Learning Objective: Following this lab students will list and describe the components of a good silvicultural prescription and will be able to construct a rudimentary prescription for a stand.

Introduction

A stand prescription is a professional plan for controlling the establishment, growth, composition, health, and quality of a specific stand. A prescription is the method by which silvicultural information is documented by professional foresters and communicated to landowners, loggers, and other stakeholders. A good prescription is temporally and spatially bounded. It meets landowner objectives in an ecologically feasible and realistic manner within given economic constraints. Prescriptions must also be consistent with the professional ethics of the authoring forester.

Because each stand is unique, prescriptions cannot follow a cook-book approach. They require on-the-ground observation by a trained forester to assess current stand conditions. This is where the art of silviculture is often applied; a forester’s experiences must be adapted to meet the challenges presented by the unique circumstances of each stand. A good prescription:

- is a written document,
- includes clear objectives and desired future conditions,
- offers long-term communication of site goals and intentions,
- captures the thoughts of the prescription writer,
- is a site-level management plan,
- provides for long-term management direction,
- is a means of communicating goals and intentions to stakeholders and constituents,
- and is driven by data (site inventory + scientific literature).

The process of writing a prescription usually follows a similar series of steps.

1. Define landowner objectives: These may include timber management, wildlife management, aesthetic considerations, protection of cultural resources like old homesteads, financial considerations (timber income, expenses, tax implications, intergenerational land transfer), and other concerns specific to the landowner.

2. Obtain maps: Various internet resources contain many useful and free maps for East Texas.
   b. Topographic maps including roads & structures: The Perry-Castañeda Library Map Collection at the University of Texas at Austin contains topographic maps with detailed road and structure data for the entire United States: [http://www.lib.utexas.edu/maps/topo/](http://www.lib.utexas.edu/maps/topo/)
   c. Ownership: County level tax assessor or appraisal offices are a useful source for ownership information and maps, including any conservation easements. While some counties have information available online, many continue to maintain only physical copies available at county courthouses or offices. Data for Nacogdoches County are available online: [http://www.nacocad.org/](http://www.nacocad.org/)
3. **Inventory tract**: Appropriate cruise designs consider:
   a. Cost constraints
   b. Adequate data quality and certainty
   c. Appropriate design for cruiser training, site and species consideration, and stand variability

4. **Assess feasibility of landowner objectives**: Objectives must be consistent with a forester’s professional ethics and must be ecologically feasible:
   a. Operations should not degrade site quality
   b. Prescription should be within the forester’s area of expertise and training
   c. Objectives should be realistic given stand conditions and site resources
   d. Objectives should be within the landowner’s economic constraints

5. **Develop a timeline**: Using landowner objectives a timeline ranging from 5-10 years to a whole rotation or longer should be decided upon. Development of a timeline facilitates understanding how operations may interact, and what the potential benefits and pitfalls of each operation are.

6. **Create marking instructions**: Marking instructions communicate the information in the prescription to the operators on the site given the regeneration method or intermediate treatment proposed and the inventory. Specific marking instructions are included. Remember that marking is a time and money intensive process, and the minimal effort to achieve the desired objectives should be expended.

7. **Inventory and mark timber for bid prospectus**: A more intensive cruise can provide detailed information for the bid prospectus. The bid prospectus allows timber buyers to make informed decisions on whether they will bid for the job.

8. **Contact timber buyers**: The prospectus is sent out to local timber buyers giving them permission to access the site to evaluate your inventory data and site conditions.

9. **Negotiate timber contract**: A contract is negotiated and recorded in the local courthouse.

10. **Administer sale**: The forester meets the logger on site and demonstrates the provisions of the contract. Regular inspections of the site during logging insure continued compliance with contract stipulations.
GENERAL PRESCRIPTION FORMAT

Stand Description:

Location / Tract Description / Roads: May include maps, and should indicate what access there will be for harvesting operations, what issues may arise with adjacent landowners.

Landowner Objectives: Desired future stand conditions, economic constraints, and desired time-frame for the prescription. In this class I will usually give you these based on realistic scenarios.

Current Stand Age / Composition / Structure / Growth Rates: This comprises data, tables, and figures that should include:

- Cohort numbers and ages
- Composition or forest cover type
- Stand and stock tables
- Stand density
- Basal area
- QMD
- Stand density index or stocking metrics
- Site index
- Compound rates of basal area growth
- Diameter distribution

Soils Description: Soil series, erosion hazards, timing of likely seasonal flooding, any evidence of past practices (e.g. windrowing) that may affect future operations.

Other Relevant Details: Existing decks, skid trails, stream crossings, streamside management zones, deer stands or hunting leases, etc.

