Plant Morphology

What a rangeland manager needs to know.

Integrated Rangeland Management

Type and Location of Meristems

Meristems & Buds = Areas with undifferentiated cells that can divide and develop cells for leaves, stems, roots, or seeds.

Three Types of Meristems:

- **Apical** or terminal - at the tips of shoots & roots
  - Responsible for growth of shoots and roots
- **Axillary** or lateral - along the sides
  - In axil of the leaf and stem just above the nodes
  - Responsible for growth of latera stems
- **Intercalary** – in the middle
  - Only in grasses
  - Responsible for expansion of leaf, sheath and internode

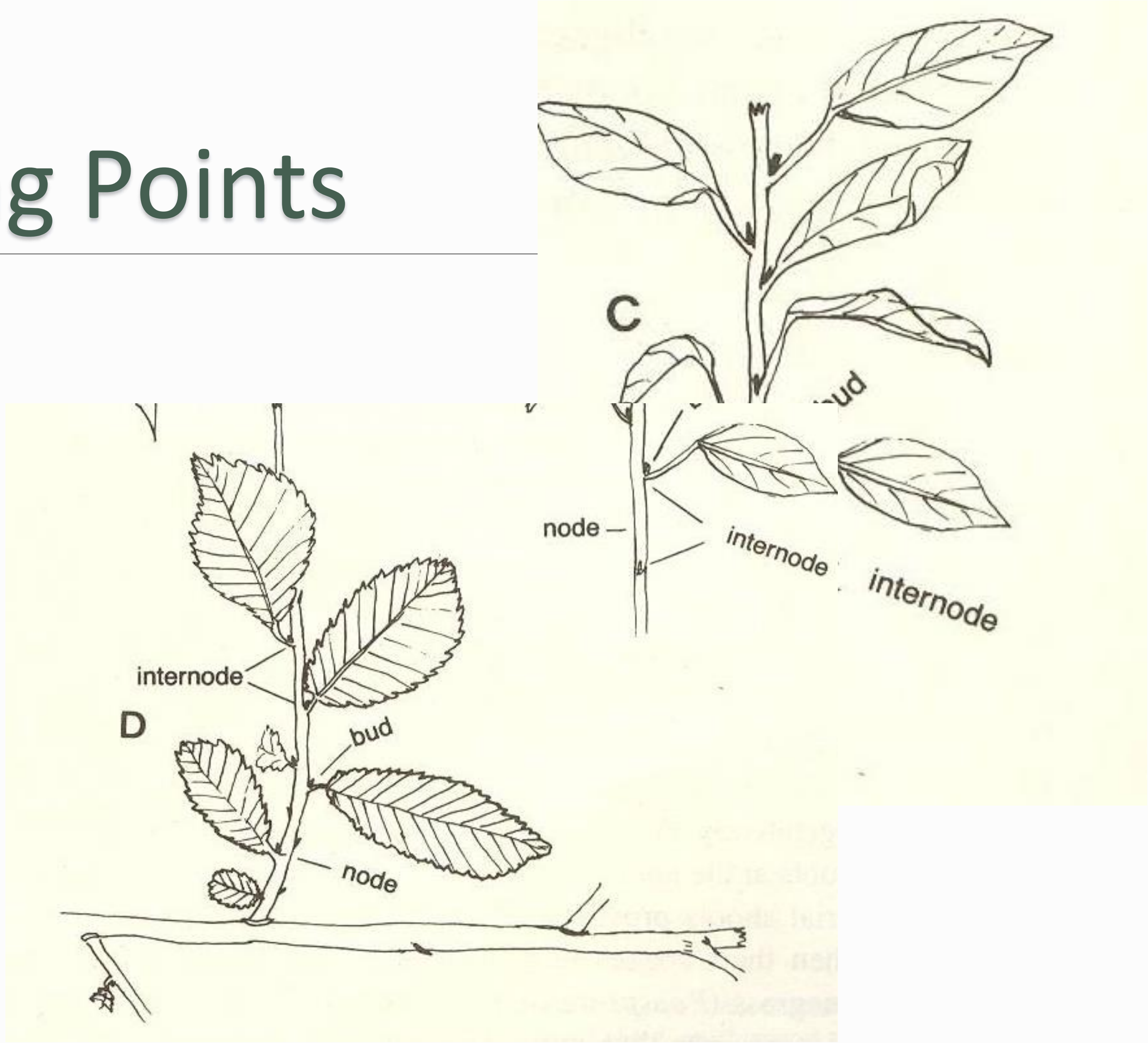
Forbs & Woody Plants

Meristems (or buds) - Three major types:

- **Apical**
  - Expand shoots and roots.
  - Become seed heads
- **Axillary** or lateral
  - Responsible for growth of the new stems.
- **Intercalary** meristems do not occur in flowering plants that are dicots
  - With a few exceptions like horsetail, *Equisetum*

Location of Growing Points

Forbs and shrubs initiate growth outermost points



Other Meristem Activity

- Lateral meristems form spines & thorns.

- Adventitious meristems:
  - Growth points not connected to the apical meristem.
  - Can give rise to new shoots or roots.

