ENVIROTHON FORESTRY STUDY GUIDE

FIRE AND FOREST MANAGEMENT

Describe the evolution of fire policy. How does current policy fit into fire ecology and ecosystem management concepts?

Decades of fire suppression and prevention has led to:

- unnatural buildups
- typical small ground fires historically kept forests open and clear of debris;
- understory of shade tolerant trees now exist robbing the environment of moisture and nutrients;
- weakening stands and making them susceptible to insects and diseases
- homes in these areas are now making it difficult to incorporate fire

    - 1924 – 30million acres burned
    - 1930 52
    - 1940 30
    - 1950 15
    - 1960 5
    - 1970 5
    - 1980 5
    - less than one million

- Drought and weather can lead to bad fires
- Presettlement and early settlement- fire was common occurrence
- 1871-1903 destructive fires over a 10 year interval-saw the loss of property and lives
- Gifford Pinchot labeled fires as the most terrible foe of North America
- Instructed all rangers to put out all fires, even small fires in their districts
- 1970 10AM policy was put into effect which indicated immediate action be taken to limit destruction of fires
- 1980 after the recognition that fires are beneficial to the ecology, fire control evolved to fire management (all fire to play as natural a role as possible)
- Wilderness Act of 1964---recognition that in order to fully enact this act, fire had to be involved
- Ecological Role of fire must be considered when establishing land resource management objectives.
- Fire leads to biodiversity (ecosystems and wildlife)

Describe a situation in which manager ignited prescribed fire might be used.

Prescribed Fires

1. dispose of logging residues
2. remove physical barriers to tree planting
3. reduce fuels
4. control fires
5. prepare seedbeds
6. reduce competition
7. recycle nutrients
8. sanitize
9. maintain native species (succession)
10. eliminate undesirable species (weeds)
11. mimic fire regime
12. kill invasive species
13. thin
14. increase palatable grasses for wildlife
15. rejuvenate decadent shrubs for deer and elk
16. restore natural conditions

How does a naturally occurring fire become a prescribed natural fire?

Lightning caused fires can be used as a prescribed as long as it meets conditions of objectives.

Prescribe fire vs. Wildfire (be familiar with the two terms)

Wildfires have nine risk factors	Percentage of all fires
1. lightning	11
2. arson	29
3. campfire	3
4. children	5
5. debris burning	25
6. equipment	5
7. railroad	2
8. smoking	5-6
9. miscellaneous	14-15

Levels of fuels

Ground fuels—deep roots, duff, mulch; fires tend to spread slowly but are hard to extinguish
Surface fuels- needles, leaves, etc.
Aerial fuels- canopy

What do you perceive as the major cause of wildfires in your state?

Wildfires are broken into different regions

Southern-	Arson 55%	debris---20%
Pacific-	lightning 58%	arson-12%
Rocky	lightning 29%	equipment 19%
Eastern	Arson 49%	Miscellaneous 11%
North Central	Arson 38%	Debris 20%

Describe the components of the fire triangle. Which side of the triangle does line building seek to remove? Backfiring? Shoveling soil on coals? Water slurry drops?

Fire response

- Ignore it
- Attack it—aggressive, modified, delayed
- Allow it to burn—predetermined plan

Fire suppression-

- Confine—limit spread to a defined area
- Contain—surround it
- Control—put it out

Heat, oxygen, fuel

To suppress a fire one must remove at least one of the components of the fuel triangle

Suppression Tactics

- Predict behavior
- Attack fire
- Mopping up

Line building—stop fires advance-----aerial dropping of liquid retardants on fires edge

Backfire—remove fuel between fire front and indirect live

What role has fire historically played in forests and grasslands?

Historically most grasslands, Southern Pinelands and Western Pinelands burned every 25 years (this was a normal cycle)

Fire kept shrubs and forest from encroaching on grasslands and it favored herbaceous species.

Interruption of the cycle has resulted in Ponderosa Pine being overcrowded with dense understories of Douglas Fir---which are more crowded, moisture loss

How does fuels management problem become a forest health issue? How does it affect wildlife? Question to consider

What measures would you suggest to reduce deaths and destruction of property at the wildland-urban interface?

