biopesticide for use on agricultural crops, fruits, nuts, vines, turf, and ornamentals, making it useful for producers of many of the fruit and vegetable crops distributed by OPWC members.
- EPA notes that there is minimal potential for concern about exposure of insects, fish, and other non-target wildlife as a result of using potassium silicate for pest control. At the recommended concentration for potassium silicate foliar spray, reactivity with other substances used in organic crop, livestock or handling is not expected.

Based on information in the 2014 technical report (TR), concerns were raised in the 2018 sunset review regarding skin irritation from handling aqueous potassium silicate, effects on farmworkers making the foliar application, effects on human or animal consumers because of its reported effect of making forage plants less digestible, its reported effect of elongation and thickening of stems, delayed antithesis and flower deformation in some plant species, and whether it is essential to and compatible with organic production.

Following up on these concerns:

- Investigation of the effect of aqueous potassium silicate on flowers showed that the articles cited were greenhouse studies in soilless media. One study showed that applications of potassium silicate "either increased or decreased height, diameter, fresh weight, dry weight, flower diameter, and leaf thickness." The other study found that drenches with higher rates of potassium silicate resulted in stunted plants with deformed flowers. However, substrate pH was not carefully controlled with the addition of such high-pH drenches. These studies have little to do with use of aqueous potassium silicate as a foliar spray in organic agriculture.
- Similarly, the study showing that aqueous potassium silicate could make forages "more difficult to chew and digest" was unrelated to the use pattern of aqueous potassium silicate in organic agriculture. . The study looked at forages harvested at different growth stages and showed that overmature grass forages contained high levels of silicon and were less digestible.

- A new, limited scope TR currently in review says that aqueous potassium silicate does not present an inhalation hazard to farmworkers.
- Aqueous potassium silicate products are used by some organic fruit and vegetable growers. They have not reported adverse effects on their produce, on the contrary, they advocated for its relisting. One grower reported that two early sprays of aqueous potassium silicate eliminated several late sprays of sulfur.

Questions to our Stakeholders

1. What is the efficacy of aqueous potassium silicate relative to available alternatives?
2. How would the removal of this product impact organic growers?
3. To what extent does listing aqueous potassium silicate result in reductions in use of copper and sulfur-based products for pest management?

Elemental sulfur

Reference: 205.601(e) As insecticides (including acaricides or mite control). (5) Elemental sulfur.

Reference: 205.601(i) As plant disease control. (10) Elemental sulfur.

Reference: 205.601(j) As plant or soil amendments. (2) Elemental sulfur.

Technical Report: 1995 TAP; 2018 TR

Petition(s): 2017 (slug or snail bait, separate sunset review)

Past NOSB Actions: 04/1995 NOSB minutes and vote (pg. 345); 11/2005 NOSB sunset recommendation; 04/2010 NOSB sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation

Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)

Sunset Date: 6/22/2025

Subcommittee Review

Use

Approved legal uses of the substance (TR 67-75): Elemental sulfur is currently on the National List of Allowed and Prohibited Substances as a synthetic substance allowed for use in organic crop production for the following categories:

1. For uses as an insecticide, including acaricides or mite control (7 CFR)) 205.601 (e)(5).
2. For plant disease control (7 CFR 205.601(i)(10)).
3. As plant or soil amendments (7 CFR 205.601(j)(2)).

The current sunset review includes all three listings of sulfur, used as an insecticide, plant disease control, and as a plant or soil amendment.

Sulfur is an essential plant nutrient, naturally present in our food and soil, and is part of normal human biochemistry. When sulfur is used as a soil amendment it can have a strong acidifying effect by replacing sodium with calcium in high pH alkali soils. Sulfur is considered the fourth major plant nutrient after nitrogen, phosphorus, and potassium-. Sulfur can also be used to control insects and/or diseases. It is approved for use on conventional and organic crops to help control fungi and other pests and is commonly used on farms domestically and internationally.

Manufacture
Sulfur is one of few elements found in its elemental form in nature, typically in limestone/gypsum formations, limestone/anhydrite formations associated with salt domes, or volcanic rock (d'Aquin 2007).

Currently, elemental sulfur is produced as a by-product from natural gas or petroleum operations and refinery processes. The latter is the primary source of most elemental sulfur currently being used.

International Acceptance
Canadian General Standards Board Permitted Substances List
Sulfur is allowed by the Canadian Organic Standards. The Canadian General Standards Board (CGSB) includes non-synthetic elemental sulfur as a permitted substance for organic production systems (CAN/CGSB-32.311-2015) for use as a soil amendment and as a foliar application. The CGSB also permits using sulfur to control external parasites and sulfur smoke bombs in conjunction with other methods used for rodent control when a pest control program is temporarily overwhelmed.