Apical Dominance over Axillary Buds

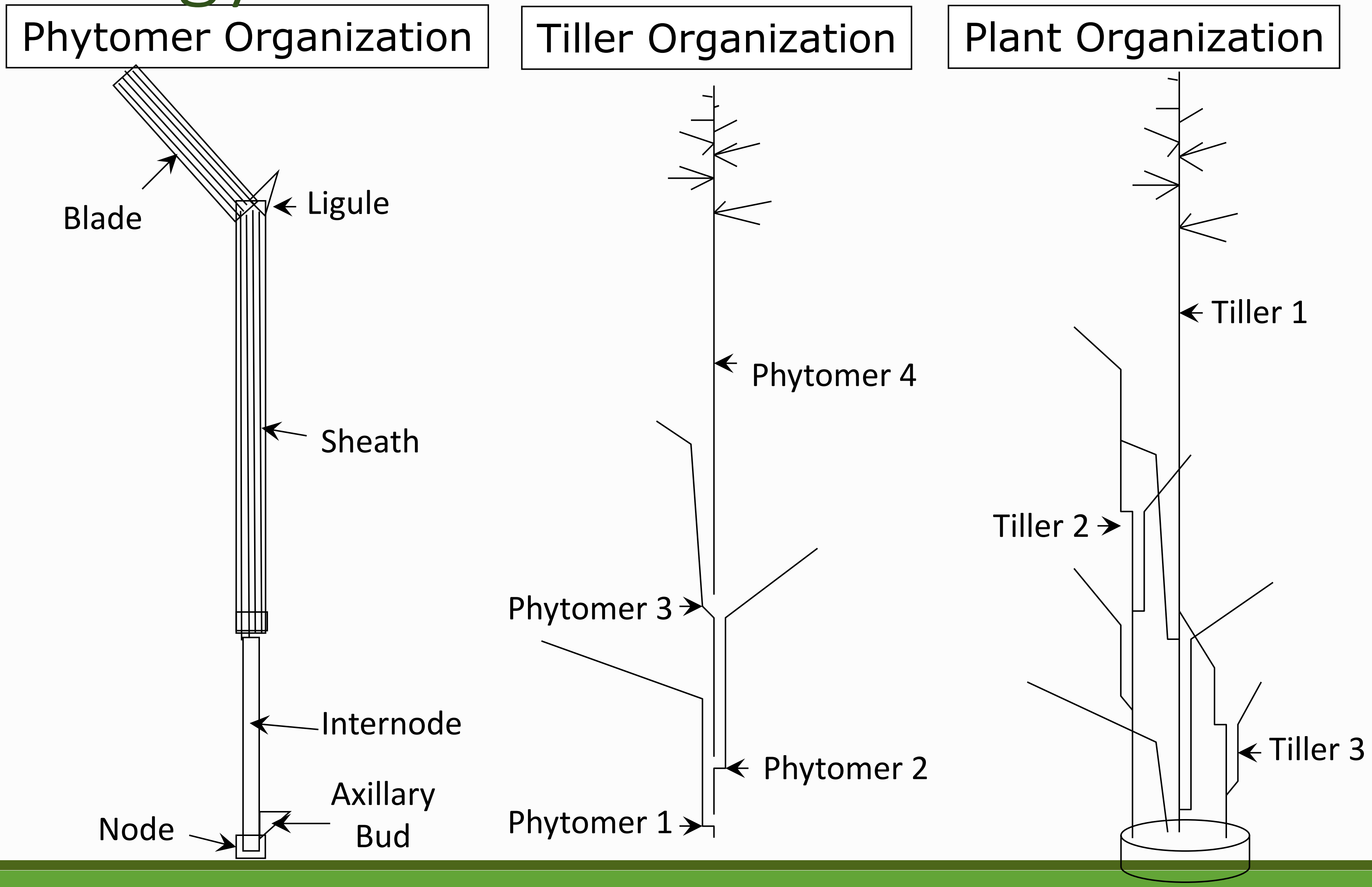
Apical meristem removed

Axillary buds will be stimulated to grow

Axillary buds become new apical buds for each stem

Meristems

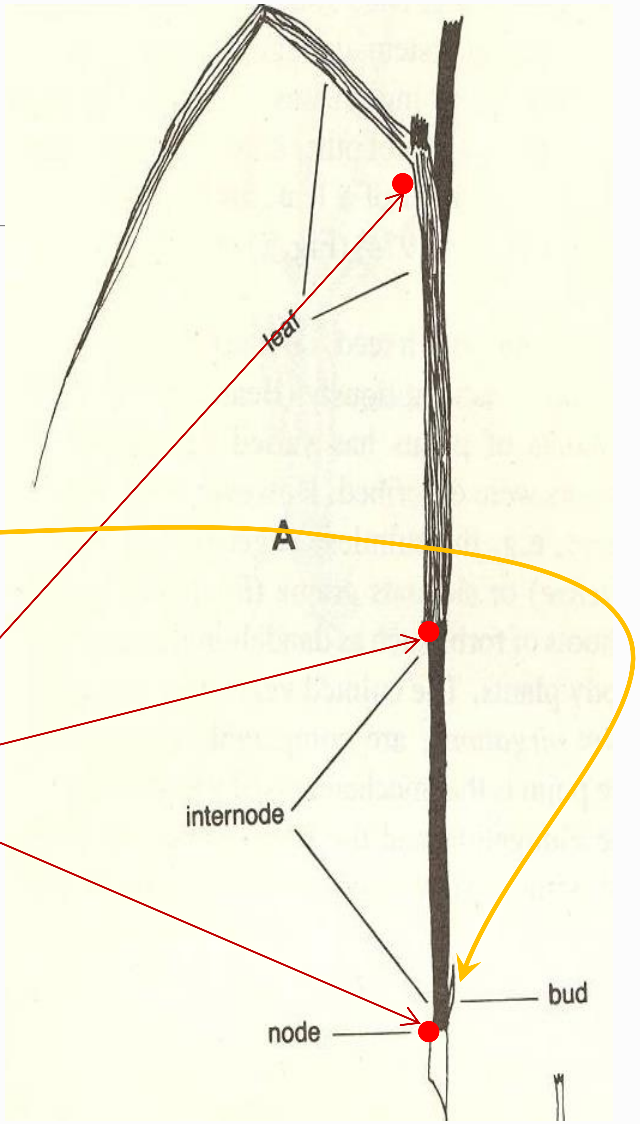
Grass Morphology



Grasses & Grass-like Plants

Meristems (or buds) - Three major types:

- **Apical** or terminal - at tip of shoot or tiller.
  - Growth and differentiation of tiller
- **Axillary** - located at the base of a phytomer, just above the node.
  - Growth of the new tillers
- **Intercalary** - base of leaf, sheath, and internode.
  - Responsible for growth of leaf, sheath, & internode

