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## Beetle Outbreak Impacts Vary Across Colorado Forests

**By Karina Puikkonen**

It's no secret. Colorado's forests have had a tough time in recent years.

While natural disturbances such as insect outbreaks and wildfires occurred historically and maintained forest health over time, multiple, simultaneous insect disturbances in the greater region over the past two decades have led to rapid changes in the state's forests.

A bird's eye view can reveal much about these changes. Annual aerial surveys conducted by the Colorado State Forest Service and USDA Forest

Service have provided yearly snapshots for the state. New collaborative research co-led by Colorado State University and the University of Wisconsin-Madison now supplements this understanding with even greater spatial detail.

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# Emergency Preparedness: Make A Plan

Karen Crumbaker, Larimer County Extension

Think about what hazards exist in your area. They might be wildfires, tornadoes, snowstorms, hail storms, flash floods, loss of power, or dangerous lightening. How will you get notified in the event of an emergency? Depending on the emergency, you may need to shelter in place. If so, what will the needs of your family be for more than one day? If you need to evacuate, what will you take? Is there an evacuation route already in place and does each member of your household know what it is?

The first step to emergency preparedness is to sign up with your County's emergency notification system. Next, sit down with your family to create a communication plan with information on how family members will contact one another if they are not together when an emergency occurs. The plan should include telephone numbers of family members, out of state family members, physicians, and medical information. Additional information to include would be insurance agency phone and policy numbers, medical insurance phone and policy numbers, and the veterinarian. The plan should also in-

clude a designated meeting place outside of your neighborhood if family members are not together during an evacuation. Be sure each member of your family has a copy of the communication plan and update it yearly or as needed.

If you need to evacuate in an emergency, identify two evacuation routes and practice with family members. Be willing to change your escape route when directed by emergency personnel. Identify family and friends you can stay with and have their contact information as part of your communication plan.

Discuss with your family where the safest place in the home is to shelter in place. If a tornado or high wind event occurs, it might be a closet or bathroom or lowest level of a home without windows. FEMA's Ready has recommended items to build an emergency supply kit to shelter in place or take with you, including an emergency supply of food and water to last for three days. Special consideration will need to be given for family members with disabilities. And don't forget your pets! Create an emergency supply kit for your pets.

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## Disasters Don't Wait. Make Your Plan Today.

September was National Preparedness month, but don't feel like you need to wait until then to get ready!

# Protecting Your Plants from Wild Weather this Spring

By John Stolzle, Jefferson County Extension

Spring weather in Colorado can be temperamental, it can sometimes feel like we experience all of the seasons in a single day. This past weekend, if your garden was located around the Front Range, it likely experienced warm springtime weather ripe for growing; but later this week, forecasts predict cooler temperatures and even a possibility for snow! These erratic fluctuations provide challenges for our gardens, but CSU Extension has put together some techniques which can help gardeners to extend the growing season and to protect plants against some these drastic weather patterns. In this post, I have highlighted some techniques and provided references with more information for managing your garden with our spring weather in mind.



Seedlings purchased from a garden nursery may need to be hardened off before they are planted in your garden

One of the most important factors to consider in vegetable gardening is when to plant your garden, and the length of your garden's growing season. If planted too early, some vegetables can encounter challenges with frosts which can kill tender plants;

but if planted too late, crops may not mature by the time fall comes around. By planting the right plants at the right time you can help to cultivate a successful crop.

Cool, hardy season crops can often tolerate minor frosts and thrive in cooler weather conditions which dip as low as 40°F, some examples are broccoli, spinach, and onions. Warm season crops are much more sensitive to frost and should not be planted until all danger of frost has past. These plants do better in temperatures ranging from 70°F - 95°F, some examples are tomatoes, peppers, and watermelon. A longer list for these plants, and more details on this topic can be found in the following link to CSU Extension's vegetable planting Guide: <https://cmg.extension.colostate.edu/Gardennotes/720.pdf>

There are a range of techniques which can be used to extend our growing season. These include things such as planting gardens on south-facing slopes, providing windbreaks, mulching, and even covering plants when frosts are suspected. Sheets and blankets can be used to trap heat from the soil around young vegetables at night; these covering should be placed low to the ground and secured. In the morning after using sheets, if this fabric has become damp it should be dried before being used for this purpose again.

