Professional Foresters Registration Examination, October 7, 2022

PART I

Instructions: APPLICANTS, PLEASE READ THESE INSTRUCTIONS CAREFULLY. Complete any Three (3) of Questions I through V.

Question I Short Answer
Question II - Forest Ecology
Question III - Forest Economics
Question IV- Silviculture
Question V - Forest Protection

In the upper right-hand corner of your answer pages include the following: your assigned applicant number, the question number, and page number.

Where indicated, short answer questions, forms and graphs may be torn from the exam booklet and included with your answers. Make sure to include your applicant number, question number and page number on these sheets as well.

Professional Foresters Registration
715 P Street, 9th floor, Sacramento, CA 95814

Applicant #:_____

Question # __I_____

ACRONYMS AND ABBREVIATIONS USED IN THIS EXAMINATION

The following Acronyms and /or Abbreviations **may be used** in this examination.

Technical abbreviations that should be known by a forester are NOT included here (e.g., DBH, MAI, MBF). You may remove this page for reference throughout this examination. **It need not be returned.**

Acronym or Abbreviation	Full Text
BLM	Bureau of Land Management, USDI
BOF	California State Board of Forestry and Fire Protection
CA	California
CCR	California Code of Regulations
CAL FIRE	California Dept. of Forestry and Fire Protection
CDF&W	California Department of Fish and Wildlife
FPR	California Forest Practice Rules
PRC	California Public Resources Code
RPF	California Registered Professional Forester
THP	California Timber Harvest Plan
TPZ	California Timber Production Zone
USFS	United States Forest Service, USDA

Applicant #:_____

Question # __I_____

Answer on these pages, tear from the booklet and submit with the answer packet if you chose to answer Question I of this examination.

October 2022 RPF EXAMINATION

3% 1. **What is a forest pest <u>epidemic</u>?**

_____

_____

3`% 2. **Give an example of a particular forest pest epidemic.**

_____

3% 3. **What is endemic forest pest?**

_____

_____

3% 4. **Give an example of an endemic forest pest.**

_____

4% 5. **Today, forest managers generally recognize that large woody structure LWS (formerly LWD) is important in influencing the biology and habitat values of streams in temperate ecosystems. List <u>four (4) biological and/or habitat functions of LWS</u> in forested streams of California.**

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Applicant #:_____

Question # __I_____

Answer on these pages, tear from the booklet and submit with the answer packet if you chose to answer Question I of this examination.

3% 6. **Define <u>Dendrochronology</u> and the primary way it is applied.**

_____

_____

3% 7. **Briefly define a "<u>blind lead or blind area</u>" in logging terminology**.

_____

3% 8. **The marking of virtually all of the most commercially valuable trees for cutting under an unevenaged individual tree marking regime, is normally termed:**

3% 9. **The term "Registered Professional Forester" is defined in the Professional Foresters Law as:**

_____

_____

4% 10. . **Give the common name of <u>two (2) deciduous</u>, western U.S. Forest <u>tree</u> <u>angiosperm species</u> that are <u>monoecious</u> and two (2) that are <u>dioecious</u>:**

_____

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Applicant #:_____

Question # __I_____

Answer on these pages, tear from the booklet and submit with the answer packet if you chose to answer Question I of this examination.

3% 11. **What must Registered Professional Foresters learn about a forest property before making planning or management recommendations?**

3% 12. **California possesses vast and valuable forest resources. The State ranks second in the Nation in total forest land. Approximately what proportion of California forest land is owned by private non-corporate entities?**

3% 13. **What must RPFs consider regarding their plans and actions that may impact adjoining land ownerships?**

4% 14. **What is a Registered Professional Forester's responsibility to their employer or client?**

4% 15. **What are the types of field data collected to measure weather conditions while planning a prescribed fire?**

Continued on Next Page

Applicant #:_____

Question # __I_____

Answer on these pages, tear from the booklet and submit with the answer packet if you chose to answer Question I of this examination.

