An Peischel
Small Ruminant Specialist

MULTI-SPECIES
Livestock and Vegetation

Integrated Knowledge Base for
Restoration of Marginal Lands
- Soils
- Ecology
- Plant Physiology
- Hydrology
- Climatology
- Forestry
- Economics
- Wildlife
- Sociology
- Animal Science

Sustainability through Biodiversity
- Persistence over generations
- Flexible
- Meet needs of present and future
- Renewable resources used wisely
- Pollution rate minimal
Ecosystem Foundation Blocks

- **SUCCESION**
  - Change and development
  - Complex, stable communities
  - Competition, interdependence and adaptation

Ecosystem Foundation Blocks

- **WATER CYCLE**
  - Maximum use of rainfall
  - Minimize erosion
  - Percolation / Infiltration

Ecosystem Foundation Blocks

- **MINERAL CYCLE**
  - Effective cyclic pattern
  - Biological soil - atmospheric interaction
  - Continuous decomposing plant and animal residues
Ecosystem Foundation Blocks

- ENERGY FLOW
  - Carbon cycle
  - Keeps all processes of life functioning
  - Solar power
  - All living things depend upon plants to harvest (capture) energy from sun and convert it to a useable form

the CONTINUUM

- Soil
- Plants
- Animals
- Atmosphere

Whole Farm or Ranch

- Soil Assessment
- Individual Pasture Assessment
- Alternative Dairy Farming
- Nutrient Management
- Marketing
- Livestock & Forage Management
- Herd Health
- Genetics
- Nutrition
- Watershed Assessment
- Farm Resources & Management Inventory
- Business Planning & Goals
- Facilities & Equipment
**PRINCIPLES of BROWSING MANAGEMENT**

1. **Rest Period** – depends on the recovery rate of vegetation

2. **Animal Performance** – use shortest browse or graze period possible while maintaining adequate rest for the vegetation

3. **Stock Density** – use highest stock numbers possible to procure uniformity of utilization

4. **Herd Effect** – impact – use the largest herd size possible consistent with good animal husbandry practices

5. **Stocking Rate** – match animal numbers to changes in carrying capacity on an annual and seasonal basis

**Vegetation**
- Energy Requirement of Goats
- Dietary Preference
- Quality

**Soil**
- Behavior

**Management**
- Health
- Physiological state
- Climate

**Dietary Preference**
- with part
- Chemical composition

**Quality**
- Plant species
- Fiber composition
- Digestive content
- Seasonal patterns
- Browse and grass

**Soil**
- Quantity
- Residual
- Dung and urine
- Grass
Feeding Preferences

<table>
<thead>
<tr>
<th>Diet Preference Animal Species</th>
<th>Type of Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grasses</td>
</tr>
<tr>
<td>Cattle</td>
<td>65 – 75</td>
</tr>
<tr>
<td>Horses</td>
<td>70 – 80</td>
</tr>
<tr>
<td>Sheep</td>
<td>45 – 55</td>
</tr>
<tr>
<td>Goats</td>
<td>20 – 30</td>
</tr>
<tr>
<td>White-tail deer</td>
<td>10 – 30</td>
</tr>
<tr>
<td>Elk, red, and fallow deer</td>
<td>30 – 60</td>
</tr>
</tbody>
</table>

¹ Shrubs or trees

ENVIRONMENTAL STRESS

• Heat and Cold
• Weather (precipitation and humidity)
• Nutrient density
• Quality of feed on offer
• Predation
• Travel (activity)
• Topography

Browsing Calendar
(based on the goat)

