Herbaceous Perennials
Hardiness

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Hardiness variables: temperature

- acclimation
- deacclimation
- date of freeze
- freeze duration
- cycling temperatures (fall, spring)
- rate of thawing
Hardiness variables:
culture and crop

- established (older) vs new plants
- moisture/watering
- fertility effects
- species/ cultivar
Hardiness variables

acclimation-- effects

- **fall**: more cold (earlier, deeper) may harden less hardy species, more hardy species may not benefit

- **winter**: more than 2 days just below freezing (28°F/-2°C), prior to lower temperatures, may be harmful
Hardiness variables deacclimation-- effects

- warm (55-65F/12-18C) for as little as 3 to 5 days midwinter can deacclimate
- back down to 39-41F (4-5C) at night doesn’t help
- no differences 34 F (1C), 40F (4.5C) and 28-41F (-2 to 5C)
- more effect at lower subsequent freezing temperatures, e.g.
  - 18F/-8C and below Sedum, Shasta Daisy
  - 12F/-11C and below Salvia
Hardiness variables

date of freezing

- plants not hardened by early fall
- some may be hardened sufficiently by November (depends on other temperature variables)
- most have maximum hardiness by December or January
- may begin to lose hardiness (deacclimation) by late February
Hardiness variables

freeze duration

- longer durations, especially at lower temperatures, may be more harmful
- less regrowth from 24-48 hours at each low temperature vs 1/2 or 2 hrs
- no differences between 1/2 and 2 hrs
Hardiness variables

**cycling temperatures**

- fluctuating above and below freezing
  - cycle=2 hrs each temp., near freezing
- hardy species: cycling may have no benefit
- less hardy species: more than one cycle may be harmful
  - more likely in late winter, early spring
Hardiness variables

**cycling temperature ranges**

- cycling 26/38F (-3/3C) may result in more hardiness than constant 38-40F
- more injury is likely at wide cycling such as 18/47F (-8/8C)
- few differences among 1, 2, 3 cycles
- duration at each temperature (1 vs 3 days) is not as crucial as temperature
Hardiness variables

rate of thawing

• from target freezing temperatures
  - 28, 23, 18, 12, 7 °F (-2, -5, -8, -11, -14 °C)
• rapid thaw--direct to 39-41F/4-5C greenhouse
• slow thaw--allow soil to return to 28F (-2 C), hold, then to greenhouse
• often rapid thaw had better growth, or no difference
Hardiness variables

older vs newer plants

• age reflection of vigor
• often more vigorous are more hardy, survive at lower temperatures, than older/rootbound or recent plugs
  – one-year old plants usually survive better than two-year old
  – Fall-potted, poorly-rooted often fail to survive low temperatures
Hardiness variables

**fertility effects**

- increased N levels and durations increased growth prior to, and after, freezing
  - best regrowth usually from Controlled Release Fertilizer
- no effect on freezing regrowth (hardiness survival), at all freezing temperatures, from levels or durations
  - different from woody plants
Fertility dates -- Karmina geranium

end: Sep 1

Oct 1

weekly 20-10-20

28F  21F  18F  12F  7F
Fertility types--Karmina geranium

20-10-20
end 10/1

Osmocote
15-9-9,
5-6 mo.

28F  21F  18F  12F  7F
Hardiness variables
moisture/watering effects

• On cultivars studied (6 genera/cultivars), soil moisture caused no differences in hardiness
  – wet 40%+ moisture, dry 10% or less
• moisture did affect growth
Species/cultivar hardiness
field trials
Vermont field trials

- 75+ new perennials per year
- 100-200 perennials in field from 8+ national/international firms
- USDA zone 4b (-20 to -25F/-29 to -32C average minimum air temperature)
- Stony loam soil
- Watering only to establish
- Compost, 5-3-4 fertilizer in spring
Genera field trials

Coneflowers (*Echinacea*)
60 cultivars (more in 2012)

Coralbells (*Heuchera*)
90 cultivars
National Ornamental Grass Trials

One of 12 U.S. sites, 2012-2016

Switchgrass (*Panicum)*
19 cultivars

Little Bluestem (*Schizachyrium*)
6 cultivars
Conclusions, to date

- Avoid low temperatures (below 28 to 23°F/ -2 to -5°C) early (before December) or late (after mid February), if possible
- Avoid widely cycling temperatures above and below freezing (such as 18/47°F (-8/8°C), especially early and late in the season
...conclusions

- The less time at very cold temperatures for less hardy species, the better (less than 24 hours, even below 28 to 23F/ -2 to -5C )
- The sooner very low soil temperatures can be warmed, the better
...conclusions

- Ideal temperatures to hold plants are 28 to 41°F/-2 to 5°C
- Try to avoid temperatures on warm days reaching (55-65°F/12-18°C) for 3 days or more (less is better, particularly for less hardy species)
...conclusions

- Keep plants well-fertilized in fall
- Keep plants watered as appropriate to the species
- Poorly rooted (potted too soon prior to cold), or overly rooted/rootbound, plants are more susceptible to cold
- Group species/cultivars by hardiness
for more information...

Perry’s Perennial Pages
perrysperennials.info

Research
Plants of the month
Leaflets and articles
Book Reviews
Videos
Resources and more...
Appreciation is expressed to the following plant introduction firms

- Ball Horticulture
- Blooms of Bressingham
- Danzinger
- McGregor Plants
- Plant Haven
- Plants Nouveau
- Pleasant View Gardens (PW/PS)
- Terra Nova
Appreciation is expressed to many growers for support or plants, including:

- Aris Horticulture
- Creek Hill
- Dunvegan
- Full Circle Gardens
- North Creek
- Quansett
- Sunny Border
Appreciation is expressed to the following for assistance with funding

- New England Grows
- Northeast Greenhouse Conference
- New Hampshire Hort. Endowment
- Perennial Plant Association
- USDA Risk Management Agency
- Vt. Agr. Expmt. Station
Two grower meetings (Massachusetts) for 2012

Boston, July 4-10, 2012
www.perennialplant.org

Worcester, Nov. 7-8, 2012, negreenhouse.org