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Florida-Friendly Landscaping™ PROGRAM

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Cold Protection of Landscape Plants[1]

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Visit http://FloridaFriendlyLandscaping.com to learn more about creating and maintaining attractive landscapes that protect Florida's water resources and environment.

Winter temperatures in Florida are frequently low enough to cause cold injury to tropical, subtropical, and occasionally temperate plants not adapted to Florida climatic conditions. Freezing weather normally occurs in north and central Florida, while below freezing temperatures are rare for south Florida. Tropical plants and summer annuals do not adapt or harden to withstand temperatures below freezing, and many suffer "chilling injury" at temperatures below 50°F (10°C). Subtropical plants can harden or acclimate (become accustomed to a new climate) to withstand freezing temperatures, and properly conditioned temperate plants can withstand temperatures substantially below freezing. Recently planted, unestablished plants may be more susceptible to cold injury.

Types of Freezes - Radiational and Advective

Freezes can be characterized as radiational or advective.

Radiational Freezes

Radiational freezes or frosts occur on calm, clear nights when heat radiates from the surfaces of plants and other objects into the environment. These surfaces can become colder than the air above them due to this rapid loss of heat or long-wave radiation. When the air is moist, a radiant freeze results in deposits of ice or frost on surfaces. Dry radiational freezes leave no ice deposits but can cause freeze damage. Plant damage from a radiational freeze can be minimized by reducing radiant heat loss from plant and soil surfaces, as described below.

Advective Freezes

Advective freezes occur when cold air masses move rapidly from the north, causing a sudden drop in temperature. Windy conditions are normal during advective freezes. Although radiant heat loss also occurs during an advective freeze, the conditions are quite different from a radiational freeze. Plant protection during advective freezes is more difficult.

How Cold Affects Plants

The ability of plants to withstand a freeze depends on both temperature fluctuations and day lengths prior to the event. A gradual decrease in temperature helps acclimate most plants to cold. That is why a sudden decrease in late fall or early winter usually results in more damage than the same low temperature in January or February. Leaf and stem tissue will not survive ice formation inside the cells (resulting from a rapid freeze), but many plants can adapt to tolerate ice formation between cells. Such preconditioning has not been well documented in tropical plants.

Short durations of warmer temperatures in midwinter can de-acclimate some plants, resulting in early bud break, flowering, and susceptibility to freeze injury.

Cold injury can affect the entire plant or just certain susceptible plant parts such as flowers, fruits, and roots. Cold injury to roots of potted plants is common, although it is usually not evident until higher temperatures occur.

One type of winter injury is plant desiccation or drying out. This is characterized by marginal or leaf tip burn in mild cases, and totally brown leaves in severe cases. Desiccation occurs when dry winds and solar radiation result in the loss of more water from the leaves than can be absorbed and/or transported by a cold root system. Root systems in the landscape are seldom frozen in

Florida, but the soil in small containers can be frozen for several consecutive hours in North Florida.

What to Do Before a Freeze

Choosing the right plant for the right place by locating plants in their proper planting zone is a good way to promote plant health throughout the winter. However, Florida homeowners often desire a tropical appearance to their landscapes and may plant species past the northern limit of their USDA planting zone (Figure 1 and 2). Tropical and subtropical plants can be used effectively in the landscape, but they must be protected or replaced when necessary. Intermingle cold tender plants with hardy plants so that the whole landscape is not totally devastated by extremely cold weather.

Homeowners can take steps to acclimate plants and protect them from temperature extremes by taking advantage of microclimates and using good cultural practices.

Temperatures can fluctuate within a landscape due to microclimates created by tree canopy, proximity to structures, and other factors. Identify these microclimates in your landscape when choosing the planting site for cold-sensitive plants. For example, tender plants should not be planted in low areas where cold air settles. Poorly drained areas result in weak, shallow roots that are susceptible to cold injury.

