RUTGERS UNIVERSITY
Cooperative Extension of Ocean County
New Jersey Agricultural Experiment Station

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# Top Drought-Tolerant Plants for a Resilient Garden

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Drought resistance in plants is achieved through a combination of structural and physiological adaptations that help them avoid or tolerate water scarcity. These strategies focus on conserving existing moisture, efficiently absorbing available water, and withstanding low tissue water content during extended dry periods.

**Root adaptations for water absorption:** A plant's root system is crucial for its ability to find and absorb water from the soil.

- **Deep taproots:** Some plants develop a long, single taproot that can reach deep into the soil to access underground water sources. This is an effective strategy in areas with a low, but consistent, water table.
- **Extensive shallow roots:** Many plants have widespread, fibrous roots that form a dense, shallow mat just below the soil surface. This allows for the rapid absorption of water from light rains or morning dew before it evaporates.
- **Specialized water-storage roots and underground stems:** Certain plants develop thick, bulbous root system that act as underground reservoirs, storing water and nutrients for future use.

**Leaf adaptations for water conservation:** Since most water loss in plants occurs through the leaves via transpiration, many drought-resistant plants have developed features to minimize this process.

- **Thick, waxy cuticle:** A thick, waterproof, and shiny coating on leaves and stems acts as a barrier to evaporation. The waxy surface also reflects sunlight, helping to keep the plants cool
- **Hairy or fuzzy leaves:** A dense covering of fine hairs, called trichomes, traps a layer of moisture around the leaf surface. This increases humidity and reduces air movement, slowing evaporation. These hairs can also reflect sunlight.
- **Silver, gray or blue-green foliage:** The unique color of the leaves can help reflect some solar radiation, reducing the leaf's temperature and thus lowering the rate of evaporation.
- **Reduced leaf surface area:** Plants may have smaller or narrower leaves, to reduce the surface area exposed to heat and sun.
- **Narrow, needle-like leaves:** The fine, slender leaves reduce the surface area exposed to sun and wind.
- **Leaf orientation:** The stiff, upright blades of grasses minimize the surface area directly facing the midday sun. Some plants can reorient their leaves to minimize the surface area exposed to direct sun, especially during the hottest part of the day. This can involve angling the leaves or curling them to reduce the solar radiation load.
- **Stomatal control:** To reduce exposure to air currents, stomata (the pores for gas exchange) are located in pits or grooves on the leaf's surface. This traps moist air and creates a more humid microenvironment, reducing the rate of water evaporation. Some plants have sensitive stomata that can be closed quickly to prevent water from escaping, especially during the hottest and driest part of the day then opening during the night when it’s cooler.
- **Leaf rolling or curling:** Many grasses and shrubs can roll or fold their leaves inward during the hottest part of the day. This decreases their exposed surface area and shades their stomata.
- **Shedding leaves:** A plant under severe heat stress may shed older or outer leaves, reducing its overall surface area and transpiration demand.
- **Avoidance via dormancy:** Some perennials avoid drought altogether by becoming dormant during dry seasons and resume growth when conditions improve.

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**CHOOSE THE RIGHT PLANT FOR THE RIGHT SPOT. Do a site assessment for LIGHT AVAILABILITY, SOIL TYPE, "NATURAL" MOISTURE**

**LIGHT AVAILABILITY SUMMARY - How much full sun does a site get during the day?**

- **FULL SUN -** 6 to 8 or more hours of DIRECT sun (mostly between 10 a.m. and 4 p.m.)
- **FULL SHADE -** At least 3 to 4 hours of sun mostly in the morning or late afternoon.
- **Anything in between is PART SHADE/PART SUN** - 4 to 6 hours of sun any time of the day or very light dappled sun during most of the day.

**SOIL – what kind of soil do you have? Sandy, clay, loamy?**

The fundamental difference lies in the size of the mineral particles they contain.

- **Sandy soil** has the largest particles, which are gritty and loose, making water drain quickly.
- **Clay soil** has the smallest, most fine-grained particles, which pack tightly together resulting in very slow drainage and prone to waterlogging
- **Loamy soil** is a balanced combination of sand, silt, and clay particles (with silt being an intermediate size), often with organic matter (humus). It is considered ideal, draining well but retaining enough moisture for most plants.