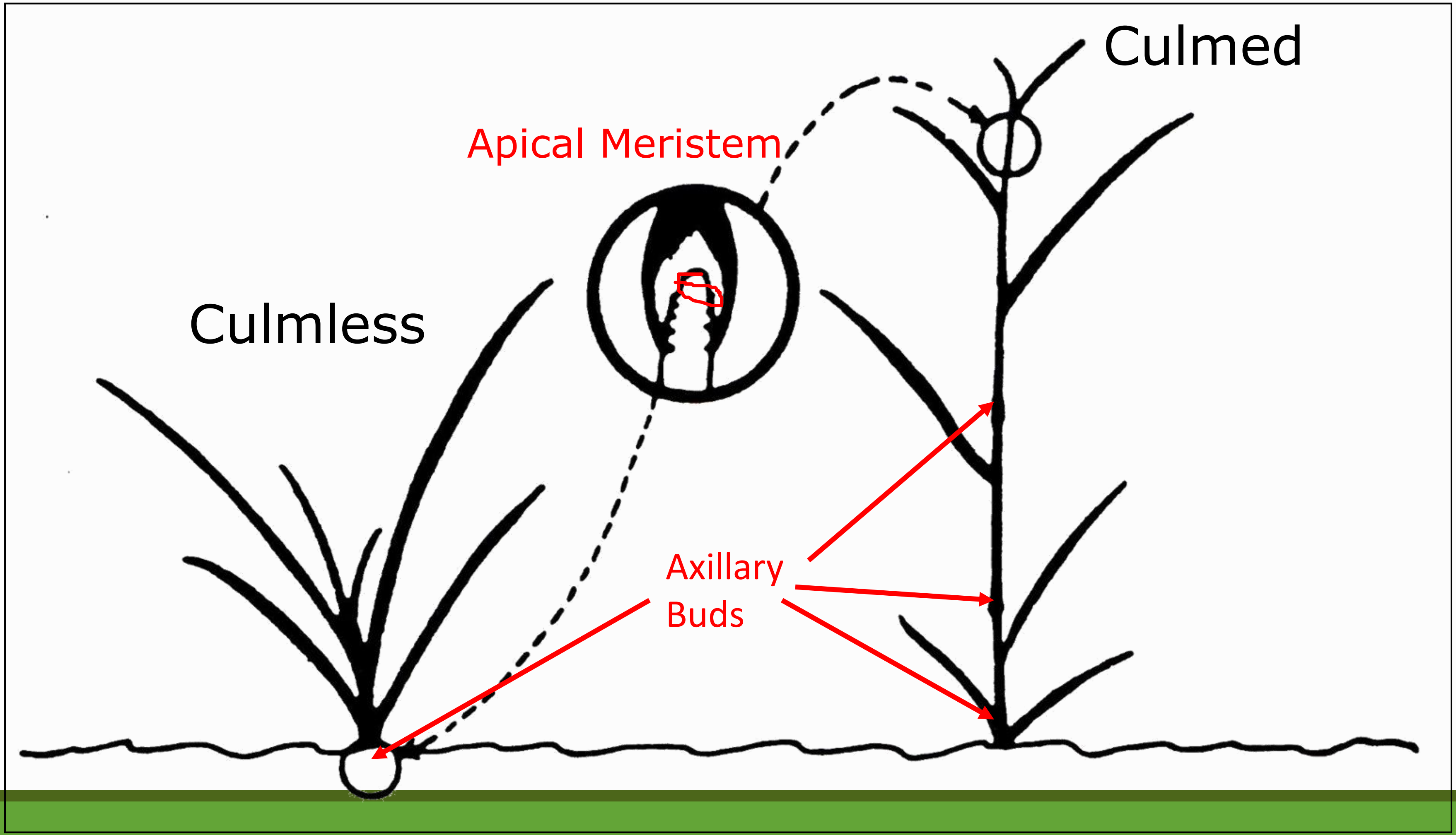


Apical and Axillary Buds

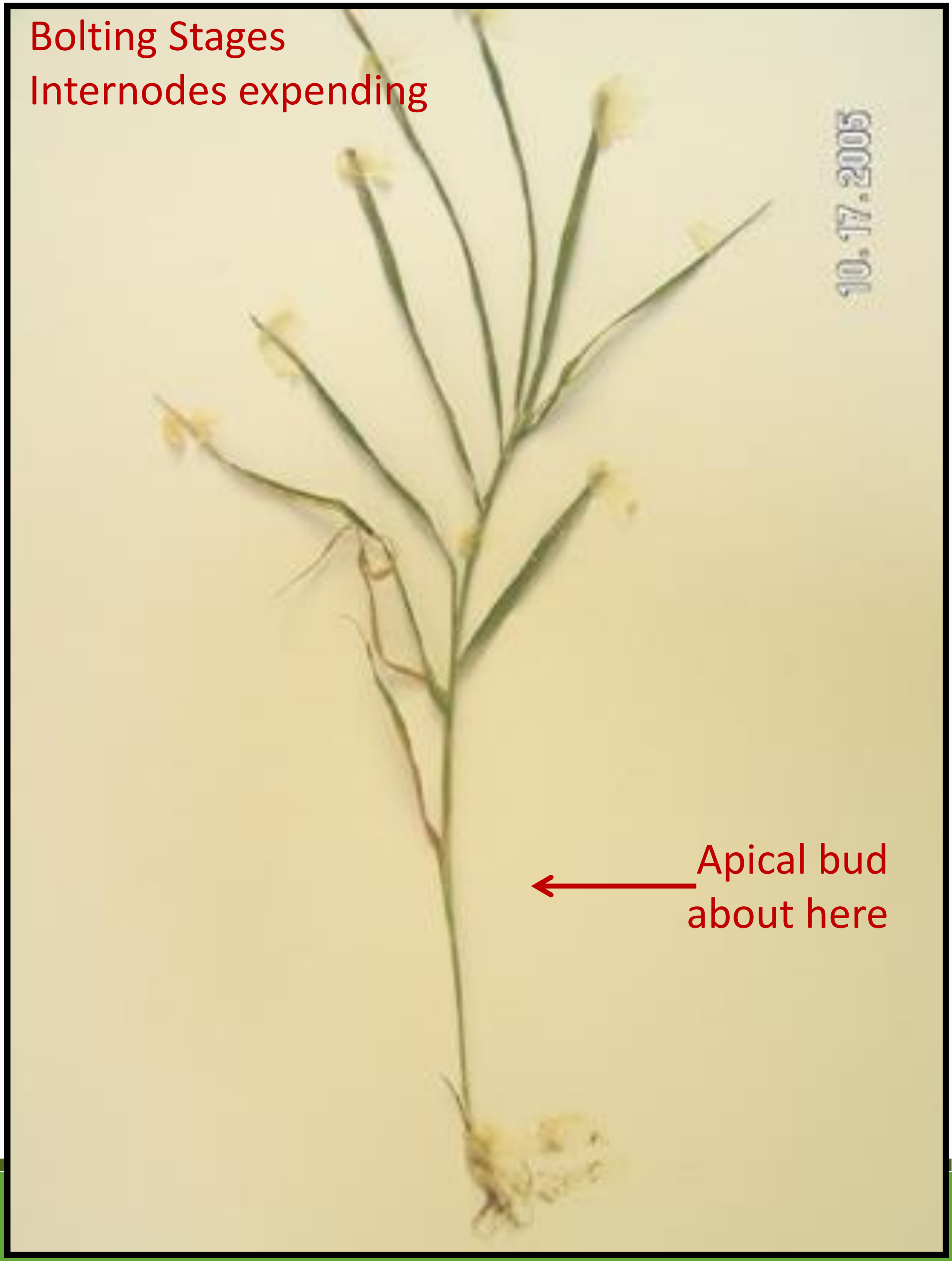
Apical Bud becomes Seed Head

Axillary Bud at base of Internode
Gives rise to new tillers

Location of Apical Meristem Matters

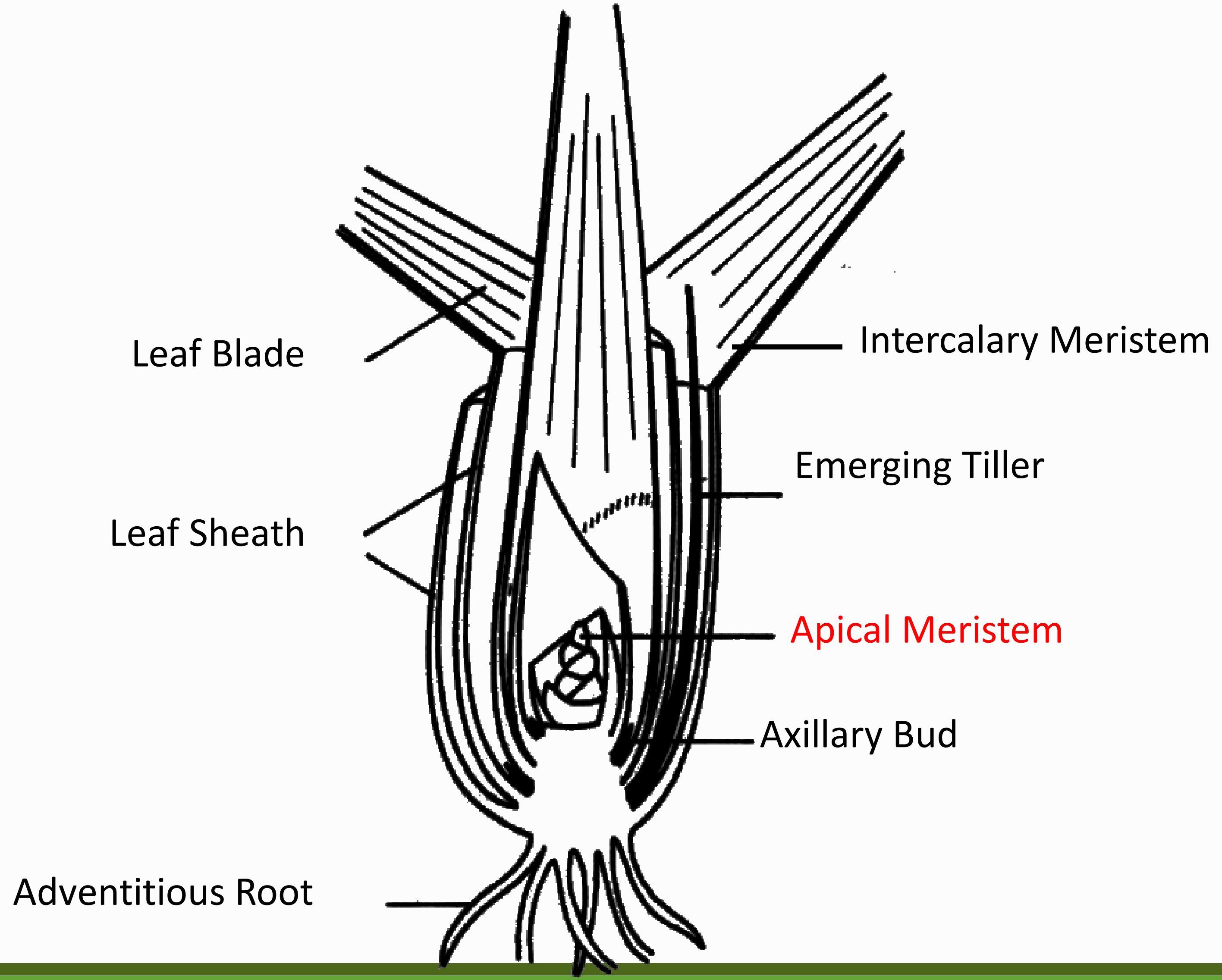


