COLORADO
Small Acreage Management
Newsletter

COLORADO STATE UNIVERSITY EXTENSION

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Natural Resources Conservation Service

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Inside this Issue:

Where do Bees Go in the Winter?
A look at bee adaptations and life cycles in the winter time

By Lisa Mason, Arapahoe County Extension

I have been asked a few times this season what happens to the bees in the winter. Bees and other insects have special adaptations, so their species survives from year to year. Here is a look at bee adaptations and life cycles in the winter time.

Honey Bees

Worker bees foraged all summer and into fall bringing in food reserves to last them through the winter. When temperatures start to drop, honey bees huddle together to make a cluster and shiver their wings. Shivering provides warmth for the hive. Their main goal is to keep the queen warm so the colony can survive. The core temperature in the hive can be as high as approximately 91 degrees Fahrenheit. A healthy hive with adequate food storage is more likely to survive, which reinforces the

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A honey bee, Apis mellifera. (Photo: Lisa Mason)

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importance of best beekeeping practices by the beekeeper all year. Read how to prep a hive for winter here.

Solitary Bees

Solitary bees live a one-year life cycle. During the life cycle, a female bee builds a nest underground or in a cavity. She will collect pollen and nectar to bring back to the nest. All the collected pollen and nectar is made into a ball called "bee bread" which will be all the food needed for one growing bee. The female lays an egg on the bee bread and seals up the nest. After the egg hatches, the larva will go through full metamorphosis from a larva, to a pupa, and on to an adult before emerging from the nest the following season. The lives ended for the female and male solitary bees we saw flying around this summer, but their brood is warm for the winter underground or in a cavity and will emerge next summer.

Bumble Bees

Bumble bees live underground or in large cavities and have a one-year life cycle, like a solitary bee. During the summer, new queens and male bees hatched. They left their colonies to mate. As temperatures dropped, the male bees and worker bees from the current season's colony died. The new, mated queens found a place to rest and hibernate over the winter, usually underground. When spring arrives, she will emerge, begin to forage, build a new nest, and lay eggs. The eggs will mostly be female worker bees at the beginning of the season. The queen will continue to lay eggs throughout the season. In late summer, new queens and male bumble bees will hatch and leave the colony and the cycle repeats itself. Queen bumble bees are capable of living alone, unlike honey bee queens.
For more information on bee life cycles, you can read the Native Bee Watch Citizen Science Field Guide.

For more information on what happens to other insects in the winter, you can refer to this CO-Horts Blog post written by Jessica Wong.

Soil Health

By Jennifer Cook, Gilpin County Extension

Soil health is defined by Natural Resources Conservation Service (NRCS) as the capacity of soil to function as a living ecosystem that sustains plants, animals, and humans. Healthy soils contain billions of bacteria, fungi, and other microbes that help form an ecosystem, providing nutrients for plant growth, absorbing and holding water, and providing the foundation for agricultural activities.

Follow four basic soil health principles to improve your soil health and sustainability:

1.) Keep the soil covered. Examples of cover are leaving plant residue behind after harvest, or mulching your garden.

Erosion by wind and water happens when the soil is not adequately covered. Keeping your soil covered as much as possible protects your nutrient-rich top soil. In addition to soil erosion, cover can affect soil temperature and moisture. A soil covered with plant litter/mulch reflects radiation due to its "albedo." This keeps soil temperatures lower than bare soils, which warm up more readily. Especially during the summer, the temperature difference between a covered and bare soil can be significant. Plants use soil moisture less efficiently at higher temperatures as more water is lost through evapotranspiration than utilized for plant growth.