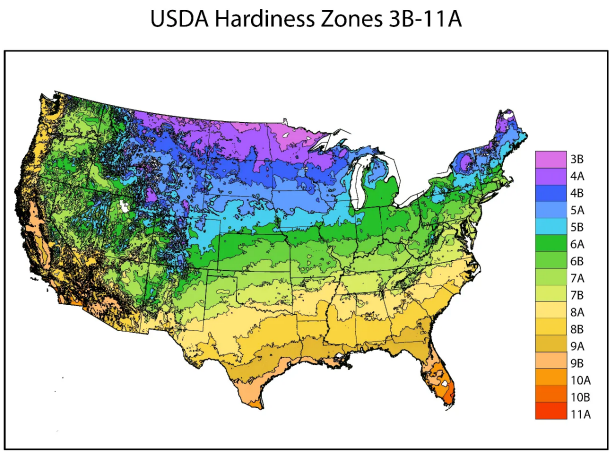

Figure 1. US Plant Hardiness Zone Map – USDA Zones 3B-11A, 11B included within hardiness zones, but not pictured on map. Credit: This map is based off the 2023 USDA Plant Hardiness Zone Map. Visit (https://planthardiness.ars.usda.gov/) for specific zone information.

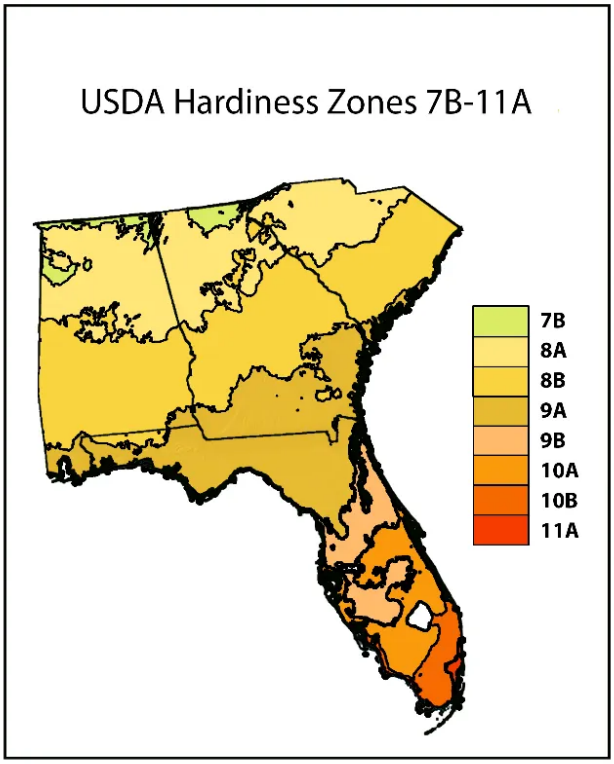

Figure 2. SE Plant Hardiness Zone Map – USDA Zones 7B-11A, 11B included within hardiness zones, but not pictured on map. Credit: This map is based off the 2023 USDA Plant Hardiness Zone Map. Visit (https://planthardiness.ars.usda.gov/) for specific zone information.

Shade

Tree canopy creates a microclimate that typically reduces cold injury during radiational freezes. Plants in shaded locations usually go dormant earlier in the fall and remain dormant later in the spring. Tree canopies trap heat radiating from the ground to the atmosphere, and thereby elevate the air temperature beneath them. Shading from early morning sun may decrease bark splitting of some woody plants after a freeze. Plants that thrive in light shade usually display less winter desiccation than plants in full sun. However, plants that are not shade-tolerant, will become unhealthy, sparsely foliated, and less tolerant of cold temperatures.

Windbreaks

Windbreaks are helpful in reducing the effects of short-lived advective freezes and their accompanying winds. Fences, buildings, adjacent plantings and temporary coverings can all serve this purpose; although their height, density, and location will affect the degree of wind speed reduction. Injury due to radiational freezes is influenced little by windbreaks.

Proper Plant Nutrition

Plants in good nutritional health will tolerate cold temperatures better and recover from injury faster than plants grown with suboptimal or imbalanced nutrition. However, late fall fertilization can result in growth flushes that are more vulnerable to cold injury. Additionally, fertilizers should be applied at the correct rates and times and only when needed. Because they have the potential to pollute water, some municipalities have adopted ordinances that regulate the formulations, sale, and application of lawn and/or landscape fertilizers. Check with your county's UF/IFAS Extension office for recommendations and rules (http://sfyl.ifas.ufl.edu/find-your-local-office/).

Water Relations

Watering landscape plants before a freeze can help protect plants. A well-watered soil will absorb more solar radiation than dry soil, re-radiate heat during the night, and slightly elevate minimum night temperatures in plant canopies. However, prolonged saturated soil conditions damage the root systems of most plants.

Pruning and Pest Management

Avoid late summer or early fall pruning. This can result in growth flushes more prone to cold injury.

Healthy plants are more resistant to cold than plants weakened by disease, insect damage, or nematode damage. Routinely inspect for pests. Contact your county's Extension Office for information on pest identification and recommended management (see https://sfyl.ifas.ufl.edu/find-your-local-office/).