Bud =
Apical Meristem
+ premature phytomer




cm
Apical Meristems
in this area

Tiller Cross Section



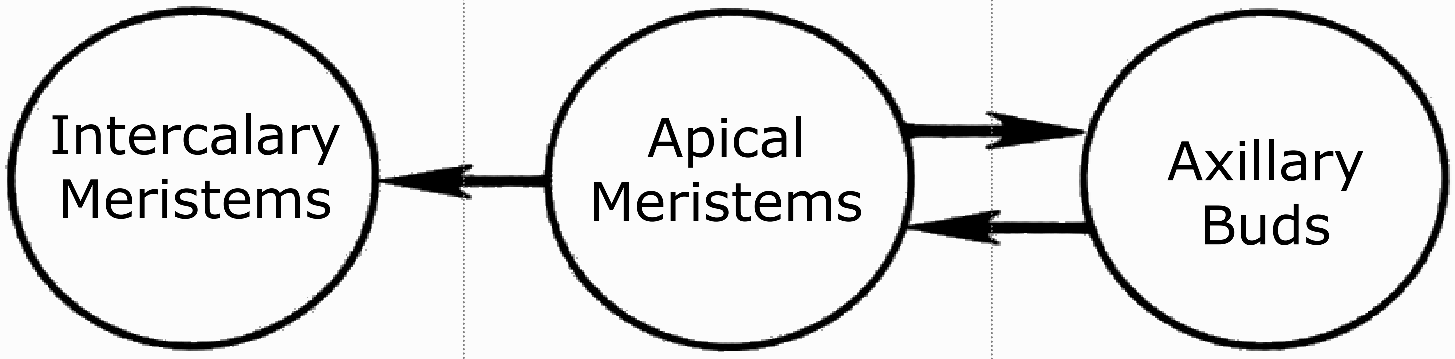

New Tiller
Overlapping Sheathes

Intercalary Meristems

- Strong and distinct in grasses.
- Regions at base of internode, sheath, and blade that produce new cells for expansion.
- Forbs and woody plants do not have intercalary meristems
  - New growth from apical meristems and existing cells
- *So what? Allows quick growth and recovery of grasses after defoliation.*

