The fluctuation of the wet spring of 2010 to the severe drought in the fall and now a long cold winter may result in poor hay and pasture stands this spring. Plants may be killed or weakened, leaving barren areas in the fields or thinning of the stand from last fall, depending on the severity of the drought and harvest management last fall.

Accurate assessment of forage stands for winter injury is an important and economically sound management practice. The degree of injury will vary depending on a number of climatic and cultural factors.

- **Weather factors**
  Exposure of plants to extreme low temperatures.
  Continued exposure of legumes to temperatures of 0ºF to 15ºF will result in plant loss. Under these conditions, plant survival depends upon the genetic cold tolerance of the variety, the insulating properties of the soil, vegetative cover and snow cover.
- **Heaving of plants from wet soils during alternate freeze and thaw.**
  The heaved root and crown tissue is exposed to lethal air temperatures. The more branched rooted legumes are less susceptible to heaving compared to tap-rooted ones. Sod-forming grasses are the least susceptible to heaving and help hold legumes in place. Selecting or providing soils with good surface drainage can reduce the occurrence of heaving.
- **Smothering of plants by ice sheets.**
  Smothering of alfalfa may cause injury within one to three weeks, and death within two to six weeks. Red clover and white clover have tolerance to smothering that is similar to alfalfa. Grasses are more tolerant than legumes to smothering and can withstand injury for up to 10 to 14 weeks. Leaving six to eight inches of vegetative stubble in the fall can help reduce the occurrence of ice sheet formation.
- **Mid-winter wake up**
  Plants that have broken dormancy during warm periods use some of their carbohydrate and nitrogen reserves during this premature regrowth attempt, leaving the plants with a reduced level of cold hardiness and less reserves available for continued survival during the rest of the winter and for spring regrowth. This factor has killed more legume and grass stands than any other weather conditions mentioned above. This is also the most common winter injury in the nidwest.

Cultural factors

the forage grower has little control over the weather, but a number of cultural practices can be done to reduce the severity of winter injury.

- Injury is more likely to occur on forages with low winter hardiness ratings.
- Disease resistance is also very important in stand persistence and may partially contribute to winter hardiness. Plants weakened by disease are less resilient and more susceptible to winter injury.
- Young stands are less susceptible to winter injury than old stands. Old plants are more likely to be infected with root and crown diseases, and stand loss is apt to be more serious because old stands generally have fewer plants per unit area than young stands.
- Injury is less severe where a grass is present. **Grass reduces heaving of legumes** and helps catch snow and provide insulation to crowns.
- Injury occurs more frequently where fall cutting or overgrazing is practiced. Fall cutting or grazing may not allow for accumulation of adequate carbohydrate reserves for the winter or leave stubble to catch snow.
- Injury is generally less severe where a good annual soil fertility program is followed. The only exception would be fall-applied nitrogen on grasses that would encourage vegetative growth when the plant should be going dormant. Don't leave over 8 inches of growth, as grasses with this much fall/winter growth will lodge and smother themselves out. .Grasses should have had 3 to 6 inches of leaf growth going into winter.

Stand Renovation

Hay Stands

- Young stands of alfalfa (within 12 to 15 months of the original planting) probably have not developed a high enough level of autotoxicity in the soil to interfere with reseeding. So reseeding with alfalfa is a good option.
- Older stands with less than 25 percent of the plants remaining may be interceded with red clover, and or short term grass such as Perun or Lofa Festulolium or Green Spirit Italian Ryegrass, if the stand will be maintained for hay harvest for only one to two more years. . It usually is recommended to destroy these stands and rotate to a different crop.
- Older stands with 25 to 50 percent of the plants remaining in the stand, interceding red clover or a grass into a uniformly thin stand of alfalfa may be beneficial.
- Alfalfa stands thinned mainly by disease should be rotated to an alternative crop for a year or more, or seeded to a grass-based forage mixture to decrease the level of disease organisms in the soil.

Pastures

- In a square foot area when grasses are 3 to 6 inches tall, you should not see more than 20% soil. Check this in multiple locations with in the same field.
- If the injured stand is to be grazed in spring, graze conservatively to let the stand recover before turning livestock onto pastures unchecked.
- Thin grass based pastures can be inter seeded at any time in the stands life with other grasses and clovers.
- Fertilization and weed control of the existing injured stand may be sufficient in improving the pasture to meet grower needs.
- A more productive grass and/or legume may be added to a thinned pasture or injured area. For more severely damaged pastures, consider no-till renovation on

erodible land or complete renovation of the stand where erosion potential is minimal.

The photo above shows a comparison of a healthy (l) and diseased (r) alfalfa crown. Inspection of the crowns in the fall and again in early spring will give an indication of the health of the stand.

White Healthy Root

Crown Rot Complex