<table>
<thead>
<tr>
<th>Specie</th>
<th>Preferred Time</th>
<th>Not Preferred</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow Star Thistle</td>
<td>Leaf phase through seedhead production</td>
<td>Cane heads are dead &amp; smelly</td>
<td>All ages &amp; classes select if at various growth phases.</td>
</tr>
<tr>
<td>Scotch Broom</td>
<td>Before flowering</td>
<td>Flowering</td>
<td>Caution using young does &amp; pregnant does because of high estrogen levels 3 weeks before flowering.</td>
</tr>
<tr>
<td>Chamise</td>
<td>Fall / winter / spring</td>
<td>Mid to late summer</td>
<td></td>
</tr>
<tr>
<td>Buckeyes</td>
<td>Fall as leaves die</td>
<td>Green &amp; productive</td>
<td>Toxic - Glycoside</td>
</tr>
<tr>
<td>Tamarisk</td>
<td>New shoots, young branches</td>
<td>Old decayed plants</td>
<td>Continuously barking &amp; trampling</td>
</tr>
</tbody>
</table>

Healthy Soils

• Drain and warm up quickly in spring
• Aeration and permeability maintained
• Store moisture for dry spells
• Resist erosion and nutrient loss
  • Support populations of microbes, earthworms, and other soil life which cycle nutrients and build humus
• Produce healthy, quality forage crops
• Ability to sustain vigorous root systems

The condition of the soil is at least as important as its fertility
CREATING SOIL (edging)

CREATING SOIL (EDGING)

CREATING SOIL (HERDING)
Experimental site NCSU after four years of grazing

Stocking rate: 1.4 acre/steer vs. 1.4 acre/steer + 0.7 acre/goat

Cattle alone  Goats + Cattle

Rosa multiflora Thumb. bushes

No bushes left

Fourth grazing season

Recommendation: 1 to 2 goats per head of cattle
Efficiency of Land Usage

Forest Management
(Ladder Fuel Reduction)

Efficiency of Land Usage

Forest Management
(Ladder Fuel Reduction)
TAN OAK (Lithocarpus)

Canopy cover affects water and nutrient cycling and energy flow
Perennial grass

Young pine trees

PLANT GROWTH
and
PHYSIOLOGY

Fuel load reduction
Creating defensible space

MANZANITA

(Heteromeles arbutifolia)

TOYON
Riparian Restoration with Perennial Stream

Grazing Riparian Areas

High Density Short Duration - one day
Stream Bank Enhancement through Vegetation Management

SCOTCH BROOM (Cytisus scoparius)

Stream Bank Enhancement and Water Quality Improvement
Cattails before Goats

Cattails attacked by Goats
(Ricinus communis)  
CASTOR BEAN

FERNS (Pteridium family)

VINCA (Vinca minor)
Olive Grove Pruning

Olive Grove Suckering

Rejuvenation of Lands while maintaining Biodiversity (YEAR 1)

(Desmodium, Green panic, Christmas berry)
Rejuvenation of Lands while maintaining Biodiversity (YEAR 2)

(Green panic, Desmodium, Kikuyu, Christmas berry)

Rejuvenation of Lands while maintaining Biodiversity (YEAR 3)

(pruned Christmas berry, Annual grasses)

Rejuvenation of Lands while maintaining Biodiversity (YEAR 4)

(Green panic, Kikuyu, Pangola, Tineroo, Desmodium, Christmas berry)
### Interrelationships

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PLANT</th>
<th>ANIMAL</th>
<th>SOIL</th>
<th>ECONOMICS</th>
<th>SOCIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herd Objectives</td>
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<tr>
<td>Unit Size</td>
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<tr>
<td>Feed on Offer</td>
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<tr>
<td>Desired Residual</td>
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<tr>
<td>Growth Rate</td>
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<tr>
<td>Growing Conditions</td>
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<tr>
<td>Animal Conditions</td>
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<tr>
<td>Days Browsed</td>
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<tr>
<td>Days Grazed</td>
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On Existence

We travel along the road of life:

hardly knowing what we are, yet always daring to be something;
seldom saying what we mean, but never afraid to have meaning;
sometimes failing in our endeavors, though never tempted to cease trying;
seeking satisfaction at every level, yet never defining happiness,
often apologizing for our existence, while realizing that life is its own excuse.

But the real joy of our otherwise insignificant efforts is that we are never quite satisfied to be on the left, or right, or in the middle of that road.

We are always attempting to change its direction.