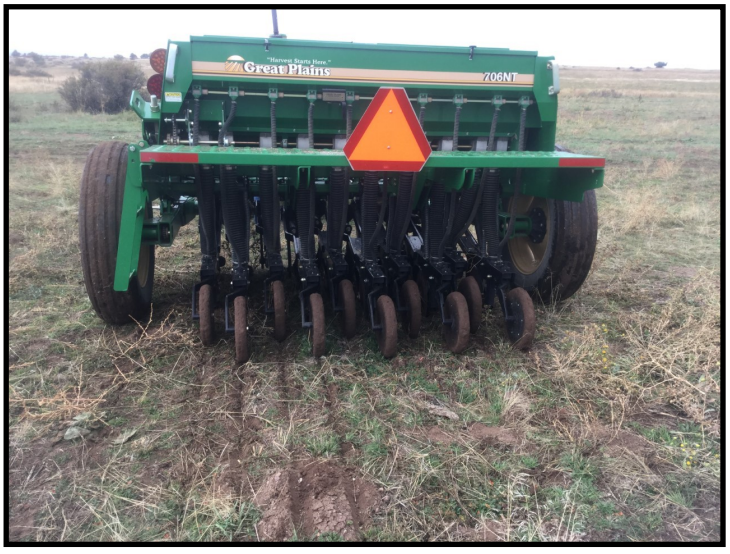
2.) Minimize soil disturbance. Examples of soil disturbance are tillage, overgrazing, and overapplication of chemicals and nutrients.

Soil disturbance such as plowing and rototilling can impact soil by physically breaking up the soil structure and by stimulating microbial decomposition of organic matter. This includes the breakdown of biological glues, such as polysaccharides and glomalin, that are key in maintaining soil structure. Without these biological glues, when the soil gets wet, it collapses and loses large soil pore spaces resulting in a net reduction in infiltration, aeration, and soil microbial activity. Disturbed and compacted soils sometimes more closely resemble a brick than a healthy functioning soil!

3.) Use plant diversity. Examples of diversity are using crop rotations or planting a variety of species for pastures or cover.

By increasing the diversity of plants above ground (at the same time or in a crop rotation), the diversity below ground can be enhanced. Diversity can build redundancies and synergies in the soil system which ultimately leads to increased resiliency (to drought for instance). Many would argue that this is the most important principle to improve soil health/function and increase long-term sustainability. For an added incentive, increasing crop diversity in agricultural systems has long been recognized as a tactic for increasing economic resiliency.

4.) Keep living plants throughout the year. This is most commonly achieved by using cover crops. Soils feed plants and plants feed soils. Through photosynthesis plants capture soil energy and convert it to organic compounds (from simple sugars to complex organic molecules like lignin). Plants use this captured solar energy for maintenance and growth. Most soil organisms need this external food source produced by plants.



No Till Drills are an option for reseeding pastures with minimal soil disturbance (Photo credit: Debbie Mitchell—Fremont Conservation District)

Soil Health continued from page 3

Many plants "leak" carbohydrates and other root exudates to stimulate soil microbial activity. Fueled by this symbiotic relationship, the area around the root (rhizosphere) is teaming with life in a healthy, functioning soil. This biological activity drives nutrient cycling in the rhizosphere. Many plants also form symbiotic relationships with mycorrhizal fungi by providing carbon to the fungi in exchange for nutrients (especially phosphorous). In these instances, soil microbes are providing services to the plant (i.e. nutrient cycling) at the cost of organic compounds from the plant.

For more information, visit NRCS's soil health webpage - https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

Contact your local NRCS office for assistance with these soil health principles on your farm.

USDA Rural Development Value Added Producer Grant (VAPG) Program Funding Available!

The Deadline for Applications is March 10, 2020!

The VAPG program is designed to help producers of agriculture commodities with Planning or Working Capital grant funds to help create, market and sell their Value-Added Products (VAP). One recent recipient of the VAPG is Rolling T Livestock who has raised Corriente Cattle for decades when they applied for and received funds from the 2018 VAPG funding. Marketed as High Plains Beef, they used the grant and their 50% matching funds for marketing and labeling their beef VAP's made in Northwest Colorado. The funds have been used to purchase marketing materials, build a website and start using social media methods for advertising. Their success in getting their Corriente Beef products to market is attributed to their dedication and hard work as well as the financial assistance the VAPG has provided. Not only did sales exceed initial expectations, but they are now selling in several states.

What about your project? Could we help you get your value-added product started or expand the market place for your current one? Contact us to discuss it soon!!! We will stop our complimentary eligibility and completeness reviews sometime toward the end of February. Successful applications are ones that are submitted early! Any applications submitted on the deadline will be final and any missing information will result in an ineligible application.