Timeline: Presented in tabular form as shown below with an example from a loblolly pine plantation being managed for timber. Use the age of the dominant cohort if more than one is present.

<table>
<thead>
<tr>
<th>Year</th>
<th>Age</th>
<th>Action</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1</td>
<td>Regen survey</td>
<td>Stocked quadrat, 1/400th acre plots</td>
</tr>
<tr>
<td>2025</td>
<td>16</td>
<td>First Thin</td>
<td>Row thin (3rd row) + operator select</td>
</tr>
<tr>
<td>2033</td>
<td>24</td>
<td>Clearcut</td>
<td>Commercial clearcut in late summer</td>
</tr>
<tr>
<td>2036</td>
<td>0</td>
<td>Mechanical site prep</td>
<td>Shear site, pile, and burn slash</td>
</tr>
<tr>
<td>2036</td>
<td>0</td>
<td>Chemical site prep</td>
<td>Aerial herbicide (imazapyr) application in fall</td>
</tr>
<tr>
<td>2036</td>
<td>0</td>
<td>Planting</td>
<td>Machine plant 454 TPA on 8 x 12 ft spacing, OP bare-root lob</td>
</tr>
<tr>
<td>2037</td>
<td>1</td>
<td>Release</td>
<td>Aerial herbicide (sulfometuron) application in spring</td>
</tr>
</tbody>
</table>

Narrative: Describe in detail each operation in narrative format referring to data that supports your decisions. MAKE DECISIONS based on most likely outcomes, DO NOT give lists of options. It is understood that changing conditions may require your prescription to be updated in the future. Do not try to predict every potential outcome. The narrative should be detailed, including such information as marking instructions, deck locations, herbicide composition and rates, fertilizer composition and rates, thinning guides, etc. Make sure to clearly identify the following using correct terminology:

- Silvicultural System
- Method of Regeneration: If necessary; this is often included in the silvicultural system name, but may need further clarification (e.g. cleancut in a clearcut system).
- Establishment Treatments
- Intermediate Treatments
Stand Description Checklist for Silvicultural Prescriptions

Note that you may not need all of this information for every prescription. Focus on what is important for your particular situation.

☐ Location Description
  ☐ Map
  ☐ Tract size (acreage)
  ☐ Roads to tract
  ☐ Roads on tract
  ☐ Border markings / Posted?

☐ Landowner Objectives
  ☐ Desired time-frame
  ☐ Economic constraints
  ☐ Economic goals
  ☐ Timber management
  ☐ Wildlife Management
  ☐ Other goals
    ☐ Recreation
    ☐ Aesthetics
    ☐ Water
    ☐ Others

☐ Stand conditions
  ☐ Cohort number
  ☐ Cohort ages
  ☐ Composition / Forest cover type
  ☐ Stand and stock table
    ☐ Stand density
    ☐ Basal area
    ☐ QMD
    ☐ SDI
    ☐ Relative Density
  ☐ Growth rates
  ☐ Growth and yield data
  ☐ Insect or disease evidence

☐ Soils
  ☐ Soil series
  ☐ Site index or site quality
  ☐ Erodible / Sensitive soils
  ☐ Limitations to growth
    ☐ Flooding
    ☐ Droughty
    ☐ Pan layers
    ☐ Nutrient limitations

☐ Land Use History
  ☐ Past practices
    ☐ Windrowing
    ☐ Bedding
    ☐ Borrow pits
    ☐ Prescribed burns
    ☐ Wildfire
    ☐ Other disturbances
  ☐ Timber or border markings
  ☐ Set / Deck locations
  ☐ Skid trail conditions

☐ Streams
  ☐ Number
  ☐ Size / Order
  ☐ Watershed
  ☐ Wetlands
  ☐ Flow pattern
    ☐ Ephemeral
    ☐ Intermittent
    ☐ Perennial

☐ BMP’s
  ☐ SMZ’s
  ☐ AMZ’s
  ☐ Stream crossings
  ☐ Road grade
  ☐ Road surfacing
  ☐ Road closures / gates
  ☐ Water control structures

☐ Oil / Gas pads
☐ Oil / Gas right of ways

☐ Wildlife
  ☐ Hunting lease
  ☐ Herbaceous vegetation

☐ Structures
  ☐ Deer stands
  ☐ Food plots
  ☐ Fences

☐ Aesthetics
  ☐ Cultural resources
  ☐ Adjacent landowners
Procedure

**Equipment for Each Group**

1. Diameter tape (1)  
2. Loggers Tape (2)  
3. Clinometer (1)  
4. Compass (1)  
5. Bark gauge (1)  
6. Increment borer (1)

**Methods**

You will collect some basic data that will allow you to create a prescription for a stand on the Stephen F. Austin Experimental Forest. Landowner objectives will be provided, and you may use the tract map from lab 1.