4% 16. **States may adopt laws to carry out federal government mandates. A prime example of this in California is the Porter-Cologne Act of 1969 (Porter-Cologne). How is this law implemented?**

3% 17. **Define <u>Antecedent Soil Moisture</u>.**

3% 18. **Differentiate between a live/running skyline and a standing skyline system.**

4% 19. **What does the California Environmental Quality Act of 1973 (CEQA) require for projects which might have a potential significant adverse impact on the environment?**

3% 20. **Define the term "estimated 100-year flood flow".**

Continued on Next Page

Applicant #:_____

Question # __I_____

Answer on these pages, tear from the booklet and submit with the answer packet if you chose to answer Question I of this examination.

4% 21. **Although proper watercourse crossing design is critical, it is <u>not</u> the most important factor in reducing water quality impacts of the forest access system. <u>Briefly discuss the most important factors in reducing environmental impacts of the forest roads</u>.**

3% 22. **What is the "time value of money" as used in calculating the value of a proposed forest treatment?**

4% 23. **There are two types of interest rates used in economic analyses, a REAL rate that does <u>not</u> include inflation and a NOMINAL rate that does include inflation. Which is commonly used in forest financial analyses? Why?**

3% 24. **The Internal Rate of Return (IRR) shows a proposed investment's actual rate of return. Describe how to calculate the Internal Rate of Return (IRR) .**

Continued on Next Page

Applicant #:_____

Question # __I_____

Answer on these pages, tear from the booklet and submit with the answer packet if you chose to answer Question I of this examination.

3% 25. **What is the Fish and Game Code definition of "Fish"?**

3% 26. **How is biological diversity described or measured?**

3% 27. **What is an ecosystem?**

3% 28. **What is silviculture?**

Continued on Next Page

Applicant #:_____

Question # __I_____

Answer on these pages, tear from the booklet and submit with the answer packet if you chose to answer Question I of this examination.

3% 29. **The Scribner Dec. C log rule differs from the International ¼" Rule in what basic way?**

_____

4% 30. **Why is genetic diversity important in forest management?**

_____

_____

END OF QUESTION # I

QUESTION II-FOREST ECOLOGY

OBJECTIVE:

To demonstrate your understanding of forest restoration and sustainability principles and their application to managed stands under influence of climate change.

SETTING:

Understanding the impacts of climate change on forest structure, composition and function is crucial for conservation and management of forest resources. Our natural climate has oscillated simultaneously at multiple and nested temporal scales, including interannual, decadal, century, millennial, and multimillennial periods.

The phrase global climate change is sometimes conflated with global warming, anthropogenic greenhouse gas impacts and politics. There is, however, a larger context that affects issues of forest sustainability and restoration ecology—that is, the role of the **natural climate system** as a pervasive force of ecological change.

QUESTIONS:

10% 1. Changes in weather are familiar features of Earth's surface, readily recognizable as diurnal variations, seasonal cycles, and annual differences. All forms of life are influenced by this variability in how and where they live.

Explain how drought, heat and cold limit the distribution of Coast Redwood.

10% 2. What would happen to the distribution of Coast Redwood if the Pacific Ocean warmed, and fog distributions patterns changed?

10% 3. Quaternary (last 2.5 mm yBP (years before present time)) climates were variable and complex revealing a repeating pattern of many ~100,000 year glacial/interglacial cycles. Natural global temperature differences between glacial and interglacial periods averaged 10 - 20°C (18° – 36° F), often requiring over 20,000 years to completely warm thus a long-term average increase of < 0.1°C (0.2°F) degrees per century.

Briefly compare the effect on Western USA forest vegetation of these natural changes with what might occur if the current rate of ~1+°C (~ 2°F) increase per century accelerates due to anthropogenic effects.

10% 4. What is the primary cause of glacial to interglacial natural (not anthropogenic) global climate change?