More techniques and helpful tricks to extend the growing season can be found in the following link to a factsheet on this topic:

<https://cmg.extension.colostate.edu/Gardennotes/722.pdf>

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## Beetle Outbreaks continued from page 1



The study titled Effects of Bark Beetle Outbreaks on Forest Landscape Pattern in the Southern Rocky Mountains, U.S.A. analyzed Landsat satellite imagery between 1997-2019 to quantify how outbreaks of three different insect species have impacted forests across high-elevation forests in Colorado, southern Wyoming, and northern New Mexico. The interuniversity team found that while these collective beetle outbreaks impacted around 40 percent of the area studied, the effects of these outbreak varied due to differences in forest structures and species composition across the region.

“In contrast to research that has examined the heterogeneous effects of wildfire on trees, there hasn’t been much work on the landscape-level variation in bark beetle effects on forests, particularly across broad areas,” said Sarah Hart, co-author and assistant professor in the Forest and Rangeland

Stewardship department. “Heterogeneity plays an important role in how these forests will look in the future, where surviving trees will regenerate the forest, and what potential there is for future outbreaks.”

Their results indicate that most forest stands affected by insects still have mature trees that can be sources for reestablishing seeds and conditions for the next generation of trees to grow. Areas with tree mortality greater than 90 percent were relatively small and isolated. Unlike severe wildfires that can kill all trees in its path, trees typically survive bark beetle outbreaks, facilitating forest recovery in upcoming decades.



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Spruce beetle-impacted forest in Southwestern Colorado with moderate levels of tree mortality. Photo credit: Sarah Hart

# Introduction to N-P-K on a Compost Test

By Kat Caswell CSU/NRCS SAM Specialist

Compost and composted manure are both wonderful soil amendments for use on pasture, cropland, rangeland, and gardens. Compost and manure are lauded for their beneficial impacts on soil organic matter, ability to increase soil water holding capacity, and additional nutrients. Farmers and small acreage owners alike can utilize compost and manure as a fertilizer, helping to reduce the need for synthetic fertilizers. However, unlike synthetic fertilizer, compost or composted manure does not come with a label detailing what the nutrient content is, and this can make it difficult to determine the best application rate. When purchasing manure or compost from a vendor, you may consider submitting a sample for testing to determine your application rate.

A compost analysis will look different than soil test results. It will include items such as carbon to nitrogen ratio, dry matter, and different forms of nitrogen. Interpreting each one of the analyses performed is a small book on its own, but there are a few items that are the most important to focus on.

Nitrogen (N) will appear in three different forms on a compost analysis: Total N, ammonium, and nitrate. The Total N will include all forms of nitrogen (organic N, ammonium, and nitrate). The amount of organic N can be found by subtracting the ammonium and nitrate from the Total N amount. In a mature, finished compost much of the N should be in the organic N form. The two in inorganic forms (ammonium and nitrate) are immediately available for use by plants in the same season you apply it. The organic N will slowly be converted to a form plants can use over time, at a rate of 10-20% each year.