1. At one or more representative location within the stand, choose a co-dominant or dominant tree, preferably of any pine species. For that tree use the attached data sheet to record:
   a. The dbh and height of the tree.
   b. Use the bark gauge to measure and record bark depth on opposing sides of the tree.
   c. Take a core at breast height using the increment borer.
      i. Count the rings from the pith to the bark to age the tree.
      ii. Measure the total width of the last five growth rings, excluding the bark.
      iii. Measure the total width of the last ten growth rings, excluding the bark.

With the data you collect from the co-dominant or dominant trees, you will be able to calculate both the five and ten year compound rates of basal area growth (BAG) for the stand. BAG is a percentage indicating how rapidly basal area is growing for the sample tree expressed as a compound interest rate. Young trees typically have small diameters and rapid growth rates, so they tend to have high BAG’s, sometimes exceeding 20%. Older trees tend to have large diameters and slower growth rates relative to their diameter, so they tend to have low BAG’s, sometimes as low as 1%.

By comparing 5 and 10 year BAG’s you can get a sense of how the rate of growth of a stand is changing, and whether prescribing a thinning or regeneration treatment may be suggested. If the 10 year BAG is substantially greater (e.g. 7% versus 3%) than the 5 year BAG, growth is slowing down and a thinning or regeneration operation may be suggested. Note that BAG is not as robust a metric as growth and yield modeling, so it should only be relied upon when growth and yield modeling is unavailable, such as in the field or when working with forest cover types for which accurate models cannot be obtained.
How to calculate compound rates of basal area growth

<table>
<thead>
<tr>
<th>DBH: Diameter at Breast Height</th>
<th>RW₅: Last 5 Years Ring Total Ring Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT₁: Bark Thickness 1</td>
<td>RW₁₀: Last 10 Years Ring Total Ring Width</td>
</tr>
<tr>
<td>BT₂: Bark Thickness 2</td>
<td>BAₙow: Basal Area Now</td>
</tr>
<tr>
<td>DIBₙow: Diameter Inside Bark Now</td>
<td>BA₅: Basal Area 5 Years Ago</td>
</tr>
<tr>
<td>DIB₅: Diameter Inside Bark 5 Years Ago</td>
<td>BA₁₀: Basal Area 10 Years Ago</td>
</tr>
<tr>
<td>DIB₁₀: Diameter Inside Bark 10 Years Ago</td>
<td>BAG₅: 5 Year Compound Basal Area Growth</td>
</tr>
<tr>
<td></td>
<td>BAG₁₀: 10 Year Compound Basal Area Growth</td>
</tr>
</tbody>
</table>

\[
\text{DBH} - (\text{BT}_1 + \text{BT}_2) = \text{DIB}_\text{now}
\]
\[
\text{DIB}_\text{now} - 2*(\text{RW}_5) = \text{DIB}_5
\]
\[
\text{DIB}_\text{now} - 2*(\text{RW}_{10}) = \text{DIB}_{10}
\]
\[
\text{DIB}_\text{now}^2 \times 0.005454 = \text{BA}_{\text{now}}
\]
\[
\text{DIB}_5^2 \times 0.005454 = \text{BA}_5
\]
\[
\text{DIB}_{10}^2 \times 0.005454 = \text{BA}_{10}
\]
\[
\text{BAG}_5 = \left[\left(\frac{\text{BA}_{\text{now}}}{\text{BA}_5}\right)^\frac{1}{5} - 1\right] \times 100
\]
\[
\text{BAG}_{10} = \left[\left(\frac{\text{BA}_{\text{now}}}{\text{BA}_{10}}\right)^\frac{1}{10} - 1\right] \times 100
\]

Plot:_________ Crew Names:_________________________________________ Date:_________
### Stand Description

<table>
<thead>
<tr>
<th>Location</th>
<th>Map, Tract Size, Roads, Boundary Markings, Neighbors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landowner Objectives</td>
<td>Goals, Time-Frame, Economic Constraints, Certification</td>
</tr>
<tr>
<td>Stand Conditions</td>
<td>Cohorts, Age, Composition, Cruise Data, Growth Rates, Insects/Disease, Invasives</td>
</tr>
<tr>
<td>Soils</td>
<td>Series, Site Index, Erosion/Sensitive, Floods, Droughty, Pan Horizons, Nutrients</td>
</tr>
<tr>
<td>Land Use History</td>
<td>Past Silviculture, Disturbances, Structures, Oil/Gas, Livestock</td>
</tr>
<tr>
<td>Water</td>
<td>Ponds, Wetlands (Perennial or Seasonal), Streams, Vernal Pools, Seeps, Bogs, BMPs</td>
</tr>
<tr>
<td>Wildlife</td>
<td>Hunting Lease, Herbaceous Strata, Deer Stands, Food Plots, Fencing</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Neighbors, Cultural Resources</td>
</tr>
</tbody>
</table>