**Saline soil,** by the seashore or winter salting for snow, is the most difficult to deal with because it causes plants to be unable to absorb water, disrupts nutrient uptake, as well as being toxic to plants' survival.

**SITE PREPARATION – use organic amendments to provide plants a healthy soil.** Add no more than 25% by volume. Higher levels can cause significant soil settling as organic matter breaks down.

**HOW MUCH "NATURAL" MOISTURE DOES THE SITE GET?**

- Dry areas where water does not remain after a rain, draining quickly (usually sandy soil)
- Dry due to tree root competition
- Dry due to slope where water runs off
- Dry due to walls, eaves, fences
- Moist - where the soil is damp and gets occasionally saturated
- Wet - where the soil is saturated for a few days except in droughts

**ALL NEWLY PLANTED PLANTS REQUIRE WATERING TO GET THEM ESTABLISHED.**

**WATERING SCHEDULE to get perennials well estabished**

The frequency should be adjusted based on the soil type and weather, but the soil must never be allowed to dry out completely in the first few months.

The key is deep, less frequent watering to promote strong, deep roots.

- **Weeks 1-2 (Initial Establishment):** Water daily to help the plant settle in and recover from transplant shock. Ensure the entire root ball is saturated.
- **Weeks 3-12 (Root Development):** Gradually reduce frequency to every 2-3 days. The top inch or two of soil should be allowed to dry slightly between waterings. This encourages roots to grow deeper in search of moisture.
- **Month 3 - First Year (Tapering Off):** Water deeply about once a week, or as needed during dry spells. Aim for about 1 inch of water per week from rain or irrigation.

**Second Growing Season (Established):** Perennials are considered established after the first year. They should now be more drought-tolerant. Continue supplemental weekly watering during prolonged hot, dry periods.

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**WATERING SCHEDULE FOR UNAMENDED SANDY SOIL (NEW PLANTS)**
The frequency should be adjusted based on the weather, but the soil must never be allowed to dry out completely in the first few months.

| Time After Planting | Perennials & Annuals | Shrubs |
|---|---|---|
| **Weeks 1-2** | Daily, potentially twice daily in hot/sunny weather* | Daily |
| **Weeks 3-12** | Every 1-2 days | Every 2-3 days |
| **Month 3 - First Year** | Every 2-3 days during dry periods | Twice a week during dry periods |
| **Second Year** | Twice a week during dry periods | Weekly during dry periods |

***FOR UNAMENDED SANDY SOIL**

- **Frequency Over Volume (Initially):** Unlike watering in richer soils, a "frequent, light watering" strategy is more effective in unamended sandy soil to keep the top layers (where the new roots are) consistently moist without excessive leaching.
- **Monitor Constantly:** The best indicator is the **finger test**. Check the soil moisture daily for small plants and every few days for shrubs at the root zone (2-3 inches for annuals/perennials, 6-8 inches for shrubs). If it feels dry, water immediately.
- **Water at the Right Time:** Water in the early morning to minimize water loss from evaporation and allow maximum absorption time.

**WHAT IS YOUR HARDINESS ZONE?** We are zone 6b to 7b (- 5°F to 10°F). For containers/planters - for plants to come back they **must be hardy to Zone 5 or lower (2 HARDINESS ZONES colder than Zone 7) to overwinter.**

**CHOOSE THE RIGHT PLANT FOR THE RIGHT SPOT BY READING PLANT LABELS:**

- Light requirement
- Moisture needs
- Mature height
- Mature width

**PLANTING** -To ensure a successful garden, at planting time, make sure all plants that are rootbound have their root-system corrected (cut/spread out), if needed, and are well watered as needed to get them well established. **MULCH** with **ORGANIC MATTER** to keep weeds down while retaining moisture in the soil and nourishing the soil/plants. **Use 2 to 3" around the plants making sure the mulch doesn't touch plants**