VAPG 2020 Deadline Countdown

We look forward to working with you!

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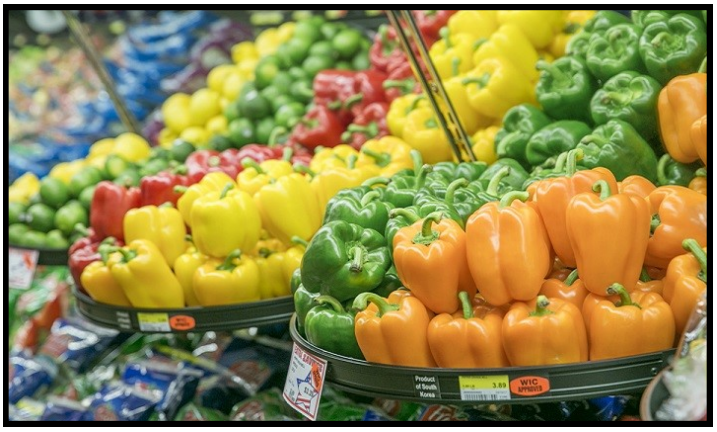

Which Trees to Transplant in the Spring and Fall in Colorado

By Emily Jack Scott, Garfield County Colorado Master Gardener

If you choose to transplant a tree or shrub this spring, there are several considerations that can improve your odds for success.

As a rule of thumb the best times to transplant most trees and woody shrubs is in early spring (as soon as the soil can be worked), or in fall (after leaves drop) – the key factor being that the tree or shrub is in dormancy. In some parts of the country, fall planting is actually preferable since most trees are channeling energy into root growth in autumn, as opposed to shoot and leaf growth in spring. However in Colorado, fall can be less ideal since the ground can be very dry in winter and roots of transplanted trees can suffer additional damage. If you do choose to transplant a tree or shrub this fall, there are options that can improve your odds for success.

Firstly, aim to complete the transplant by the end of October. Transplanting any later in fall or winter will leave little opportunity to help water in the new planting before the ground freezes. New transplants are particularly susceptible to winter drought injury due to the dry winter soils in Colorado. This can be curtailed in part by winter watering, which is critical for newly transplanted trees and preferable for all established trees and shrubs in Colorado (refer to Fact Sheet 7.211 Fall and Winter Watering for more information). Winter drought can also be helped by properly mulching a newly transplanted tree (refer to Fact Sheet 7.214 Mulches for Home Grounds).

The species of the tree also factors into transplanting success. This is in part due to the difference in root structure between different species – with some species having shallower, more fibrous root systems that are better adapted to transplanting, especially in fall. Some types of trees really should only be planted in spring including oaks, fruit trees,

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CSU Online Land Stewardship Short Courses

Take one or all of these self-paced online courses developed for the Colorado-arid west soil and climatic conditions.

Stewardship Planning—$40
Soils—The Basics—$50
Water—The Basics —$50
Management of Forage Plants—$50
Management of Invasive and Noxious Weeds—$50
Emergency Preparedness—$50
Management of Wildlife in Colorado—$50
*Discounts for bundling classes

Each class aims to help small acreage audiences and takes 5—10 hours to complete at your own pace.

Participants will gain a better understanding of natural resources, localized land strategies, and build an effective long-term land management plan for their property.