Meristematic Contribution to Grass Growth

Contribution to Biomass Production →



Hours | **Days** | **Weeks**

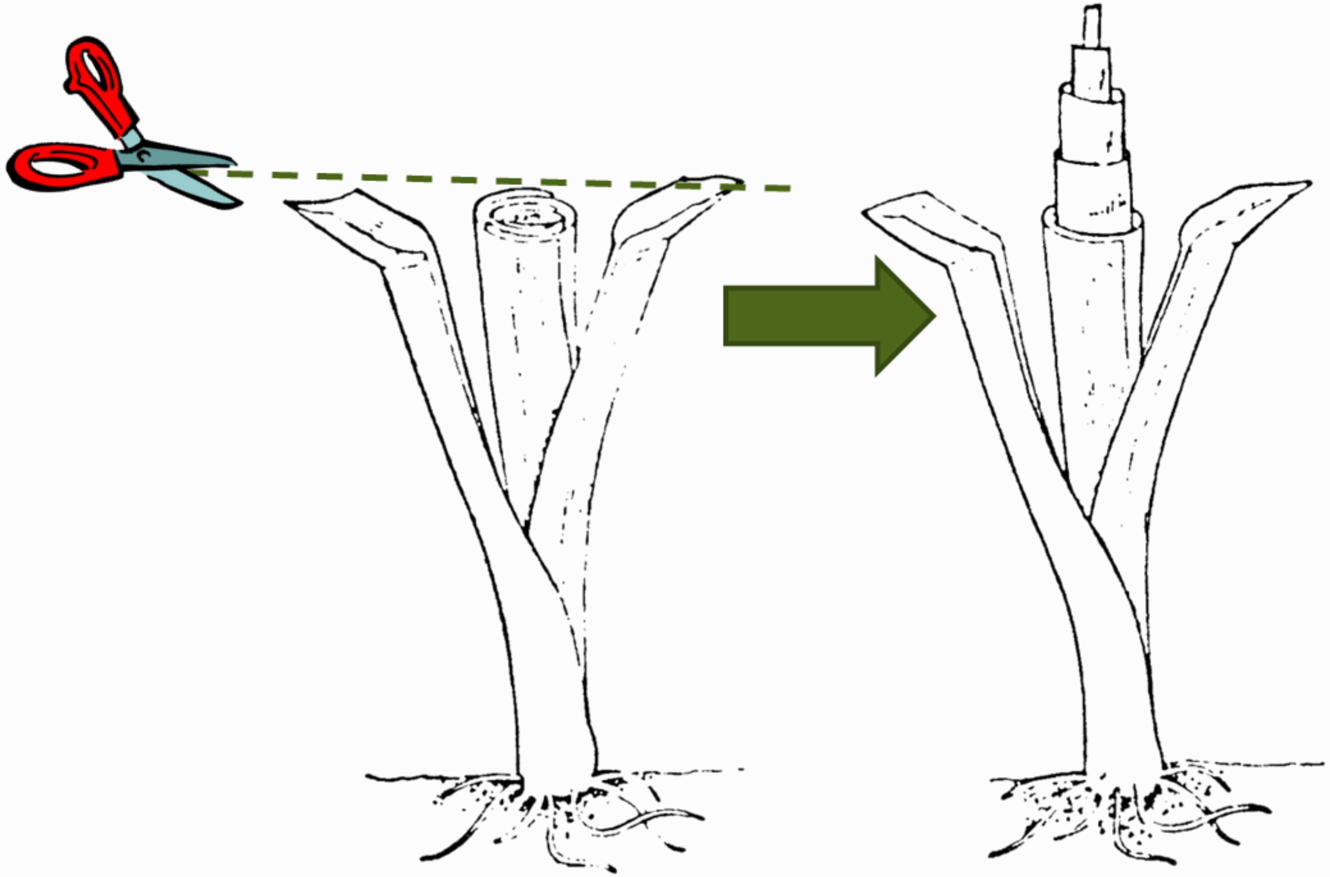
← *Rate of Growth Following Defoliation*

Leaf elongation
(Cell enlargement)

Leaf production
(Cell division & differentiation)