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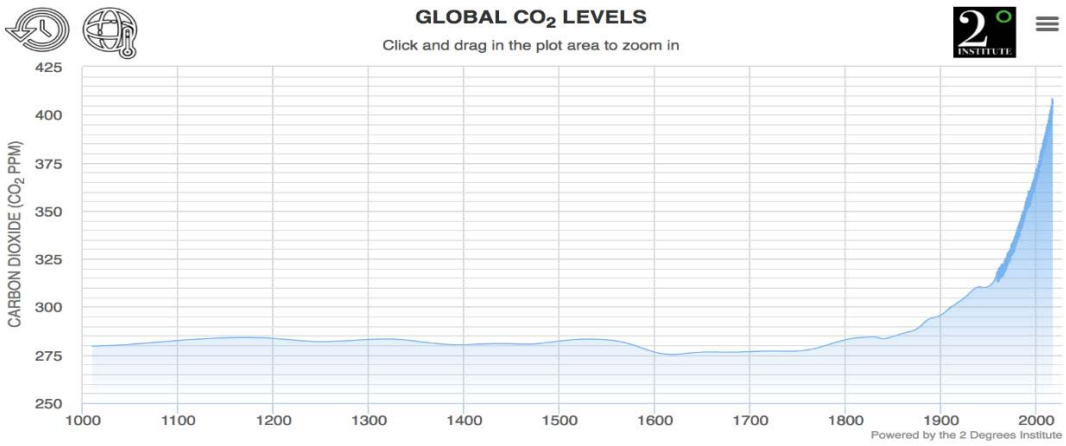
10% **5.** Multiple century scale Natural Climate Cycles are called “Bond cycles”. The last such cycle has been dubbed the “Little Ice Age”, a global **cold** period from CE (current era) 1450 to 1920. Forest restoration projects in California often reference the year 1850 as “pre-settlement” thus the desired future condition to be restored.

Explain how knowledge of the “Little Ice Age” might influence this perception of “desired” future conditions.

15% **6.** Ecological sustainability is a dominant paradigm in restoration ecology just as forest sustainability is in managed forests. Discuss the conditions that demonstrate ecological forest sustainability (note this is not simply sustained yield).

10% **7.** The graph below depicts the level of atmospheric carbon dioxide over the past 1,000 years. Beginning with the Industrial Revolution, CO_2 levels, due to various anthropogenic activities, began to increase and are now 45% higher and still increasing. Describe the effect of increased atmospheric carbon dioxide on forest tree growth.



10% **8.** Climatologists have documented Interannual scale natural Climate Change. The best known of these cycles is the El Niño pattern, also called the El Niño-Southern Oscillation (ENSO). The reverse effect is dubbed La Niña which brings unusually warm and dry falls and winters in central and southern California.

What might be the effects of a decade of unusually warm and dry La Niña on Central and Southern California forests?

Continued on Next Page

15% **9.** At ~ 1000 meters (~ 3200 feet) elevation, the lower edge of the "Yellow Pine Belt" (dominated by *Pinus ponderosa*) in central California has retreated upslope about 526 meters (1700 feet) since 1850. Effects known to influence this effect (grazing, competition by nonnative grasses, urbanization, and fire) occurred on only 42% of the total area of change. Due to temperature rebound following the "Little Ice Age" and increases in greenhouse gases, the monthly minimum temperatures in the middle-elevation central Sierra Nevada Mountains have increased over the past 100 years by about 3°C (5.4° F).

How might this temperature increase have influenced the shift in Pine vegetation?

End of Question

QUESTION III-FOREST ECONOMICS

OBJECTIVE

To demonstrate understanding of the relationship of value to specific variables within a forest timber management regime.

SITUATION

Many contemporary resource management projects involve decisions regarding the harvest, retention or manipulation of forest vegetation. In making management recommendations it is important for an RPF to understand the relationship between value and resource elements.