**Use SMART watering practices**

- Purchase DROUGHT TOLERANT plants that have become established
- Water less frequently, but for longer periods
- Water in the morning
- Soaker hoses and drip irrigation are typically the most efficient

General rule of thumb - apply 1"- 2" of water a week (Take into consideration natural rainfall)

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**DROUGHT TOLERANT PLANTS FOR DRY SHADE – the most difficult**
*Ajuga reptans* 'Chocolate Chip' (Bugleweed) Evegreen, deer resistant, salt tolerant
*Astilbe chinensis* 'Amber Moon' (False Spirea) deer resistant, salt tolerant
*Astilbe chinensis var. pumila* (False Spirea) deer resistant, salt tolerant
*Athyrium niponicum var. pictum* (Japanese Painted Fern) deer resistant
FERNS - *Osmunda regalis* (Royal Fern) NJ, *Dryopteris filix-mas* (Male Fern), *Matteuccia struthiopteris* (Ostrich Fern) NJ, *Adiantum pedatum* (Northern Maidenhair Fern) NJ, *Dryopteris celsa* (Log Fern) NJ, *Athyrium filix-femina* (Lady Fern) NJ all are deer resistant
*Epimedium* (Barrenwort, Fairy Wings, Bishop's Hat) deer resistant
*Euphorbia amygldaloides var.robbiae* (Wood Spurge) deer resistant
*Eurybia divaricata* (White Wood Aster) NJ Native, larval host, KEYSTONE PLANT, deer resistant
*Geranium macrorrhizum* 'Bevan's Variety' (Big Foot Cranesbill) deer resistant, salt tolerant
*Geranium macrorrhizum* 'Ingwersen's Variety' (Cranesbill) deer resistant, salt tolerant
*Helleborus* spp. (Hellebore) deer resistant, salt tolerant
*Helleborus foetidus* (Stinking Hellebore) deer resistant, salt tolerant
*Helleborus orientalis* (Lenten Rose) deer resistant, salt tolerant
*Helleborus niger* (Christmas Rose) deer resistant, salt tolerant
*Heuchera* spp. *and hybrids* (Coral Bells) deer resistant, salt tolerant
*Heuchera villosa* 'Citronelle' (Coral Bells) deer resistant, salt tolerant
*Heuchera villosa* 'Caramel' (Coral Bells) deer resistant, salt tolerant
*Hosta spp.* (Plantain Lily) salt tolerant
*Lamium maculatum* spp. (Deadnettle) deer resistant, salt tolerant
*Liriope spp.* (Lilyturf) deer resistant, salt tolerant
*Liriope spicata* (Creeping Lilyturf) deer resistant, salt tolerant
*Liriope muscari* 'Variegata' (Lilyturf) deer resistant, salt tolerant
*Stylophorum diphyllum* (Celadine Poppy, Wood Poppy) U.S. Native, deer resistant
*Tiarella cordifolia* (Allegheny Foamflower) NJ Native, larval host, deer resistant

**DROUGHT TOLERANT SHRUBS FOR SHADE**
*Aucuba japonica* 'Variegata' (Japanese Laurel, Gold Dust Plant) salt tolerant
*Mahonia japonica bealei* (Grape Holly) deer resistant, salt tolerant
*Skimmia japonica* deer resistant, salt tolerant
*Vaccinium angustifolium* (Lowbush Blueberry) deer resistant, salt tolerant

**DROUGHT TOLERANT PLANTS FOR SUN**
*Achillea* spp. (Yarrow) deer resistant, salt tolerant
*Achillea millefolium* 'Sumer Pastel Mix'(Yarrow) Can be an AGGRESSIVE spreader
*Achillea* 'Coronation Gold' (Yarrow) deer resistant, salt tolerant
*Achillea x* 'Little Moonshine'(Yarrow) deer resistant, salt tolerant
*Aquilegia canadensis* (Columbine) deer resistant, salt tolerant
*Armeria maritima* 'Spendens' (Sea Thrift) deer resistant, salt tolerant
*Artemisia ludoviciana* 'Valerie Finnis' (Wormwood) deer resistant, salt tolerant
*Artemisia schmidtiana* 'Silver Mound' (Wormwood) deer resistant, salt tolerant
*Artemisia* x 'Powis Castle' (Wormwood) deer resistant, salt tolerant
*Asclepias tuberosa* (Butterfly Weed) deer resistant, salt tolerant
*Baptisia australis* (False Indigo) deer resistant, salt tolerant
*Calamintha nepeta* (Calamint) deer resistant, salt tolerant
*Calamintha nepeta* 'Marvelette Blue' (Calamint) deer resistant, salt tolerant
*Calamintha nepeta* 'White Cloud' (Calamint) deer resistant, salt tolerant