Defensible space---clearing area between structures and flammable vegetations, flame retardant homes

Students should be familiar with these tools and how they are used.
National Fire Danger Rating System (NFDRS)
Daily weather data
RAWS-Remote Automatic Weather Station

MYCORRHIZAL FUNGI

1) What do they do for plants?
Mycorrhizal fungi increase the surface area absorbing area of roots 100 to a 1,000 times, thereby greatly improving the ability of the plant to access soil resources. Several miles of fungal filaments can be present in a thimble of soil. Mycorrhizal fungi increase nutrient uptake not only by increasing the surface absorbing area of the roots, but also release powerful enzymes into the soil that dissolve hard-to-capture nutrients, such as organic nitrogen, phosphorus, iron and other "tightly bound" soil nutrients. This extraction process is particularly important in plant nutrition and explains why non-mycorrhizal fungi form an intricate web that captures and assimilates nutrients, conserving the nutrient capital in soils.

2) What are Mycorrhizal Fungi?
"Mycor" - "rhiza" literally means "fungus" - "root" and defines the mutually beneficial relationship between the plant root and fungus. These specialized fungi colonize plant roots and extend far into the soil resource. Mycorrhizal fungal filaments in the soil are truly extensions of root systems and more effective in nutrient and water absorption than the roots themselves.

3) How hardy are mycorrhizae?
Cold temperature, even freezing, does not affect the viability of mycorrhizal propagules that are most commonly used as inoculum. High temperatures, above 140 degrees F, damage mycorrhizal propagules and should be avoided. Once the propagules are mixed with the soil, they remain in a dormant state until there is root activity. Mycorrhizal propagules germinate in the presence of certain root exudates. Once the spores germinate and attach to the root system, the mycorrhizae will remain with the plant for the life cycle of the plant. Plants growing on stressed sites or frequently disturbed sites may require several inoculations.

4) What plants form specialized roots with mycorrhizal fungi?
90% of the world's plant species form mycorrhizae and require the association for maximum performance in non-artificial conditions.

5) How do mycorrhizal fungi increase nutrient uptake?

These fungi increase the surface absorbing area of roots 10 to 100x thereby greatly improving the ability of the plants to utilize the soil resource. Estimates of amounts of mycorrhizal filaments present in soil associated with plants are astonishing. Several miles of fungal filaments can be present in less than a thimbleful of soil! But mycorrhizal fungi increase nutrient uptake not only by increase the surface absorbing area of roots, they also release powerful chemicals into the soil that dissolve hard to capture nutrients such as phosphorous , iron and other "tightly bound" soil nutrients. This extraction process is particularly important in plant nutrition and explains why non-mycorrhizal plants require high levels of fertility to maintain their health. Mycorrhizal fungi form an intricate web that captures and assimilates nutrients, thus conserving the nutrient capital in soils. In non mycorrhizal conditions much of this fertility is wasted or lost from the system.

6) What other activities do mycorrhizal fungi do?

Mycorrhzial fungi are involved with a wide variety of other activities that benefit plant establishment and growth. The same extensive network of fungal filaments important to nutrient uptake is also important in water uptake and storage. In non-irrigated conditions, mycorrhizal plants are under far less drought stress compared to non-mycorrhizal plants.

Mycorrhizal fungi also improve soil structure. Mycorrhizal filaments produce humic compounds and organic "glues" (extracellular polysaccharides) that bind soils into aggregates and improves soil porosity. Soil porosity and soil structure positively influence the growth of plants by promoting aeration, water movement into soil, root growth, and distribution. In sandy or compacted soils the ability of mycorrhizal fungi to promote soil structure may be more important than the seeking out of nutrients.

7) Don't soils already contain mycorrhizal fungi?

Undisturbed soils are full of beneficial soil organisms including mycorrhizal fungi. Research indicates, however, many common practices can degrade the mycorrhiza-forming potential of soil. Tillage, fertilization, removal of topsoil, erosion, site preparation, road and home construction, fumigation, invasion of non-native plants, and leaving soils bare are some of the activities that can reduce or eliminate these beneficial soil fungi. Reintroducing mycorrhizal fungi in areas where they have been depleted can dramatically improve plant establishment and growth.