More info and register here—
www.online.colostate.edu/badges/land-stewardship/

Follow @Colorado Stewardship on Instagram and Facebook

Upcoming Focus -

Conservation of Natural Resources

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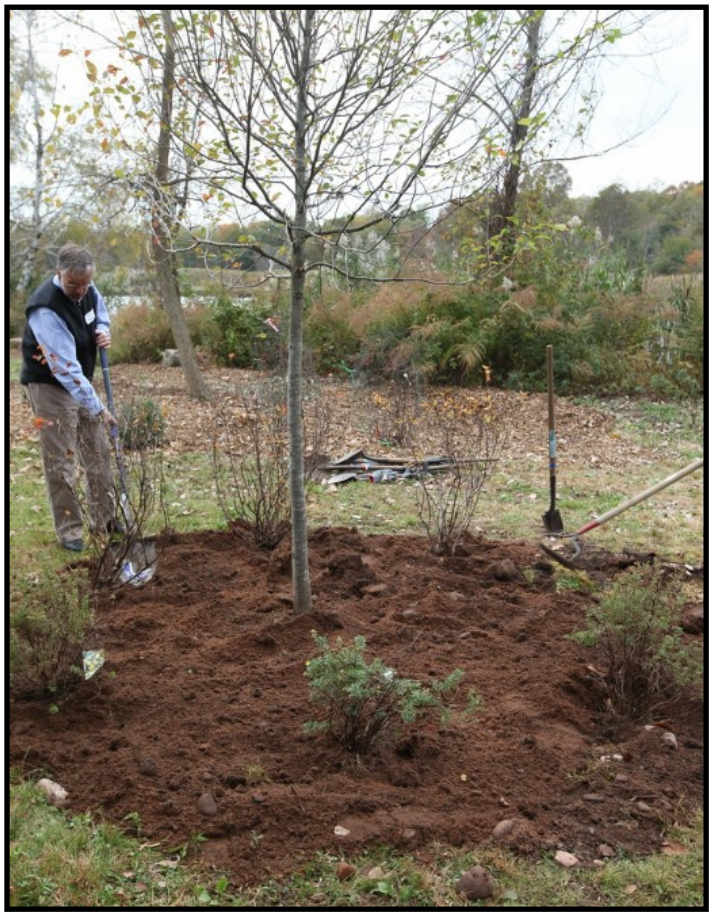
poplars, willows, redbuds, and birches. Other species can be more successfully transplanted in the fall such as maples, alders, lindens, catalpas, elms, ashes, and honeylocusts. Conifers such as pine and spruce benefit from being transplanted when soils are warmer.

Whether you choose to transplant a tree or woody shrub this spring or wait until fall, ultimately the success of your planting depends on following proper tree-planting steps (refer to GardenNotes #633 The Science of Planting Trees). Happy planting!



Source: U. S. Fish and Wildlife Service—Northeast Region [Public Domain]

Additional Resources:

Fall and Winter Watering. https://extension.colostate.edu/topic-areas/yard-garden/fall-and-winter-watering-7-211/

Fall Planting. http://planttalk.colostate.edu/topics/trees-shrubs-vines/1707-fall-planting/

Fall Planting of Trees and Shrubs. https://hortnews.extension.iastate.edu/1997/8-22-1997/fallplant.html

Planting and transplanting trees and shrubs. https://www.mortonarb.org/trees-plants/tree-and-plant-advice/horticulture-care/planting-and-transplanting-trees-and-shrubs

When is the best time to transplant trees? http://blog.davey.com/2017/11/when-is-the-best-time-to-transplant-trees-pine-oak-maple-and-fruit/

Bird Migration Timing Skewed by Climate

Life cycles for birds, insects and trees are shifting

By Mary Guiden, Colorado State University

Life cycles for birds, insects and trees are shifting in this current era of a rapidly changing climate. How migration patterns, in particular, are changing and whether birds can track climate change is an open question.

Kyle Horton, assistant professor at Colorado State University, led a new study analyzing nocturnal bird migration that he hopes will lead to more answers about shifting migration patterns. He and the research team used 24 years of radar data from NOAA, the National Oceanic and Atmospheric Administration, for the study.

The research team found that spring migrants were likely to pass certain stops earlier now than they would have 20 years ago. Temperature and migration timing were closely aligned, with the greatest changes in migration timing occurring in regions warming most rapidly. During fall, shifts in migration timing were less apparent.

The study, one of the first to examine the impacts of climate change on migration timing at a continental scale, is published December 16 in *Nature Climate Change*.

Analysis using cloud computing revealed patterns of millions of birds

Horton described the breadth of the research as "critically important," with the team observing the nocturnal migratory behaviors of hundreds of species representing billions of birds.