QUESTIONS

35% **1.** For any important commercial forest tree species grown in California:

(10%) 1. a. Draw a graph illustrating what you consider to be typical relationship between STUMPAGE VALUE or delivered log value PER MBF LOG SCALE (vertical axis), and DIAMETER AT BREAST HEIGHT (horizontal axis). Graph paper provided on the next page.

(25%) 1. b. Discuss the dynamics of, and reasons for, what occurs along the curve you have drawn. Label critical points.

20% **2.** The SHAPE of the curve (relationship between VALUE and DBH) will change over time with changes in forest product prices, logging costs, and processing costs etc. Discuss IN DETAIL what forces might lead to substantial changes in the shape of the curve.

45% **3.** Financial Maturity

(15%) 3. a. Explain how the concept of financial maturity works when making decisions on the harvesting of EVEN-AGED timber stands.

(15%) 3. b. Explain how the concept of financial maturity, as discussed above, might be adapted to determine optimal lengths of cutting cycles and the levels of residual growing stock when timber stands are being managed utilizing the selection method.

(15%) 3. c. Explain which economic factors, other than financial maturity, would be important in a "real world" situation of a timberland owner deriving income by selling delivered logs or stumpage from a 10,000-acre tract. (Do **not** consider the case of an owner who processes their own timber.)

Graphs Continued on the Next Page

Question # _____# APPLICANT'S NUMBER= _____#

				Relative Log Stumpage Value by DBH Class								
	25											
Relative	20											
$ / MBF	15											
	10											
	5											
	0	5	10	15	20	25	30	35	40	45	50	
						DBH						

END OF QUESTION

QUESTION IV-SILVICULTURE

OBJECTIVE:

To demonstrate understanding of silviculture principles and their application to managed stands.

5% **1.** As used in silviculture, what is stocking?

5% **2.** As used in silviculture, what is thinning?

9% **3.** Name three (3) primary objectives of thinning.

12% **4.** Describe four (4) of the following thinning styles: crown thinning, free thinning, low thinning, mechanical thinning, selection thinning.

10% **5.** What is stand density?

10% **6.** What is the stand density as shown in "normal stand tables"?

5% **7.** What is relative stand density?

5% **8.** What is the major advantage of using a stand density index over basal area or volume per acre as a stocking guide?

***6*%** **9.** Rank the following species (mixes) from highest (1) to lowest (6) as to their Reinecke stand density index (SDI) maximum: Ponderosa pine (CA), Sierra Mixed Conifer, Coast redwood, White fir (CA), Incense cedar, Douglas fir (CA). Maximum Reinecke stand density index equals the number of stems per acre at full site occupancy when QMD = 10 inches dbh.

10% **10.** What is stand density management? What two (2) specific growing stock control points are used in stand density management?

5% **11.** What are density management diagrams? An example is shown on the last page of this question.

Continued on Next Page

18% **12.** Review the density management diagram for Douglas fir shown at the end of this question.

(6%) 12. a. If a plantation has 350 well established trees per acre, what QMD and average height will the stand have when the canopy closes?

(6%) 12. b. Assume that same stand is low thinned when the canopy closes. What should the residual TPA be of that thinning if you wish the stand QMD to be about 15" when density reaches the zone of imminent competition induced mortality?

(6%) 12. c. How many well-established seedlings are needed per acre to begin a stand which will have a QMD of 13 inches dbh when it reaches the zone of imminent competition mortality?