How quickly the organic N is converted to a plant available form will partially depend on the carbon to nitrogen ratio (C:N). Composts with a C:N ratio greater than 30 are likely to prevent N from being converted to a plant usable form but composts with a C:N ratio less than 20 will more readily break down organic N. Adding compost with a high C:N to your soil may tie up N, meaning less will be availa-



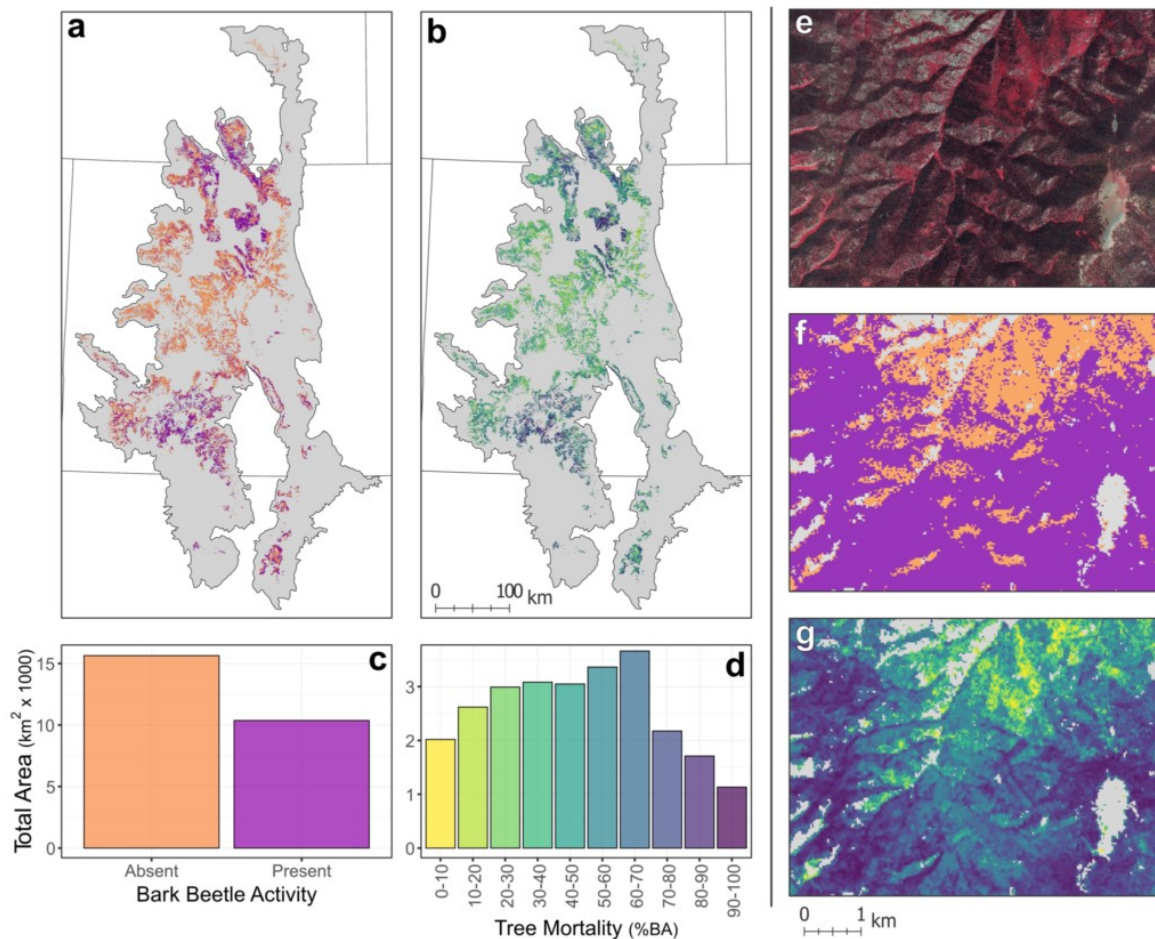
ble to the plants. If this is the case, consider adding another source of N to your compost and allowing it to further mature or use an additional N fertilizer on your soil.

Phosphorus (P) and potassium (K) are plant macronutrients required for plant growth. When purchasing a synthetic fertilizer, the nutrient content is generally listed by the numeric content of N-P-K. The compost analysis will list P and K in the oxide form. Compost tests for P and K provide an indication of the nutrient content but it is not yet known what the exact plant availability of these nutrients are.

