**Plant Nutritive Value**

**Based on the most limiting nutrients on rangelands in the western U.S.**

* Energy
  + Structural carbohydrates (e.g., cellulose)
  + Sugars & starch
  + Fats (to a limited degree, but important for birds and rodents).
* Nutrients –
  + Protein - Nitrogenous compounds
  + Phosphorus = generally most limiting mineral on rangelands
  + Vitamins = Carotene or Vitamin A

**The 3 major factors determining nutritive value in plants:**

* Cell structure: (Ration of Cell Wall to Contents)
* Degree of Lignifications
* Secondary Compounds or “Anti-quality” factors

**Cell structure: (Wall:Contents)**

**Degree of Lignification**

* Lignin - indigestible portions of cell walls that impregnates cellulose to form wood.

**Secondary Compounds or “Anti-quality” factors**

* Plants may contain compounds or toxins that reduce forage quality or adversely affect the herbivore

**Comparative Nutritive Value of Plant Parts**

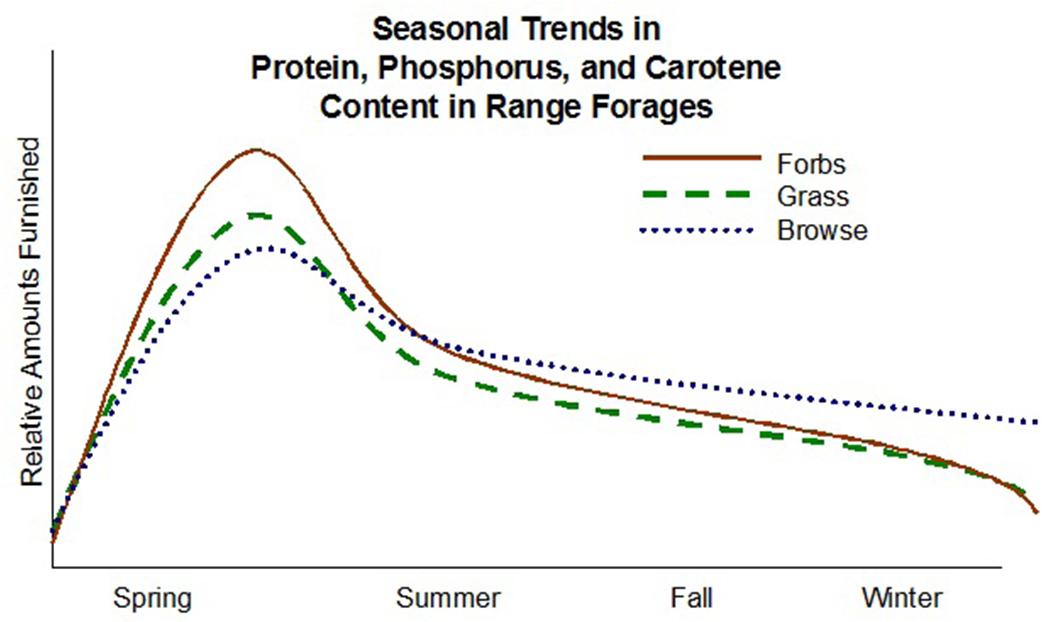
* Fruits, seeds, root-crowns and flowers generally have higher levels of cell contents (cell solubles) and are therefore more nutritious than leaves or stems.
  + Seeds also contain significant levels of fats
* Leaves are more nutritious than stems. Why?
  + More cell contents
  + Less structural CHO's
* In shrubs, current seasons growth is generally more nutritious than old growth. Why?
  + A
* What is browse?
  + The portion of shrubs used for forage. Generally, leaves & current seasons twigs.

stem age they become LIGNIFIED

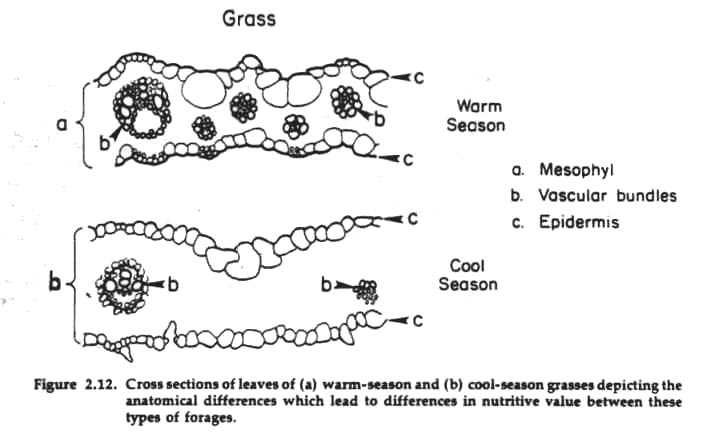
**Maturation Effects on Nutritive Quality:**

* Most range plants are highly nutritious when young. Even plants that are normally considered undesirable (such as cheatgrass) are nutritious when young.
* As plants mature nutritive value decreases.
  + Increased structural CHO's
  + Lignification
  + Increasing Stem:Leaf Ratio
  + Leaching of nutrients by rain in dormancy.
  + Leaching is when rain washes soluble nutrients out of the plant into the soil. Plants that
  + resist leaching due to dry climate, morphology, or range site are said to "cure" well.

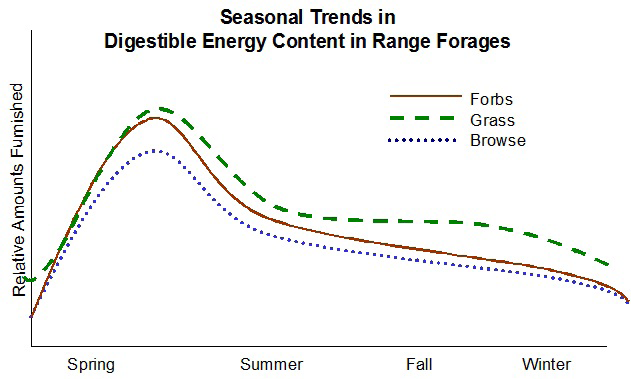
**Comparative Nutritive Value of Grasses, Forbs, and Shrubs**

* During growing season - forbs are more nutritious than grasses (which are more nutritious than shrubs).
* This is because the cell wall of grasses is thicker than the cell wall of forbs.
* During dormant season - browse are important for nutrients.

**C3 (Cool Season) vs C4 (Warm Season) Grasses**

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**Comparative Nutritive Levels of Grasses, Forbs, and Shrubs**

* During growing season - grasses, forbs, and shrubs all provide good amounts of energy
* During dormant season - grasses provide a stable source of energy.

**Anti-quality Agents:**

* Most common in shrubs and forbs.
* Rarely a problem in grasses
* Inhibitors - may cause illness but also inhibit digestion
  + React with dietary proteins to form complexes resistant to microbial degradation.
  + Inhibit digestion inhibiting microbial growth.
* Toxins - cause illness or death (i.e., alkaloids)

**Recap:**

* Forbs are important sources of protein and carotene during the growing season.
* Shrubs are important to maintain phosphorus and protein levels in winter (dormant season).
* Grasses are important sources of energy (structural CHO's) throughout the year.
* Forbs and shrubs may contain anti-quality agents which decrease their nutritive value.