*Callirhoe involucrata* (Poppy Mallow, Wine Cups) U.S. Native, Larval host
*Coreopsis grandiflora* 'Early Sunrise' (Tickseed) salt tolerant
*Coreopsis verticillata* 'Moonbeam' (Threadleaf Tickseed) deer resistant, salt tolerant
*Coreopsis verticillata* 'Zagreb' (Threadleaf Tickseed) deer resistant, salt tolerant
*Delosperma cooperi* (Ice Plant) deer resistant, salt tolerant
*Echinacea purpurea* (Purple Coneflower) deer resistant, salt tolerant
*Echinops ritro* (Globe Thistle) deer resistant, salt tolerant
*Eryngium alpinum* 'Blue Glitter' (Sea Holly) deer resistant, salt tolerant
*Eryngium alpinum* 'Blue Star' (Sea Holly) deer resistant, salt tolerant
*Eryngium yuccifolium* (Rattlesnake Master) deer resistant, salt tolerant
*Euphorbia x martinii* 'Ascot Rainbow' (Flowering Spurge) deer resistant, salt tolerant
*Gaillardia* spp. (Blanket Flower) deer resistant, salt tolerant
*Gaillardia* 'Arizona Red Shades' (Blanket Flower) deer resistant, salt tolerant
*Gaillardia* 'Arizona Sun' (Blanket Flower) deer resistant, salt tolerant
*Gaillardia* 'Arizona Apricot' (Blanket Flower) deer resistant, salt tolerant
*Gaillardia* 'Arizona Red Shades' (Blanket Flower) deer resistant, salt tolerant
*Hemerocallis* spp. (Daylily) salt tolerant
*Hylotelephium telephium* 'Autumn Joy'(Stonecrop) deer resistant, salt tolerant
*Hylotelephium telephium* 'Matrona'(Stonecrop) deer resistant, salt tolerant
*Iberis sempervirens* 'Autumn Beauty' (Candytuft) deer resistant, salt tolerant
*Iris germanica* (Bearded Iris) deer resistant, salt tolerant
*Iris germanica* 'Immortality' (Bearded Iris) rebloomer, deer resistant, salt tolerant
*Kniphofia uvaria* (Red Hot Poker) deer resistant, salt tolerant
*Kniphofia uvaria* 'Alcazar' (Red Hot Poker) deer resistant, salt tolerant
*Lavandula x intermedia* 'Phenomenal' (Lavender) deer resistant, salt tolerant
*Liatris spicata* 'Kobold' (Blazing Stars, Gay Feather) deer resistant, salt tolerant
*Lychnis coronaria* (Rose Campion) deer resistant, salt tolerant
*Nepeta* 'Walker's Low' (Catmint) deer resistant, salt tolerant
*Phlox subulata* (Moss Phlox, Moss Pinks) deer resistant, salt tolerant
*Pycnanthemum muticum* (Mountain Mint) deer resistant
*Rudbeckia deamii* 'American Gold Rush' (Black-eyed Susan) deer resistant, salt tolerant
*Salvia* spp. (Meadow Sage) deer resistant, salt tolerant
*Salvia yangii* 'Little Spire' (Russian Sage) deer resistant, salt tolerant
*Sedum reflexum* 'Blue Spruce' (Stonecrop) deer resistant, salt tolerant
*Sedum rupestre* 'Angelina' (Stonecrop) deer resistant, salt tolerant
*Sempervivum* spp. (Hens & Chicks) deer resistant, salt tolerant
*Solidago rugosa* 'Fireworks' (Goldenrod) deer resistant, salt tolerant
*Solidago sempervirens* (Stiff Goldenrod) deer resistant, salt tolerant
*Stachys byzantine* 'Silver Carpet' (Lamb's Ears) deer resistant, salt tolerant
*Symphyotrichum oblongifolium* 'October Skies' (Aromatic Aster) deer resistant, salt tolerant
*Symphyotrichum oblongifolium* 'Raydon's Favorite' (Aromatic Aster) deer resistant, salt tolerant
*Verbena bonariensis* (Brazilian Verbena) deer resistant, salt tolerant
*Yucca filamentosa* (Adam's Needle) deer resistant, salt tolerant
*Yucca filamentosa* 'Color Guard' (Adam's Needle) deer resistant, salt tolerant
ORNAMENTAL GRASSES Multi-seasons of interest, deer resistant, most are salt tolerant