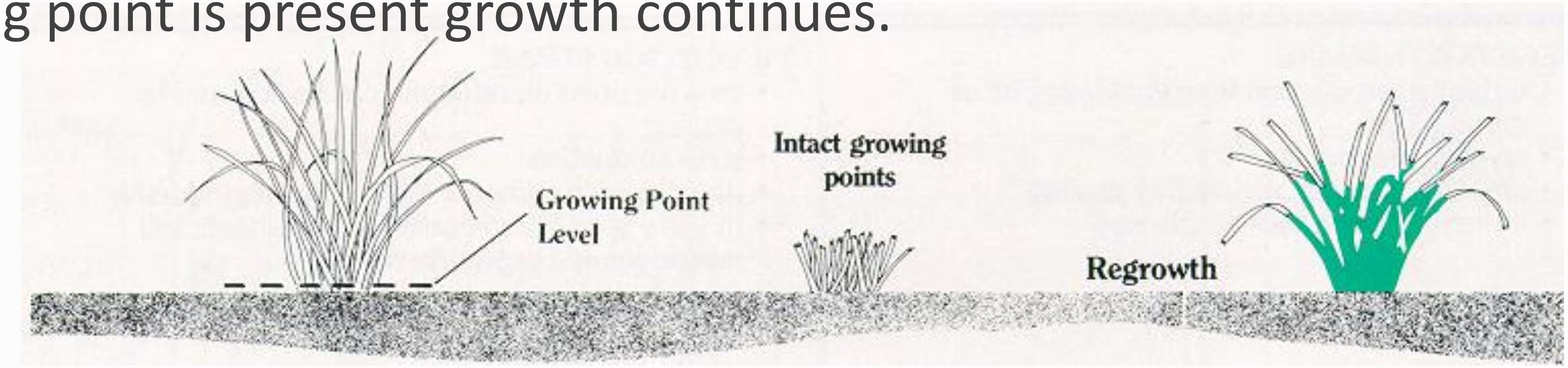
Tiller production
(Activate dormant buds)

Telescoping Growth Caused by Intercalary Meristems

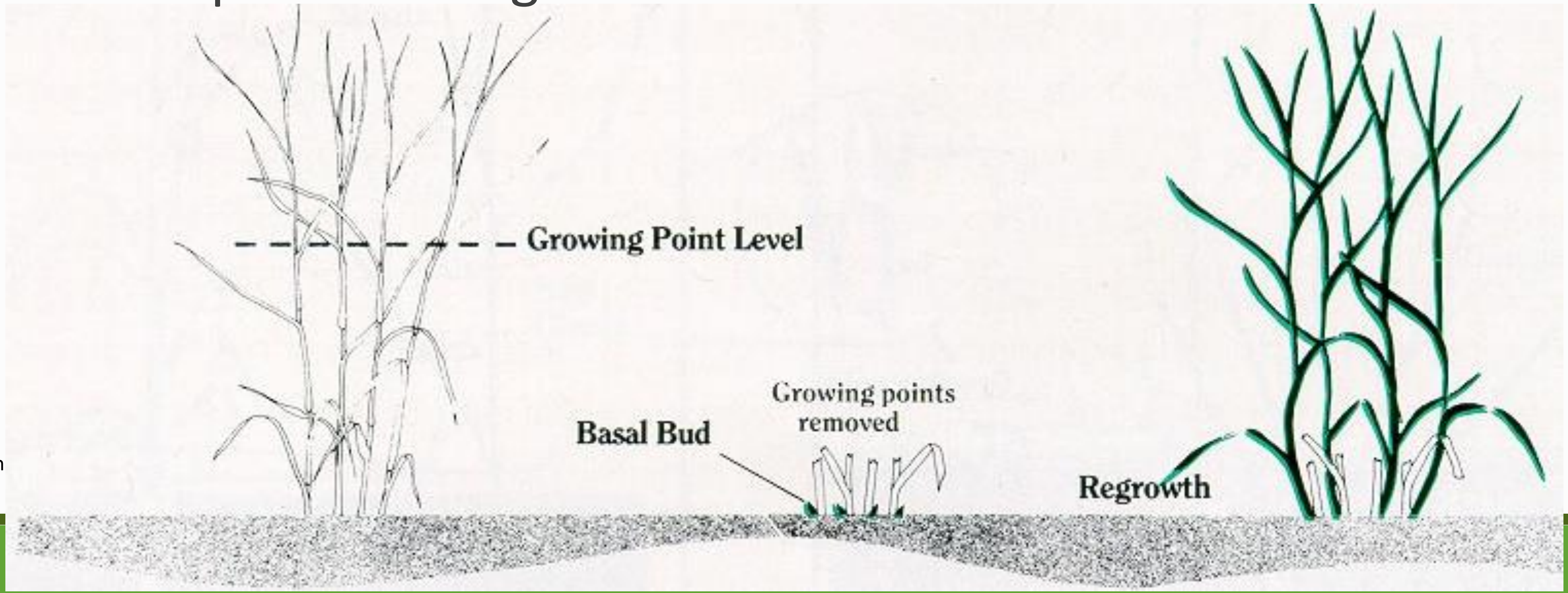


Location of Growing Points

If the growing point is present growth continues.