European Economic Community (EEC) Council Regulation, EC No. *834/2007* *and* *889/2008*
European Economic Community (EEC) Council Regulation (EEC No 2092/91), carried over by Article 16(3)(c) of Regulation No 834/2007, permits the use of sulfur as a fungicide, acaricide, and repellent in organic food production.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Codex Alimentarius Commission (CAC GL 32-1999) permits the use of sulfur for pest and disease control when the certification body or authority recognizes the need for plant protection (Codex, 2013).

International Federation of Organic Agriculture Movements (IFOAM)
The International Federation of Organic Agriculture Movements (IFOAM) lists sulfur as an approved substance for use as pest and disease control, fertilizer/soil conditioner, and crop protectant and growth regulator.

Japan Agricultural Standard (JAS) for Organic Production
The Japan Agricultural Standard (JAS) for Organic Production (Notification No. 1605 of 2005) permits the use of sulfur as a fertilizer or soil improvement substance and as a substance for plant pest and disease control.

Environmental Issues
Elemental sulfur is relatively innocuous in the environment when used according to the product label. It is also low in toxicity. It should not be used within one month of any horticultural oil product, as currently stated on most sulfur labels.

An updated Technical Report (TR) was completed on April 19, 2018. There was no new information contradicting historical information that characterizes sulfur as an important and relatively safe material for organic agriculture.

Although low in acute toxicity, sulfur is a respiratory, ocular, and dermal irritant that can significantly impact farmworker health. Farmworker exposures can be mitigated if label recommendations and proper PPE recommendations are followed.

Discussion
2018 NOSB Review: Historically, there has been strong support for the continued listing of sulfur, particularly for use against various bacterial and fungal diseases, insects, and as a plant and soil amendment. It was noted that several agricultural commissioners in California had encouraged a shift to wettable formulations in vineyard applications, and anecdotal information suggests fewer drift and regulatory problems.

Based on the extensive public comment and discussions, new technical reviews, previous committee votes & discussions, and historical public comment, the 2018 NOSB review concluded that elemental sulfur still appears to be necessary in organic crop production. The NOSB should continue to monitor sulfur use in organic agriculture and respond to any new information raising environmental or, in particular, public health concerns.

The current Subcommittee reviewed the use, manufacture, environmental concerns, and previous board reviews and research. The Subcommittee also discussed the Spring 2018 recommendation to add a new use for sulfur: as a molluscicide. The subcommittee reviewed a journal article, and a study completed at Oregon State University to further discuss the effects on children's respiratory health.

Questions to our Stakeholders

1. How often are wettable formulations used for the application of sulfur?

Lime sulfur

Reference: 205.601(e) As insecticides (including acaricides or mite control). (6) Lime sulfur—including calcium polysulfide.
Technical Report: 2014 TR
Petition(s): N/A
Past NOSB Actions: Actions: 04/1995 NOSB minutes and vote (pg. 341); 11/2005 NOSB sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
Lime sulfur is on the National List at §205.601(e)(6) as an insecticide (including acaricide or mite control) and at §205.601 (j)(6) for plant disease control. As an insecticide, lime sulfur is used to control mites (spider mites and rust mites), aphid, and San Jose scale in tree fruit and other organic crops.

Manufacture
Lime sulfur is often referred to by its chemical name, calcium polysulfide. It is considered to be synthetic and is produced by reacting boiling calcium hydroxide [$CaOH2_2$] and ground sulfur (2014 TR).

International Acceptance
Canadian General Standards Board Permitted Substances List
Allowed as a production aid

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Permits the use of lime sulphur (calcium polysulfide) as a fungicide, insecticide, acaricide.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Does not appear on this listing

International Federation of Organic Agriculture Movements (IFOAM)
Allowed as a crop protectant

Japan Agricultural Standard (JAS) for Organic Production
Lime sulfur powder allowed as Substances for Plant Pest and Disease Control

Environmental Issues
Residues of lime sulfur are exempt from the requirement of a tolerance under 40 CFR 180.1232 as determined by the U.S. EPA because the calcium polysulfides found in lime sulfur products rapidly degrade to calcium hydroxide and sulfur in the environment and human body.

Discussion
The vast majority of public commenters during the previous review were in favor of relisting lime sulfur for control of fungal and bacterial diseases as well as its uses for various insects. It has widespread and historical use across many crops and regions. Many comments note that there are not viable alternatives for its various uses. The few comments against lime sulfur primarily referenced the 2014 Technical Report (TR), noting that later-season use of the material may have a negative impact on beneficial insects and that large scale releases of the material could have environmental impacts. Lime sulfur can cause phytotoxicity in some crops, however, rates and timings can be used to avoid this problem. In fact, lime sulfur pesticide applications during and shortly after bloom can have a desirable crop-thinning effect on apples. The TR notes that lime sulfur may impair some beneficial insects, but timing of use can minimize the negative effects. It also noted potential human health concerns from lime sulfur primarily due to its high alkalinity or the release of hydrogen sulfide. In New York State, , lime sulfur is classed as a restricted use pesticide because of potential hazards handling the concentrated product. This concern can be mitigated if proper safety procedures are followed during manufacture

and label directions including personal protective equipment (PPE) are followed. The TR also provided an extensive list of alternative materials and practices, however, if an outbreak of mites or scale occurs, lime sulfur is an effective option.