### Regeneration Treatments

| Even Aged | Clearcut, Seed-Tree, Shelterwood |
| Two Aged | Reserves (CC, ST, SW), Deferment (ST, SW) |
| Uneven Aged | Patch Selection, Group Selection, Single-Tree Selection |

### Establishment Treatments

<table>
<thead>
<tr>
<th>Site Preparation</th>
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</thead>
<tbody>
<tr>
<td>Slash Management</td>
</tr>
<tr>
<td>Soil Properties</td>
</tr>
<tr>
<td>Site Resources</td>
</tr>
</tbody>
</table>

| Artificial Regeneration |
| Direct Seeding | Broadcast, Row, Spot |
| Planting | Machine, Hand |

### Intermediate Treatments

| Precommercial Thinning | Cleaning, Liberation, Weeding |
| Commercial Thinning | Geometric, Low, High, Selection, Free |
| Site Resources | Fertilizer, Woody Weed Control, Burn |
| Sawtimber Management | Pruning |

### Wildlife Structures

| Habitat Structures | Snags, Cavity Trees, Coarse Woody Debris, Slash Piles, Wood in Streams, Wetlands |
| Age Class Structures | Vertical Heterogeneity, Horizontal Heterogeneity, Age Class Diversification |
| Food Resources | Mast Producing Species (Hard and Soft), Browse, Food Plots |
| Landscape Patterns | Hard Edges, Soft Edges, Stand Adjacency, Corridors, Fencing |
SFASU Forestry  

Silviculture Field Prescription Form

<table>
<thead>
<tr>
<th>Your Name:</th>
<th>Stand Name:</th>
<th>Date:</th>
</tr>
</thead>
</table>

Stand Description

Timeline for silvicultural prescription with narrative notes

<table>
<thead>
<tr>
<th>Year</th>
<th>Age</th>
<th>Action</th>
<th>Narrative Notes</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
### Silvicultural Prescriptions Grading Key

<table>
<thead>
<tr>
<th>Annotation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Terminology</strong> is incorrect or imprecise. Be sure to use correct silvicultural terminology in all prescriptions.</td>
</tr>
<tr>
<td>2</td>
<td>Prescribed action is too <strong>vague</strong>. You need more detail (e.g. marking instructions, removal percentage).</td>
</tr>
<tr>
<td>3</td>
<td>Prescribed action does not meet <strong>landowner objectives</strong>, or some of the constraints we discussed for this stand.</td>
</tr>
<tr>
<td>4</td>
<td>Prescribed action is <strong>incorrectly timed</strong>. Is your rotation is too short or long based on growth rates of your species or landowner objectives? Are you applying herbicide too late compared to planting (herbaceous control spring after planting, hardwood control fall before planting)?</td>
</tr>
<tr>
<td>5</td>
<td>Prescribed action is not <strong>ecologically feasible</strong>. Does your regeneration method match with the shade tolerance of your crop species? Did you prescribe a burn that will likely kill all your crop trees?</td>
</tr>
<tr>
<td>6</td>
<td>Prescribed action is not <strong>operationally feasible</strong>. Is the stand too small? Are you removing too little volume per acre for a logger to take the contract? Are you operating when the site is too wet?</td>
</tr>
<tr>
<td>7</td>
<td>Prescribed action is <strong>unnecessary</strong>. Are you fixing something that is not actually a problem (e.g. mechanical site preparation on a site with no soil limitations, herbicide on a site with no competition problems, fertilizer on a droughty site, thinning a stand that’s at an appropriate density)?</td>
</tr>
<tr>
<td>8</td>
<td>An additional prescribed <strong>action needed</strong>. Did you forget to apply herbicides when planting? Was slash management not prescribed on a high-slash site? Was bedding not prescribed on a wet site?</td>
</tr>
<tr>
<td>9</td>
<td>Prescribed action will not achieve the <strong>density</strong> you state. Did your planting spacing and density match? Did your row thinning intensity and post-thinning density match?</td>
</tr>
<tr>
<td>10</td>
<td>More than one treatments are <strong>combined</strong> on a single line. Be particularly careful with this for establishment of stands, when multiple treatments may be used in within one or two years. Each should go on its own line.</td>
</tr>
</tbody>
</table>