There are two methods for determining how much compost to apply, both will be based on the values from the most recent soil test of the area. Compost can either be applied at the N-rate or the P-rate. When compost is applied to meet the N requirements of the crop, it will exceed the requirements of P and K for the given area. Conversely, if compost is applied at the rate to meet P requirements, the crop will be deficient in N and additional fertilizer will be needed. If you choose to apply at the N rate, regular soil testing will be required to ensure there is not an excessive buildup of P, K, or salts in the soil. Over application of compost can lead to excessive N fertilization, harming a vegetable or pasture crop.

For further details on compost or manure application, visit the Small Acreage webpage at [sam.extension.colostate.edu](http://sam.extension.colostate.edu).





## Beetle Outbreaks continued from page 4

Widespread outbreaks of three important bark beetle species have occurred in Colorado's forests since the turn of the century: mountain pine beetle, spruce beetle, and the western balsam beetle (that affects various fir tree species). These bark beetles primarily target large trees with reduced defenses due to lower precipitation amounts and higher temperature trends since the turn of the century.

This research team combined satellite imagery capable of identifying small groups of dead trees with a decade of extensive field data from nearly 250 plots to develop presence and severity maps for tree mortality caused by bark beetle attacks. Having this data combination gave the research team detailed information about how many trees have died in particular places, and helped to identify what may still be causing the death of individual trees.

"These maps give us unique insight into the effects of recent insect outbreaks because they span a large area but also show a lot of detail, and we are confident that they are showing us how many trees are dying because technicians counted trees on the ground," Kyle Rodman, lead author and post-doctoral researcher at the University of Wisconsin-Madison said.



The maps the team produced indicate that areas most impacted by bark beetles are concentrated in northern and southwestern Colorado due to higher concentrations of old lodgepole pine and spruce forests which were then infested by mountain pine beetle and spruce beetle, respectively. Western balsam beetle impacts were also widespread across the region, but these beetles tended to kill fewer trees in any single location.

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## Beetle Outbreaks continued from page 5

“Satellite data is a crucial bridge that allows us to take detailed information from individual places and extend this localized knowledge to large areas,” Rodman said. “In using these maps, we can see how the forest has changed over the past 20 years during each of these outbreaks.”

Fortunately, much of the 25,000 square kilometer study area showed low to moderate levels of tree mortality, with high tree mortality being contained in small and isolated patches averaging only about nine city blocks in overall size.

“People tend to notice what has changed, rather than what has stayed the same,” Rodman said. “These forests have changed a lot, but I am hopeful. It will just take a little while for them to recover, but many of these beetle-killed forests are likely to recover within a few decades.”

*This study was a multi-year, collaborative effort among the following institutions and organizations: Colorado State University, University of Wisconsin- Madison, Clark University, University of Colorado, The Nature Conservancy, Texas Tech University, University of Washington and Washington State University.*



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## Emergency Preparedness continued from page 2

After the communication plan has been finalized, document items in and around your home. Could you remember everything in your home if it were damaged or destroyed? Either write down, take pictures or video each room, opening drawers and closets. If you can, store the video or photos to the cloud or off site. Store important documents such as a birth certificate, social security card, will or passport off site or in a safety deposit box. Important documents, heirlooms, photographs and other valuables should be included on a “grab list” of items you will want to gather quickly in the event of an evacuation. Medications and survival items for each family member should also be added to a “grab list”.

The links below have suggestions for supplies, forms to complete your communication plan, and additional information to help you begin thinking about the steps to ensure your family’s safety in an emergency. The one thing the past year has taught us is we must be prepared in the event of a disruption to our daily lives!