Many routine nursery practices, such as fumigation and dousing with high levels of water and nutrients, produce non-mycorrhizal plants. When high levels of fertilizer and water are provided for non-mycorrhizal plants, they can thrive in this artificial growing media, but they are ill prepared to survive the eventual outplanted condition.

SILVICULTURE

Reproduction methods

Replacing one age class of trees with another, or starting a forest in an area dominated by a nonforest community calls for three broad activities:

- Altering the existing forest or plant community to provide ecological space for the desired tree reproduction
- Treating the surface of the soil (site preparation) to provide conditions necessary for the desired reproduction
- Providing sources of reproduction for the new stand or community of trees.

Altering the existing stand by removing trees.

- Clearcutting
- Selection
- Shelterwood

Site preparation aims to:

- Control non-tree plant species that both compete with and modify the environment for future forest reproduction
- Reduce debris or slash left from the previous stand after the harvesting operation
- Prepare soil

Sources of reproduction

- vegetative reproduction
- coppice
- cuttings

Intermediate operations (operations performed after seeding but before harvest to increase the overall health and vigor of the stand)

a. Cultural practices
b. Release cuttings
c. Stand improvement cuttings
d. Pruning
e. Sanitation cutting
f. Salvage cutting
g. Thinning
h. Fertilizing

Forest Ecology Study Questions

Below are questions students should be able to answer.

1. Distinguish between forest ecology and silviculture.

2. Describe the following methods for reproducing a forest stand: clearcutting, shelterwood cutting, and selection system.

3. What three things are likely to be done in site preparation?

4. Define forest health.

5. How has efficient fire control affected forest health? How does the fuel management problem become a forest health issue?

6. Describe the components of the fire triangle.

7. Why are there large-scale problems with fuel accumulation and management?

8. Contrast the methods and aims of Gifford Pinchot and John Muir. Was the conflict between these philosophies inevitable? Can you see any parallels today within either the resource professionals or the environmental movement itself?

9. Explain the meaning of these acronyms: NEPA, EIS, DEIS. Why is closely following the NEPA process important in proposing a resource management action?

10. Wildland/Urban Interface: The wildland-urban interface (WUI) is the area where houses meet or intermingle with undeveloped wildland vegetation.

11. Name the six major forest types or regions of the United States. In which do you reside? Name its major tree species.

12. How can insects damage forests? Why are they so difficult for forest managers to keep in balance?

13. Define integrated pest management (IPM).

14. Name some destructive forest insects in our region, for each, indicate how they inflict damage?

15. What are beneficial effects of insects in forest ecosystems?

16. What are the beneficial and detrimental influences of wildlife on forests?

17. What are the impacts of forest management on wildlife?

18. Fire management-Discuss fire suppression, prescribed burning, Timber cutting, Forest Fragmentation and Chemical treatments

19. Describe the evolution of fire policy. How does current policy fit into fire ecology and ecosystem management concepts?

20. What is the difference between fire risk and fire hazard?

21. What do you perceive as the major cause of wildfires in your state?

22. Describe the components of the fire triangle. Which side of the triangle does line building seek to remove? Backfiring? Shoveling soil on coals? Water slurry drops?

23. What role has fire historically played in forests and grasslands?

24. How does fuels management problem become a forest health issue? How does it affect wildlife?

25. What measures would you suggest to reduce deaths and destruction of property at the wild land-urban interface?

26. Define these cultural practices:
    a. Release cuttings
    b. Stand improvement cutting
    c. Pruning
    d. Sanitation cutting
    e. Salvage cutting
    f. Thinning
    g. Fertilizing

27. How did extensive and unregulated logging change the cover type in certain areas of the Southern Forest?

28. What factors have led to the predominance of southern pine in the pulpwood industry?

29. With what does forest ecology concern itself? Why is an understanding of forest ecology essential to forest management?

30. What are the primary requirements for tree growth? How do climatic factors affect this?

31. Discuss forest competition.

32. Explain what is meant by primary succession, and secondary succession, perturbations, mature forest.

33. Discuss some historical uses of forests and new uses that are evolving.

34. What role did forest resources play in the discontent of the American colonists?

35. How might our appreciation of forest values change forest management in other countries around the world?

36. Describe three eras of conservation. What would be a suitable name for the fourth era?

37. How do you believe extensive and unregulated logging would change the cover type in certain forests? Give an example.