Questions to our Stakeholders

1. Is lime sulfur a necessary organic pesticide?

Lime sulfur

Reference: 205.601(i) As plant disease control. (6) Lime sulfur.

Technical Report: 2014 TR

Petition(s): N/A

Past NOSB Actions: Actions: 04/1995 NOSB minutes and vote (pg. 341); 11/2005 NOSB sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation

Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)

Sunset Date: 6/22/2025

Subcommittee Review

Use

Lime sulfur is on the National List at §205.601(e)(6) as an insecticide (including acaricide or mite control) and at §205.601 (j)(6) for plant disease control. As a fungicide, it is used to control powdery mildew, anthracnose, scab, peach leaf curl, fire blight, and several other plant diseases in tree fruit and berry crops.

Manufacture

Lime sulfur is often referred to by its chemical name, calcium polysulfide. It is considered to be synthetic and is produced by reacting boiling calcium hydroxide [$CaOH2_2$] and ground sulfur (2014 TR).

International Acceptance

Canadian General Standards Board Permitted Substances List
Allowed as a production aid

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Permits the use of lime sulphur (calcium polysulfide) as a fungicide, insecticide, acaricide.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Does not appear on this listing

International Federation of Organic Agriculture Movements (IFOAM)
Allowed as a crop protectant

Japan Agricultural Standard (JAS) for Organic Production
Lime sulfur powder allowed as Substances for Plant Pest and Disease Control

Environmental Issues
Residues of lime sulfur are exempt from the requirement of a tolerance under 40 CFR 180.1232 as determined by the U.S. EPA because the calcium polysulfides found in lime sulfur products rapidly degrade to calcium hydroxide and sulfur in the environment and human body.

Discussion
The vast majority of public comments during the previous review were in favor of relisting lime sulfur for control of fungal and bacterial diseases as well as its uses for various insects. It has widespread and historical use across many crops and regions. Many comments note that there are not viable alternatives for its various uses, especially as part of an integrated fire blight control program. The few comments against lime sulfur primarily referenced the 2014 Technical Report(TR) in noting that later season use of the material may have a negative impact on beneficial insects and that large scale releases of the material could cause environmental impact.
Lime sulfur can cause phytotoxicity in some crops, however, rates and timings can be used to avoid this problem. In fact, lime sulfur pesticide applications during and shortly after bloom can have a desirable crop-thinning effect on apples. The TR notes that lime sulfur may impair some beneficial insects, but, once again, timing of use can minimize the negative effects. It also noted potential human health concerns from lime sulfur primarily due to its high alkalinity or the release of hydrogen sulfide. In New York state, lime sulfur is classed as a restricted use pesticide because of potential hazards handling the concentrated product. This concern can be mitigated if proper safety procedures are followed during manufacture and label directions including personal protective equipment (PPE) are followed. The TR also provided an extensive list of alternative materials and practices; however, an important benefit of lime sulfur is that it can be effective even after a fungus infection has taken place. Almost all other organic alternatives have only preventative action.

Questions to our Stakeholders
1. Is lime sulfur a necessary organic pesticide?

Hydrated lime

Reference: 205.601(i) As plant disease control. (4) Hydrated lime.
Technical Report: 1995 TAP; 2001 TAP; 2002 TR (calcium hydroxide); 2015 TR (Livestock)
Petition(s): N/A
Past NOSB Actions: 04/1995 NOSB minutes and vote (pg. 345); 04/2006 sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Technical correction annotation change published 10/31/2003 (68 FR 61987); Sunset renewal notice published

10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
Hydrated lime is a synthetic substance limited for use in organic crop production for plant disease control and as an external pest control in organic livestock production (7 CFR §205.603(b)(6)). Regarding livestock applications, hydrated lime may not be used to cauterize physical alterations (medical treatment) or deodorize animal wastes. Hydrated lime, also known as calcium hydroxide, is listed for handling as an allowed synthetic, nonagricultural substance which may be used as an ingredient in or on processed products (7 CFR 205.605(b)(8)).