Methods of Protection

Plants in containers can be moved into protective structures where heat can be provided if necessary. Containers that must be left outdoors should be protected with mulches and pushed together before a freeze to reduce heat loss from container sidewalls. Plants should be re-spaced as soon as possible after the freeze as they may be damaged if crowded together for extended periods.

Heat radiating from soil surfaces warms the air above the soil or is carried away by air currents. Radiant heat from the soil protects low-growing plants on calm cold nights, while tall, open plants receive little benefit. Radiant heat loss is reduced by mulches placed around plants to protect the roots. For perennials, the root system is all that needs to be protected, because some perennials die back naturally in winter while others survive freezes and quickly regenerate new foliage from the roots.

Grafted or budded plants, like some gardenias and many fruit trees, can be protected by insulating the trunks with commercial tree wraps or one- to two-foot mounds of soil. This protects the trunk so that even if the branches freeze, the tree will be able to re-sprout from above the graft. Remove the wrap or mounded soil each spring.

Covers are better at protecting plants from frost than from extreme cold (Figure 3). Ideally, the covering should not rest on the foliage which may be injured by the contact. Some examples of coverings are "frost cloth," canvas tarps, bedsheets, or quilts (Figure 4). Covers must extend to the ground to trap radiant heat and may need to be anchored with rocks, bricks, soil, etc., if it is windy (Figure 5). Cardboard boxes, gallon plastic containers, or even trash cans may can be used to protect small plants (Figure 6). These objects should be weighted down to keep them in place. Valuable plant specimens can be protected with temporary greenhouses constructed of wood framing and plastic sheets. The addition of an outdoor approved incandescent light bulb or an incandescent string of Christmas lights under a cover is a simple method of providing heat to plants in the landscape. Remove or ventilate plastic covers during a sunny day.

Turn off in-ground irrigation systems before freezing temperatures occur. Nurseries and farmers protect crops during a freeze by sprinkling the plants with water. Sprinkling for cold protection helps keep leaf surface temperatures near 32°F (0°C), because sprinkling utilizes latent heat released when water changes from a liquid to a solid state (ice). Sprinkling must begin as freezing temperatures are reached and continue until thawing is completed. Home irrigation systems are not designed to supply water in quantities ample enough to maintain a film of liquid water on plant surfaces, thus more harm than good usually results. Water soaks the soil resulting in damaged root systems, plants break due to ice build-up, and water is wasted. Furthermore, water restrictions do not allow this use in much of the state, and fines can be levied.

Figure 3. Frost cloth extending to the ground, weighted down by stones for cold protection.
Credit: Cat Wofford, UF/IFAS

Figure 4. Bedding material extending fully to the ground for cold protection.
Credit: Cat Wofford, UF/IFAS

Figure 5. Frost cloth secured with anchor pins.
Credit: Cat Wofford, UF/IFAS

Figure 6. Cardboard box used for cold protection.
Credit: Cat Wofford, UF/IFAS

What to Do After the Freeze

Water Needs

Plant water needs should be checked after a freeze. Plants may have lost substantial moisture during a windy advective freeze. Plants will transpire (lose water vapor) on a sunny day after a freeze, but sometimes their roots are too cold to function normally. Water in the soil of containerized plants can freeze and be unavailable to roots. Apply water to allow thawing, rehydration of plants, and dilution of fertilizer salts that might otherwise burn plant roots.

Pruning

Cold injured wood can be identified by lightly scraping the bark with your fingernail and examining the color of the cambium layer (food conducting tissue) just underneath. Green tissue indicates the plant is still alive at that point; black or brown coloration indicates dead or injured tissue. Prune these branches behind the point of discoloration. Branch tips may be damaged while older wood is free of injury. If in doubt, delay pruning until new growth appears to ensure that live wood is not removed. Leaves and stems that have been damaged by cold weather do provide some insulating value to the rest of the plant, so delay pruning, if possible, to take advantage of this insulation. Once new growth begins, these plants can be pruned back, but new shoots should be protected with covers should more cold weather arrive. Cold injury may appear as a lack of spring bud break on a portion, or all of the plant, or as an overall weak appearance. After a particularly harsh cold event, some plants may be very slow to recover, so some patience is required.

More Information

For additional information on cold protection and coping with cold injury to plants, visit the UF/IFAS EDIS website at https://edis.ifas.ufl.edu and use the search word "cold."

Acknowledgements

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