"To see changes in timing at continental scales is truly impressive, especially considering the diversity of behaviors and strategies used by the many species the radars capture," he said. Yet while the team saw these shifts, Horton noted that this doesn't necessarily mean that migrants are keeping pace with climate change.

Migratory birds serve an important role in ecosystems. They eat and take insects off the land, disperse seeds and serve other significant functions, including measuring health in these ecosystems. Andrew Farnsworth, the study's senior author and a research associate at Cornell Lab of Ornithology, said the team's research answered, for the first time, key questions on birds and climate change.

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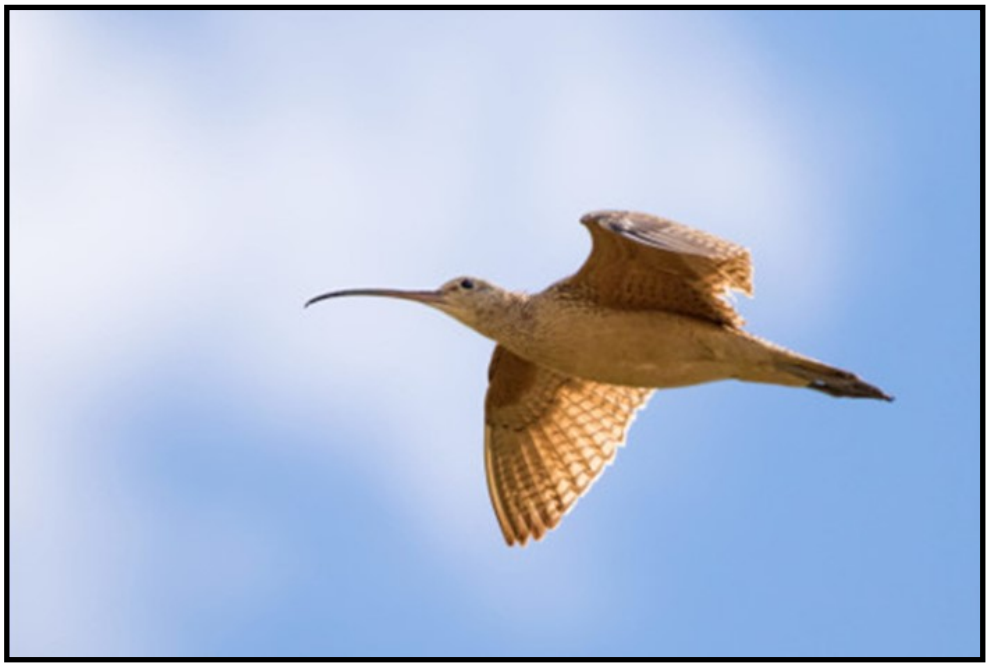

A long-billed curlew in flight. (Photo: Nick Saunders)

Bird Migration continued from page 7

"Bird migration evolved largely as a response to changing climate," he said. "It's a global phenomenon involving billions of birds annually. And it's not a surprise that birds' movements track changing climates. But how assemblages of bird populations respond in an era of such rapid and extreme changes in climate has been a black box. Capturing scales and magnitudes of migration in space and time has been impossible until recently."

Researchers accessed NOAA datasets through Amazon Web Services as part of the agency's Big Data Project, designed to provide access to data in a more efficient way.

Horton said that this access to the data and cloud computing greatly enhanced the team's ability to synthesize the findings.

While Amazon Web Services provided access to the data, new algorithms designed by scientists at the University of Massachusetts revealed the potential of these radar data for biologists. Specifically, the scientists designed new computer vision techniques to remove weather data, a problem that had challenged biologists from decades.

"Historically, a person had to look at each radar image to determine whether it contained rain or birds," said Dan Sheldon, associate professor of computer science at the University of Massachusetts Amherst.

"We developed 'MistNet,' an artificial intelligence system to detect patterns in radar images and remove rain automatically."

Fall migration tends to be 'messier'

Horton, who works in the Department of Fish, Wildlife and Conservation Biology at CSU, said that the lack of change in fall migration patterns was a little surprising, though migration also tends to be a "little bit messier" during those months.