Manufacture
According to the 2015 Technical Review for Livestock, the "industrial production of hydrated/slaked lime involves two elementary reactions beginning with naturally occurring limestone deposits. In the first step, ground limestone—which contains predominantly calcium carbonate (CaCO3) with smaller amounts of magnesium, silicon, aluminum, and iron oxide compounds—is thermally transformed into quicklime (Oates, 2010). Specifically, heating raw or minimally processed limestone to temperatures in excess of 900 ºC results in conversion of the calcium carbonate content of limestone to calcium oxide (CaO) in a material known as quicklime (equation 1). This thermal transformation occurs with liberation of carbon dioxide (CO2) gas. In the slaking process, quicklime reacts exothermically (releases heat) with two equivalents of water to produce hydrated/slaked lime consisting primarily of calcium hydroxide [Ca(OH)2] (equation 2). The normal hydration process is carried out at atmospheric pressure and temperatures of approximately 100 ºC (Kenny & Oates, 2007). A variation of the normal hydration process involves reaction of quicklime and water under a high steam pressure of up to 1 MPa and at temperatures approaching 180 ºC to form hydrates. After hydration, the hydrated lime product is dried, milled, and air classified" (TR 231-243).

International Acceptance

Canadian General Standards Board Permitted Substances List
Hydrated lime is listed in Section 4.3—Crop Production Aids and Materials—for use as a plant disease control agent only (CAN, 2011). Canadian organic regulations also permit the use of hydrated lime as a health care product and/or production aid in organic livestock production under Section 5.3 of the Permitted Substances Lists. According to this rule, hydrated lime is not allowed for use to cauterize physical alterations (medical treatment) or deodorize animal wastes. (2015 TR 177-181)

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008

Annex I of the European regulations allow "industrial lime from sugar production"—a byproduct of sugar production from sugar beet—as a fertilizer or soil conditioner. Calcium hydroxide may be used as a fungicide on fruit trees to control Nectria galligena in organic crop production under Annex II and as a processing aid in the production of processed organic foods of plant origin under Annex VIII (EC, 2008). European Union Organic regulations do not permit the use of hydrated lime/calcium hydroxide as an external parasiticide in livestock production. (TR 188-93)

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)

The Codex Guidelines for the Production, Processing, Labeling and Marketing of Organically Produced Foods (CAC/GL 32-1999) do not list hydrated lime/calcium hydroxide for use in organic livestock or crop production. However, calcium hydroxide is included in the list of "processing aids which may be used for the preparation of products of agricultural origin referred to in Section 3 of these guidelines" (Codex, 2013). (TR 183-86)

International Federation of Organic Agriculture Movements (IFOAM)

Permits the use of "milk of lime" (i.e., hydrated/slaked lime, calcium hydroxide) for pest and disease control and disinfection in livestock housing and equipment (Appendix 5). Likewise, calcium hydroxide (slaked lime) is included in the "Indicative List of Equipment Cleansers and Equipment Disinfectants" (Appendix 4 – Table 2) for organic handling/processing. Calcium hydroxide is also listed as an approved food additive for maize tortilla flour and processing aid for sugar (Appendix 4 – Table 1). Lastly, application of calcium hydroxide (hydrated lime) is allowed on aerial plant parts only for plant disease control according to Appendix 3 of the IFOAM Norms (IFOAM, 2014). Hydrated lime is not explicitly listed as an approved miticide according to IFOAM. (TR 201- 208).

Japan Agricultural Standard (JAS) for Organic Production

Calcium hydroxide derived from calcium oxide (slaked lime) is listed in Table 1 of the standard as an approved fertilizer and soil improvement substance (JMAFF, 2012). Hydrated lime is not explicitly approved as a miticide according to Japanese organic regulations. (TR 195-199)

Environmental Issues

Hydrated lime is released to the environment through various industrial waste streams and according to its use in agricultural production. Both calcium and hydroxide—the principal atomic/molecular subunits of hydrated lime—are abundantly present in natural waters; therefore, it is unlikely that small to moderate releases will adversely affect the aquatic or terrestrial environment. Large-volume accidental releases, however, could significantly raise the pH of receiving waters and soils, resulting in toxic effects to non-target organisms. Hydrated lime is considered practically non-toxic to slightly toxic to freshwater fish and invertebrates when added in quantities that do not lead to significant changes in water pH. While certain strains of soil bacteria can tolerate extreme pH levels (e.g., pH 1.0 or 11.0), larger soft-bodied soil organisms are significantly more sensitive to changes in soil pH. Earthworms, for example, can only survive in the physiological pH range of 4.0 to 8.0. Changes in soil pH due to application of alkaline hydrated lime can also affect the bioavailability of toxic heavy metal contaminants as well as essential micronutrients. It is highly unlikely that hydrated lime from livestock treatments will be released to nearby soils in sufficient quantities to adversely impact the environment. Industrial production of the chemical precursor, quicklime (CaO), uses considerable amounts of energy and may release dust into the atmosphere. The use of more efficient modern kilns and bag filters can minimize the environmental impact of this process.