Create Your Family Emergency Communication Plan—<https://www.ready.gov/sites/default/files/2020-03/create-your-family-emergency-communication-plan.pdf>

FEMA’s Ready Kit—<https://www.ready.gov/kit>

FEMA’s Ready Food—<https://www.ready.gov/food>

FEMA’s Ready Water—<https://www.ready.gov/water>

FEMA’s Ready Disabilities—<https://www.ready.gov/disability>

FEMA’s Ready Disabilities—<https://www.ready.gov/pets>

University of Tennessee “Grab List” - <https://ag.tennessee.edu/fcs/Documents/GrabAndGoBag.pdf>

## Protecting Plants Continued from Page 3

Frosts and cold snaps are one challenge, but hail can be one of the greatest risks to our gardens. Hoop houses or high tunnels can both extend the growing season and offer protection from hail. Hoops can also provide structures to which tightly woven 'hail cloth' can be fastened for added protection; hail cloth can also be placed over tomato cages or other structures available in your garden.

Walls of water and gallon milk cartons (with the bottoms cut off) can be used to protect new seedlings. If you leave the cap off of these cartons, they can even be left over seedlings until the plant outgrows this structure. Your imagination is the limit! Before a hailstorm, cardboard boxes, plastic buckets, and even sheets can help prevent some of the most extreme damage from occurring; however, you should never risk personal safety to protect your garden and should only implement these methods if you are able to get out far enough ahead of a storm for it to be safe.

A seven minute video on Hail Mitigation and clean-up can be found in the following link to more information provided by CSU Extension staff: <https://www.youtube.com/watch?v=hQ9G6S4ODtA>

A factsheet on this topic can be found on the following link: <https://elpaso.extension.colostate.edu/wp-content/uploads/sites/44/2017/05/May-27-2017-Hail-mitigation.pdf>

Sometimes it isn't possible to protect our gardens from a rapidly developing hailstorm. If you don't find yourself with enough notice that a potential storm is coming or perhaps find yourself away from your garden when this weather occurs, you should know that our plants can recover!



Simple hoops over a garden can provide great fastening points for hail cloth and shade cloth

They want to grow. To include a direct quote from our Plant Talk page on this topic:

*For perennials with foliage intact but stripped, remove flower stalks and cut them back leaving as many intact leaves as possible. Lightly cultivate the soil, and apply a light dressing of low-nitrogen fertilizer.*

*Flowering annuals with no remaining foliage probably won't recover after a hailstorm. Petunias usually survive if there is at least some foliage still on the plant. Clean the plants of ruined foliage and apply a light application of fertilizer to help them recover.*

*Early vegetable root crops with no remaining foliage will not recover. They need the green leafy foliage to produce energy for the roots to grow. Leafy vegetable crops may recover; replant if you see no signs of new growth after a week or so.*

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## Protecting Plants continued from page 8

The reality is that Colorado's climate and weather patterns are challenging for gardens. But, CSU Extension is here with specialized knowledge to help you grow successful gardens of abundance. To get started, check out the following two links to the Colorado Vegetable Guide: <https://growgive.extension.colostate.edu/wp-content/uploads/sites/63/2021/01/Colorado-Vegetable-Guide-2.1.pdf>

For a wealth of information on gardening, I would also highly encourage you to check out our 'Growing' resources at <http://growandgivecolorado.org/>



## Annual Weeds

By Kara Harders CSU/NRCS SAM Specialist

Many annual weeds are up and growing! The climate differences across Colorado cause weeds to germinate or resume growing at different times in the spring, in some areas these weeds may already be blooming and trying to reproduce while in others they may just be starting to sprout. The way to beat annual weeds is to prevent them from reproducing and this is the easiest time of year to do it!

Now, to be clear, I did not simply say “killing the weeds in the goal”. This is because the annual weeds that are coming up this year are not the same plant that was there last year or the one that will be there next year. These plants sprout, grow, reproduce, and die all on their own. So, killing the weeds after they have already gone to seed, without collecting and throwing the seeds away, will do nothing in the grand scheme of things.