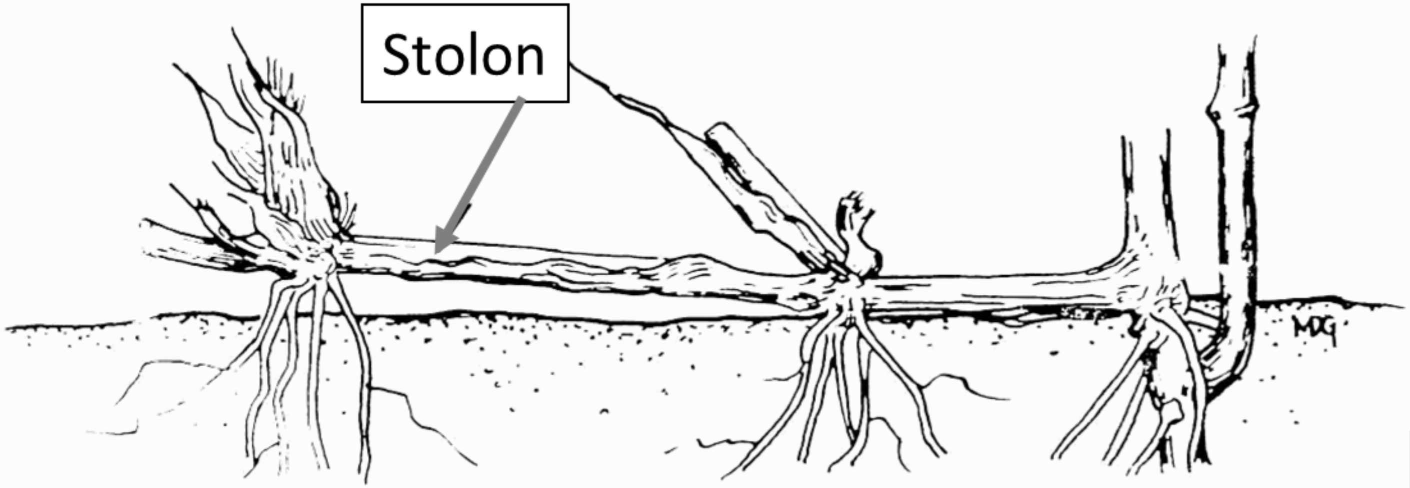


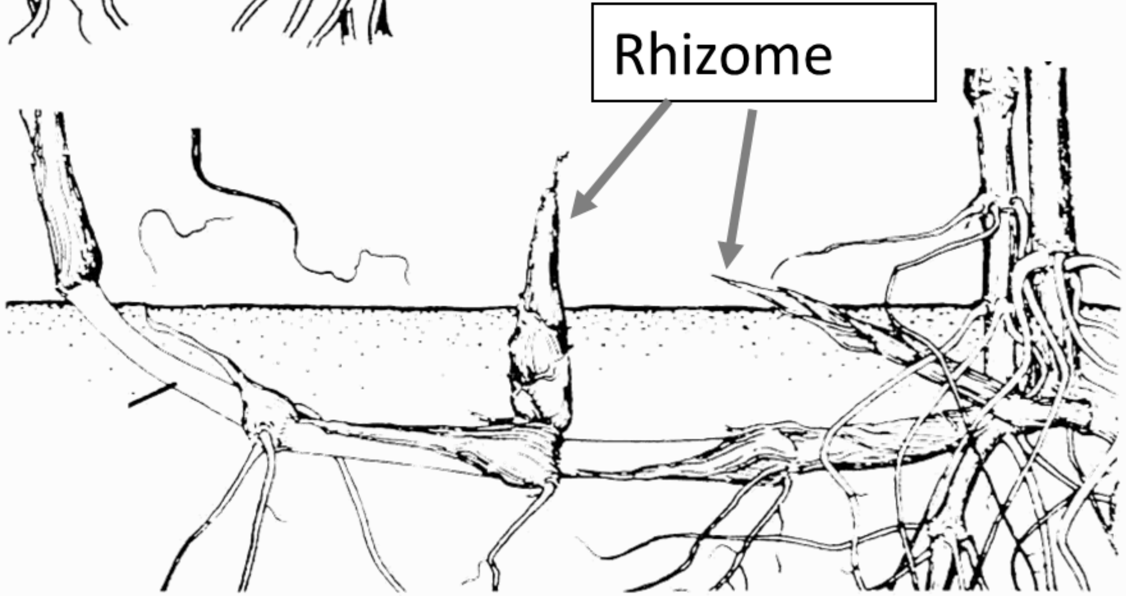
If removed - growth stops and new growth must initiate from a dormant bud.



From National Range and Pasture Handbooks
www.glti.nrcs.usda.gov/technical/publications/n
Chapter 5 page 2-13

Location of Growing Points…





New growth can come from below ground **stolons** & **rhizomes**

Location of Growing Points

Location of apical meristem depends on season:

- Early in the growing season
  - close to the ground and protected.
- As the season progresses
  - elevates and subject to removal.

What determines if and how a plant regrows after disturbance?

- Type of plants
  - Grass vs Forb or Browse
- Part of plant removed
  - Vegetative or Meristematic
- Number and type of meristems remaining
- Resources for recovery

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