Discussion

The Crops Subcommittee discussed this substance and its use across all areas of the National List, including Crops, Livestock, and Handling (listed as calcium hydroxide). Two Technical Advisory Panels (TAPs) and two Technical Reports (TR) were compiled in 1995, 2001, 2002, and 2015, respectively. The use of hydrated lime (as has been practiced in organic production) is known to be an effective disease suppression practice. A previous sunset review noted that the use of hydrated lime in Bordeaux mix to make copper available for disease suppression is highly effective and widely used by fruit and vegetable

growers. The Subcommittee discussed the history of hydrated lime and expressed a desire to receive further information on the current extent of use.

Questions to our Stakeholders

1. Is there any new information that would warrant the need for a new TR for this substance?
2. Please provide information on the extent to which hydrated lime is used in organic cropping systems.

Liquid fish products

Reference: 205.601(j) As plant or soil amendments. (8) Liquid fish products —can be pH adjusted with sulfuric, citric or phosphoric acid. The amount of acid used shall not exceed the minimum needed to lower the pH to 3.5.

Technical Report: 1995 TAP; 2006 TR (fish-based fertilizers); 2019 TR (liquid fish products)

Petition(s): N/A

Past NOSB Actions: 04/1995 NOSB minutes and vote (pg. 346); 11/2005 NOSB sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation

Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)

Sunset Date: 6/22/2025

Subcommittee Review

Use

Liquid fish products are used as fertilizers in the production of organic crops. Liquid fish products contain fundamental nutrients and many trace minerals critical for use in organic farming. Liquid fish foliar application can deliver important nutrients that can reduce certain nutrient stresses which can, in turn, improve crop yields.

Manufacture

Liquid fish products are fish hydrolysates that are made from chopped fish byproducts that are (1) enzymatically digested and heated, or (2) enzymatically processed without heat (cold processing). Liquid fish products are then stabilized with an acid, such as phosphoric, sulfuric, or citric acid, to prevent microbial growth. The use of formic acid is prohibited due to phytotoxicity. A third method of liquid fish product manufacture utilizes fermentation by bacteria that produce lactic acid, which preserves the fish. All three methods of liquid fish product manufacture cannot result in a pH below 3.5.

International Acceptance

Canadian General Standards Board Permitted Substances List

The Canadian Organic Standard allows for the use of liquid fish products. Acids are permitted to lower the pH to 3.5, but no prohibited preservatives can be used.

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Liquid fish is not on the EU Annex I list of approved fertilizers, but the EU does allow fish meals.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Contingent upon recognition from a certification body or authority.

International Federation of Organic Agriculture Movements (IFOAM)
The International Federation of Organic Agriculture Movements (IFOAM) permits using fish and shell products and food processing of animal origin.

Japan Agricultural Standard (JAS) for Organic Production
The Japanese Organic Standard permits the use of food industry byproducts of fish origin if they are derived from natural sources.

Environmental Issues
Nutrient runoff from excessively or improperly applied fertilizers can cause eutrophication of surface waters, potentially harming fish, and other aquatic animals.

Global impacts of commercial fisheries on marine ecosystems include documented fish population decline (and in some cases, ecosystem collapse) due to overharvesting. Liquid fish products are derived from several sources, including fish waste and bycatch/mortalities. To a lesser extent, fish are harvested for meal, oil, and solubles (also known as the wet reduction process). Large-scale population declines have occurred, with at least three fish species harvested for meal, oil, and soluble production. Considering this information, during the previous sunset review, conducted in 2018, the Crops Subcommittee added a work agenda item regarding liquid fish products. At the October 2020 meeting, the Board proposed, approved, and recommended to the NOP to add an annotation to liquid fish products at § 205.601(j)(8) to limit the use to fish sourced from waste left over aftermarket food fish are processed for human consumption, bycatch, and invasive species.

Discussion:
Previous NOSB sunset review summary: Historically, there has been strong support for keeping liquid fish products on the National List, and public comment at the October 2018 NOSB meeting reiterated the strength of that support. Many farmers considered liquid fish products essential for many crops, including foliar and other applications. Concerns about the sustainability of source fish, including the possible use of wild fish harvested for the sole purpose of producing liquid fertilizers, were raised by the Crops Subcommittee, and extensive discussion during the October 2018 NOSB meeting focused on production methods and sources of raw fish material for the production of fish-based fertilizers. These discussions resulted in a work-agenda request to assess the environmental impact of harvesting wild, native fish for all fertilizer purposes, to protect natural fish populations, and to ensure that liquid fish and other fish-based fertilizer products used in organic production are not harmful to the environment. Information from this review could inform future policy recommendations regarding the use of wild fish for organic fertilizers but is beyond the scope of review for this sunset review.

The current Crops Subcommittee discussed the uses of liquid fish products as a plant or soil amendment, the manufacturing process, and environmental issues. The Subcommittee also reviewed the October 2020 NOSB recommendation on Wild, Native Fish for Liquid Fish Products, which the NOP has not implemented; it is currently listed as “On Hold” in the NOSB Recommendations Library.