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**SHRUBS**
*Prunus maritima* (Beach Plum) deer resistant, salt tolerant
*Itea virginica* 'Henry's Garnet' (Virginia Sweetspire) deer resistant
*Kerria japonica* 'Pleniflora' (Easter Rose)
*Picea pungens* 'Globosa' (Dwarf Globe Blue Spruce) deer resistant, salt tolerant

**PLANTS TO AVOID THUGS to AVOID (in alphabetical order) because they are INVASIVE and VERY HARD to eliminate!!!**
*Aegopodium podagraria* 'Variegata' (Bishop's Goutweed), *Chasmanthium latifolium* (Northern Sea Oats), *Covallaria majalis* (Lily-of the-Valley), *Hedera helix* (English Ivy), *Houttuynia cordata* (Chameleon plant), *Lamiastrum galeobdolon* (Yellow Archangel), *Lysimachia punctata* (Yellow Loosestrife), *Lysimachia ciliata* 'Purpurea' (Fringed Loosestrife), *Lysimachia clethroides* (Gooseneck Loosestrife), *Lythrum salicaria* (Purple Loosestrife), *Pennisetum alopecuroides* 'Moudry' (Black Fountain Grass), *Phalaris arundinacea* (Ribbon Grass), *Physalis alkekengi* (Chinese Lantern), *Physostegia virginiana* (Obedient Plant) NJ native, *Vinca Minor* (Periwinkle Plant)
*Miscanthus sinensis* (Maiden Grass, Japanese Silver Grass)

**ONLINE INFO:**
Chicago Botanic Garden http://www.chicagobotanic.org
Mt. Cuba www.mtcubacenter.org
Jersey-Friendly Yards Plant Database www.jerseyyards.org
Missouri Botanical Garden https://www.missouribotanicalgarden.org/plantfinder/plantfindersearch.aspx
Brooklyn Botanic Garden https://www.bbg.org
The New York Botanical Garden https://www.nybg.org
https://www.google.com type in plant name and rely on site links ending in .edu and .org
Most .com sites are commercial entities selling plants.

**A FEW GARDENS TO VISIT:**
Longwood Gardens - 1001 Longwood Rd, Kennett Square, PA 19348 https://www.longwoodgardens.org/
Brooklyn Botanic Garden - 1000 Washington Ave, Brooklyn, NY 11238 https://www.bbg.org/
The New York Botanical Garden - 2900 Southern Blvd, Bronx, NY 10458 https://www.nybg.org/
The High Line - Park-level access is also available at 30th Street at Hudson Yards. The Western Rail Yards between 30th and 34th Streets and 11th Avenue and the West Side Highway are currently closed for the season. https://www.thehighline.org/
Wave Hill Public Garden & Cultural Center - 4900 Independence Ave, Bronx, NY 10471 https://www.wavehill.org
Bowman's Hill Wildflower Preserve 1635 River Rd, New Hope, PA 18938http://www.bhwp.org/
Mt. Cuba Center 3120 Barley Mill Road, Hockessin, DE 19707http://www.mtcubacenter.org/