**Weed Early:** If you can pull or otherwise root up the weeds when they are very small (less than 3 inches, and no sign of seed heads) they will likely die without reproducing (win!). If you don't mind the look of little weed bodies all over, you can even leave them on the ground. No bagging for you! Herbicides are also an effective choice at this

point (always read the label on herbicides! The Label is the Law).

**Weed Often:** Sometimes with cold and warm weeks and spring rains we will have “flushes” of new weeds coming up. So, take a walk around your yard or property fairly frequently, it's good for your health and lets you keep on top of what is sprouting up!



Here are young Kochia plants, perfect for pulling since they have not gone to seed yet

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Annual Weeds continued from page 9

Quiz time!

Which of the following annual weeds pictured could be killed and left behind, and which need to be picked up and thrown away?

See answers below:

Prickly Lettuce— Kill and leave  
Blue Mustard—Dispose of seeds  
Flixweed—Dispose of seeds  
Cheatgrass—Kill and leave



(Above) Flixweed



(Above) Blue Mustard



Cheatgrass (Downey brome)

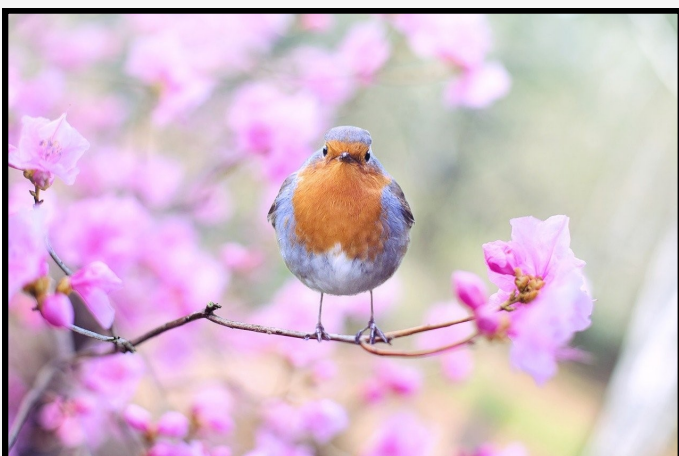


(Above) Prickly lettuce



## El Paso County Webinars and Trainings

El Paso County is offering various online classes ranging from canning to pollinators to farm finances. Register here: <https://www.eventbrite.com/o/colorado-state-university-extension-el-paso-county-3307878188>



## Food Smart Colorado Bulletin List

You may be interested in subscribing to this free monthly email newsletter with information about food, nutrition, health, food safety, recipes, and how-tos.

<https://mailchi.mp/colostate/foodsmart>

## SARE Quick Guides

What Are Quick Guides?

SARE and state Extension services produce a variety of how-to publications, bulletins, and project reports.

Western SARE Quick Guides distill this information into a short, easy-to-digest format. They are intended as a supplement to these more extensive publications.

In March they published guides on improving grazing distribution and supporting barn owls for rodent control!

<https://western.sare.org/learning-and-resources/how-to-quick-guides/>



## Building Your Permaculture Property

April 23 - April 25

This free, live, online global summit is sponsored by New Society Publishers and hosted by Building Your Permaculture Property co-authors Rob and Michelle Avis, founders of Verge Permaculture, and Takota Coen of Coen Farm. Michelle, Rob, and Takota will be offering an inspiring, information-packed keynote on their five-step process to design and build a thriving permaculture property. Afterward, they'll interview nearly 20 world-renowned permaculture pioneers about their own early beginnings, painful lessons, hard-won victories, and inspiring case studies.

<https://attra.ncat.org/event-calendar/building-your-permaculture-property/>



Do you have a question for extension but don't know who to ask? Try [Ask Extension!](#)



**Check out our Dryland Pasture Assessment to see how your pasture measures up!**

<https://sam.extension.colostate.edu/wp-content/uploads/sites/2/2018/07/GrazingGuide.pdf>

**Do you have a question about managing your small acreage?**

**Contact CSU Extension /NRCS Small Acreage Coordinator(s):**

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