Questions to our Stakeholders

1. Is the liquid fish products annotation "- can be pH adjusted with sulfuric, citric, or phosphoric acid. The amount of acid used shall not exceed the minimum needed to lower the pH to 3.5." clear and able to be enforced?

Sulfurous acid

Reference: 205.601(j) As plant or soil amendments. (11) Sulfurous acid (CAS # 7782-99-2) for on-farm generation of substance utilizing 99% purity elemental sulfur per paragraph (j)(2) of this section.
Technical Report: 2010 TR; 2014 TR; 2023 Limited Scope TR (pending)
Petition(s): 2008
Past NOSB Actions: 05/2009 NOSB recommendation; 10/2014 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 07/07/2010 (75 FR 38693); Sunset renewal notice published 06/19/2015 (80 FR 35177); Sunset renewal notice published 05/07/2020 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
The primary use of sulfurous acid is as an acidifying agent to neutralize and reduce excessive alkalinity in soil and/or water. The resulting acidic irrigation water can be helpful with nutrient deficiencies that arise when saline or alkaline conditions tie up essential micronutrients. This use supports improved crop yields and can help to reduce soil degradation from salinity build up.

Manufacture
The primary ingredients used in the preparation of sulfurous acid are water and elemental sulfur. Almost all elemental sulfur is produced as a byproduct of coal, natural gas, and petroleum refinement. Sulfurous acid is manufactured by spraying water through smoke and fumes created by burning elemental sulfur. Several substances are created in this process, including sulfur dioxide, hydrogen sulfide, and hydrogen sulfite.

International Acceptance
Canadian General Standards Board Permitted Substances List
Sulfurous acid can be used in the production of Canadian Organic Products as a preservative in alcoholic beverages made from grapes or other fruit, although minimum use is recommended. No mention is made of sulfurous acid as a soil amendment (CGSB, 2011a,b).

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Sulfurous acid is allowed in wine production only.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Sulfurous acid is allowed in wine production only.

International Federation of Organic Agriculture Movements (IFOAM)
Sulfurous acid is allowed by IFOAM in wine production, as a pH adjuster in sugar production, and is a permitted soil amendment.

Japan Agricultural Standard (JAS) for Organic Production
JAS does not mention sulfurous acid but allows sulfuric acid as a pH adjuster in sugar production.

Environmental Issues

Sulfurous acid appears on the EPA non-food inert list and does not require a tolerance or an exemption from tolerance. According to a sulfurous acid manufacturer (and noted in the 2014 TR, lines 229-232) sulfur dioxide released into the atmosphere by a sulfurous acid generator is minimal. The EPA does not regulate this emission. Sulfurous acid contains no persistent substances of record. Hydrogen sulfite present in the solution is metabolized by sulfite-reducing bacteria and plants that recycle sulfurous acid into bioavailable sulfur compounds. Water and other dissolved compounds leach into the soils. Functionally sulfurous acid serves to condition soils by adjusting pH.

Regarding human health concerns and per the 2014 TR, sulfurous acid is not expected to be carcinogenic (2014 TR, lines 370-371). Sulfur dioxide is approved by the US Food and Drug administration for use as a food preservative and food colorant (2014 TR, lines 371-372).

Discussion

During the Fall 2018 meeting, the NOSB voted unanimously to keep sulfurous acid on the National List. Most of the written comments at the Fall 2018 meeting supported the relisting, several indicated "no reported use" and one commented that no synthetic fertilizers should be permitted.

A limited scope TR was received by the Crops Subcommittee in early February 2023 and was declared "sufficient" during the Subcommittee meeting held on February 9th, 2023. The TR authors did a seemingly complete job of listing potential alternatives and then evaluating these alternatives as being less effective than sulfurous acid. This limited scope 2023 TR is in the process of being posted online.

Questions to our Stakeholders

None.

Ethylene gas

Reference: 205.601(k) As plant growth regulators. (1) Ethylene gas—for regulation of pineapple flowering.

Technical Report: 1999 TAP; 1999 TAP (handling) (pg. 14-54); 2000 TAP (supplemental information); 2007 TAP; 2011 Limited Scope TR; 2023 TR (Crops, Handling) - pending

Petition(s): N/A

Past NOSB Actions: 10/1999 NOSB recommendation (handling) (pg. 443); 10/2001 recommendation (handling) (pg. 2); 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation

Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Technical correction annotation change published 10/31/2003 (68 FR 61987); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal

notice published and was effective 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
Ethylene gas is on the National List for use as a plant growth regulator, for organic pineapple production only. Ethylene gas is used to induce uniform flowering in pineapples and is applied 7-15 months after planting. Application can be repeated two to three times after the initial application (2011 TR lines 53-56). Ethylene gas is made from hydrocarbon feedstocks, such as natural gas liquids or crude oil. Operators should be well trained and prepared. However, the safety concern to workers is limited when correctly used and monitored (2007 TAP, pg. 4).