"In the spring, we see bursts of migrants, moving at a fairly rapid pace, ultimately to reach the breeding grounds," he explained. "However, during the fall, there's not as much pressure to reach the wintering grounds, and migration tends to move at a slower, more punctuated pace."

During the fall, birds are not competing for mates, and the path to reach their destination is more relaxed. There's also a wider age range of birds migrating, as the young eventually realize they need to migrate, too. The combination of these factors makes fall migration more challenging to study.

Horton said the findings have implications for understanding future patterns of bird migration, since the birds rely on food and other resources as they travel. Under climate change, the timing of blooming vegetation or emergence of insects may be out of sync with the passage of migratory birds. This seemingly subtle shift could have negative consequences for the health of migratory birds.

Researchers plan to expand their data analysis to include Alaska, where climate change is having more serious impacts than in the lower 48 states in the U.S.

Payson Lupine and Silvery Lupine

By: Sierra Crumbaker, Colorado Natural Heritage Program (CNHP)

Nothing, arguably, could represent CNHP and its mission more than a species that is found nowhere in the world except Colorado. Payson lupine (Lupinus crassus) is one of these rare species, found only in Montrose County and given an imperilment rank of G2/S2 due to its small numbers and narrow distribution. Locations are tracked by CNHP and further details can be found in the Colorado Rare Plant Guide.

With its light-colored petals and hues ranging from white to pink with purple tips (unlike most lupine species, which are usually solid blue-purple), this lupine adds a touch of color to the dry, shale soils in the pinyon-juniper woodland it calls home. Once you know where to look, Payson lupine can be spotted

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by its winding stems along the ground that form large clumps. Multiple flowers shoot straight up from these bunches in May to June. With the abundance of diversity found throughout the state, it's exciting to have a species entirely unique to a less-than 200 square mile area in Colorado — but it also highlights the importance of protecting rare plants and animals that could be lost for future generations if we fail to recognize their values.

Silvery Lupine

While Payson lupine is a special hidden gem of Colorado, you are far more likely to cross paths with one of the 10 other species of lupines inhabiting the state. Since they often hybridize, they are notoriously difficult to identify.

The most common species found in Colorado is Lupinus argenteus, or Silvery lupine. Naturally widespread throughout the western United States and popular for cultivated landscapes, this member of the pea family can be seen at numerous elevations, from the foothills to the subalpine.

A close-up of Payson lupine. (Photo Credit: Peggy Lyon)

Between May and September, large thickets of lupine can cover hillsides in blooming white to violet flowers that entice visits from bees, which provide pollination services to plants.

The plant's flowers attract numerous other insect pollinators and hummingbirds. Another, more unique affiliation of lupine occurs below ground: it forms a mutualistic relationship with bacteria that grow on its roots, helping it fix nitrogen from the air and subsequently allowing the plant to fertilize the soil. Because of this, lupine can establish itself in harsher areas and naturally convert the soil so that it is more accommodating to other species.

Lupinus comes from the Latin lupus, meaning "wolf." Now, you might be wondering, why the association with the wolf? It was once erroneously believed that lupine species deteriorated the land, and perhaps that reflected the negative views also portrayed with wolves. But as it turns out, silvery lupine can act like a wolf in another way: when it is in the seed stage, ingestion by sheep and other livestock can be toxic, causing birth defects in unborn young and even mortality if too much is consumed.

It's also possible people thought planting lupine would keep wolves away. Or maybe they thought eating a lupine seed would turn one into a werewolf. We may never know.

Lupine. (Photo Credit: Peggy Lyon)

Do you have a question for extension but don't know who to ask? Try Ask an Expert!

COOPERATIVE EXTENSION

Do you have a question about managing your small acreage?

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

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Upcoming Poultry Webinars!

February 19 – Dr. David Frame, DVM
Utah State University
How to perform a simple necropsy
https://learn.extension.org/events/3758

March 10 – Dr. Rachel Lynn Davis
University of Maryland
Poultry-human bond
https://learn.extension.org/events/3759

April 14 – Dr. Tony Pescatore
University of Kentucky
Raising pullets for egg production
https://learn.extension.org/events/3760

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