Manufacture
Ethylene gas is produced almost exclusively from the pyrolysis of hydrocarbons in tubular reactor coils installed in externally fired heaters. Ethylene may also be made from ethanol in fixed or fluid-bed reaction systems (2007 TAP).

International Acceptance

Canadian General Standards Board Permitted Substances List
Allowed for use in Canadian organic production for post-harvest ripening of tropical fruit and de-greening of citrus and to control sprouting of potatoes post-harvest in holding bins.

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Allowed for use in Europe organic production in the degreening of bananas, kiwis, and kakis; Degreening of citrus fruit only as part of a strategy for preventing fruit fly damage in citrus; Flower induction of pineapple; sprouting inhibition in potatoes and onions.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
CODEX indicates:
“For degreening of citrus for fruit fly prevention and as a flowering agent for pineapples. As sprouting inhibitor for potatoes and onions: Need recognized by the certification body or authority for sprout inhibition of stored potatoes and onions where varieties that have long dormancy characteristics are not available, or these varieties are not suited to local growing conditions. Must be used in a manner that minimizes exposure to operators and workers.”

International Federation of Organic Agriculture Movements (IFOAM)
Ethylene gas is allowed in organic production by IFOAM for the de-greening and ripening of citrus.

Japan Agricultural Standard (JAS) for Organic Production
JAS limits the allowed use of ethylene gas to the ripening of bananas, kiwifruits, and avocados after harvest.

Environmental Issues
Public testimony during the last sunset review indicated that the current level of organic pineapple production is dependent on the availability of this material. No new issues of human health or environmental concerns were raised that had not been addressed in previous NOSB Sunset review cycles. The main safety concern in relation to ethylene use has been the explosive nature of the gas in the air. Operators should be well trained and prepared, though the safety concern to workers is low when correctly used and monitored (2007 TAP, pg. 4).

Discussion
The Crops Subcommittee discussed the use, manufacturing, and the environmental issues, and previous NOSB reviews of ethylene gas. The Crops Subcommittee will incorporate information from the 2022 Technical Report into the Sunset proposal document for the Fall 2023 meeting.

As part of the Spring 2018 public meeting, the Crops Subcommittee requested additional information regarding the issue of scale and the use of ethylene and alternative technologies. Written and oral commenters expressed continued support for this material, stating that it is an essential tool for the commercial production of pineapples for the export market. Commenters stated that no viable alternatives exist. Without ethylene, commenters said, it would be impossible to achieve the uniform ripening necessary for timing the harvest for fruit shipment. Others commented that the material does not fit any OPFA criteria, and it is not essential for the production of the crop but rather is employed for economic reasons.

Questions to our Stakeholders
1. Have any alternatives become available?
2. Based on the international acceptances, is there a need to expand the use of ethylene?

Microcrystalline cheesewax

Reference: 205.601(o) As production aids. (1) Microcrystalline cheesewax (CAS #'s 64742-42-3, 8009-03-08, and 8002-74-2)-for use in log grown mushroom production. Must be made without either ethylene-propylene co-polymer or synthetic colors.
Technical Report: 2018 TR
Petition(s): 2007; 2008 (Addendum #1)
Past NOSB Actions: 05/2008 NOSB recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 03/15/2012 (77 FR 8089); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review

Use
Microcrystalline cheesewax has been used in organic agriculture as a production aid in log-grown shiitake mushrooms since the 1980s. Microcrystalline cheesewax is used to seal holes in hardwood logs (commonly oak) after the shiitake spawn is inserted.

Manufacture
Microcrystalline cheesewax is a food-grade product made up of a mixture of microcrystalline wax, paraffin wax, and petroleum. All three of these materials come from refining crude oil, where these petroleum waxes are separated by fractional distillation followed by fractional crystallization.

International Acceptance

Canadian General Standards Board Permitted Substances List
CAN/CGSB-32.311 "Table 6.5 Processing aids" prohibits microcrystalline wax "either alone or in formulation with paraffin wax."

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Neither microcrystalline cheesewax, nor its components, are listed in EC No. 834-2007 nor EC No.889/2008.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Neither microcrystalline cheesewax, nor its components, are listed in the CODEX (GL 32-1999).

International Federation of Organic Agriculture Movements (IFOAM)
Neither microcrystalline cheesewax, nor its components are listed in IFOAM.

Japan Agricultural Standard (JAS) for Organic Production
Neither microcrystalline cheesewax, nor its components, are listed in the JAS for organic food production.

Environmental Issues (and human health concerns)
Per the 2018 TR and referenced studies: "There have been no reports that indicate the likelihood of the bioaccumulation of either microcrystalline cheesewax or its breakdown products, nor any reports of associated ecotoxicity." Microcrystalline cheesewax is widely regarded as "readily biodegradable" [232-239].
Also per the 2018 TR, "...microcrystalline cheesewax, its components, and its breakdown products are chemically stable and are not known to be health risks." [308-309]. Microcrystalline cheesewax is sometimes heated just before being used as a sealant, at which time caution should be used to avoid inhaling the vapor as this could cause respiratory irritation [317].

Discussion
At the Fall 2018 meeting, the NOSB voted unanimously to keep microcrystalline cheesewax on the National List. Some of the written comments reviewed during the Fall 2018 meeting focused on the current need for microcrystalline cheesewax, saying that the production method (inoculated logs) was no longer used. This notion was countered by the assertion that there was still wide use by small growers.

Questions to our Stakeholders
1. Is there now an effective natural or approved synthetic replacement for the microcrystalline cheesewax that is not derived from petroleum by-products?
2. Should an annotation be added that requires the removal of residues of the microcrystalline cheesewax that remains in the environment once the logs are finished fruiting?

Potassium chloride

Reference: 205.602(e) Potassium chloride—unless derived from a mined source and applied in a manner that minimizes chloride accumulation in the soil.
Technical Report: 1995 TAP; 2023 TR pending
Petition(s): N/A
Past NOSB Actions: 11/1995 NOSB minutes and vote (pg. 22); 11/2005 NOSB sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation; 10/2018 NOSB sunset recommendation
Regulatory Background: Added to National List 04/21/2001 (65 FR 80547, 66 FR 15619); Sunset renewal notice published 10/16/2007 (72 FR 58469); Sunset renewal notice published 06/06/2012 (77 FR 33290); Sunset renewal notice published 03/15/2017 (82 FR 14420); Sunset renewal notice published 05/07/2020 (85 FR 27105)
Sunset Date: 6/22/2025

Subcommittee Review
Use
Potassium is required for health in humans, plants, and microorganisms (1995 TAP pg. 4, 14). Potassium is an essential element for plants as they use it to regulate movement of water and nutrients within the plant, photosynthesis regulation, and enzyme activation. While potassium is found in many soils, it may not exist naturally in a high enough concentration for optimal plant growth, and/or it may be present but in a bound format rendering it unavailable. Potassium is commonly used by growers either alone, as a complex in potassium chloride, or as an ingredient in a fertilizer blend for soil supplementation. Chloride is also an essential element for plants (TAP pg. 12); however, monitoring of chloride use is required to assure soil salinity is managed appropriately. The current annotation in the NOP regulations stipulates chloride monitoring when potassium chloride is used to prevent chloride accumulation in soils.

Manufacture
Potassium chloride is a mineral that occurs naturally and is a product of potash mining where water is forced into the ground to dissolve potassium chloride deposits (1995 TAP, pg. 3). Brine is brought back to the surface where the water is evaporated off to isolate the potassium chloride. Potassium chloride can similarly be produced from sea water extraction via solar evaporation.

International Acceptance

Canadian General Standards Board Permitted Substances List
Permitted for use from mined sources such as sylvite, carnalite, and potash.

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Not specified as permitted for use.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Permitted for use.

International Federation of Organic Agriculture Movements (IFOAM)
Permitted for use.

Japan Agricultural Standard (JAS) for Organic Production
Permitted as “fertilizers and soil improvement substances.”

Environmental Issues
Potassium chloride is derived from mining activities, and there are impacts associated with its extraction. There has not been widespread concern about significant impacts.

Discussion
At the Fall 2018 meeting, the NOSB unanimously voted to relist potassium chloride at 7 CFR 205.602

During 2018 meetings, public commenters were also unanimously supportive of continued listing with the current annotation, and there were no other non-chloride types reported by the public. At the time, one certifier recommended that the NOSB request a technical report (TR) on potassium chloride to thoroughly consider the use of synthetic dust suppressants or other synthetic additives.

A draft TR was provided to the Crops Subcommittee on December 2, 2022 and was deemed sufficient, although the Subcommittee requested additional information on effective organic alternatives to potassium chloride. This 2023 TR is pending.

The Crops Subcommittee has had anecdotal discussions about whether or not potassium chloride (per this listing) is being used by organic growers. Subcommittee members have acknowledged that potassium chloride is an inexpensive means of dealing with potassium deficiencies in the soil and is likely very geographically specific in its application (potassium is prevalent in high mineral soils, for example, and thus minimal need for supplemental potassium), but also noted that potassium sulfate may be another good cost-effective alternative with adverse effect. Subcommittee members also discussed the nature of the annotated listing itself and whether it has been successful in reducing chloride leaching – and associated environmental impact -- where it is applied, and also noted that if chloride buildup in the soil is an issue that merits monitoring, there are likely other problematic accumulations in the soil in such contexts as well. The Crops Subcommittee discussed the wide use of potassium chloride in conventional agriculture and the fact that conventional growers are able to mitigate salt concerns by virtue of the conventional toolkit.

Questions to our Stakeholders
1. Is potassium chloride widely used by producers of organic crops?