DIAGRAM CONTINUED on NEXT PAGE

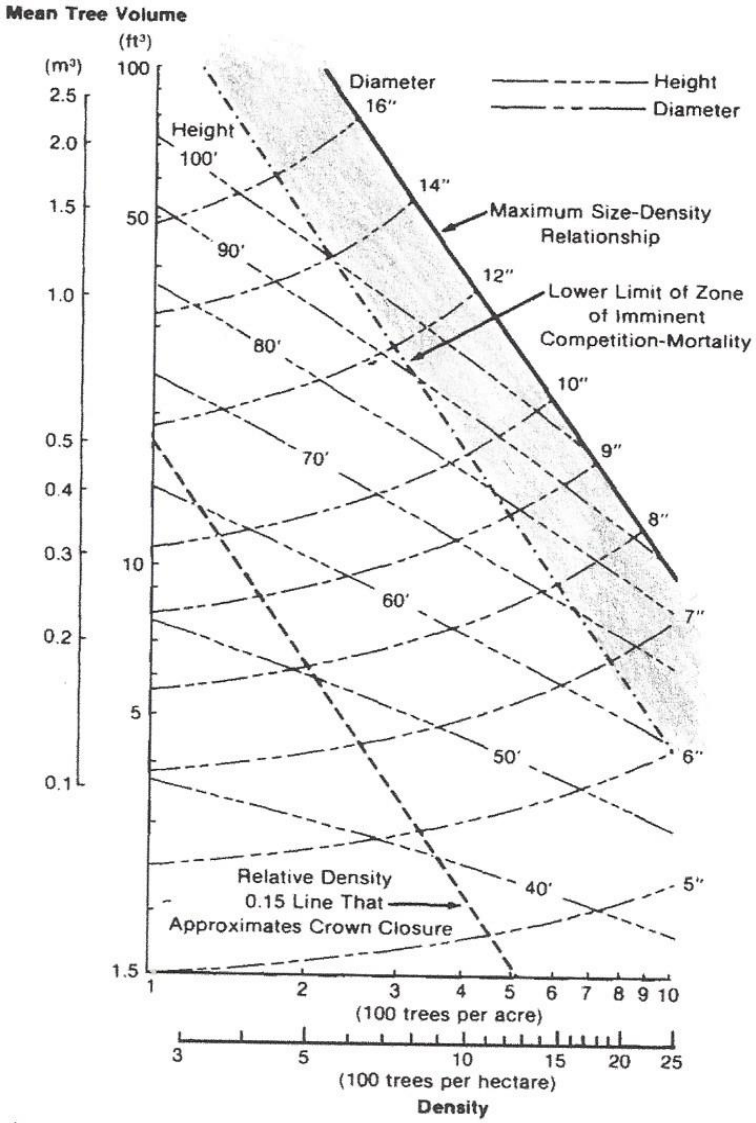


Figure 2. Stand management diagram for Douglas-fir with estimates of diameter and height.

End of Question and Answer

QUESTION V- FOREST PROTECTION

OBJECTIVE

To demonstrate your ability to identify and assess factors relevant to archeological review and protection of archeological resources.

SITUATION

A THP has been proposed on private commercial forest property in California. You are the RPF responsible for the project. Assume there is no other RPF or Professional Archaeologist available for this project. As the plan signatory RPF you are responsible for completeness and accuracy of all information in this matter even though you may employ someone else with an Archaeological Training Certificate.

QUESTIONS

30% 1. Identify and discuss the archaeological background information you will need to obtain to comply with present forest practice rules and regulations and to carry out an efficient discovery phase of the archeological review.

20% 2. Assume that you are ready to implement an archaeological survey of the project area, two survey procedures must be followed and addressed in your (or your supervised designee's) survey report, the **SURVEY METHOD** and the **SURVEY INTENSITY**. Describe and explain these important survey procedures. Give examples.

20% 3. During your field survey, a cultural site is found that must be addressed. In order to determine what mitigation measures might be necessary and to what degree the project may have an adverse effect, the California Environmental Quality Act and forest practice rules usually require that significance of the site be considered and addressed. Describe and discuss five elements of significance.

25% 4. Once significance has been considered and the project's site-specific objectives evaluated, describe and explain **enforceable protection measures** both within the site and within 100 feet of the site boundaries.

5% 5. What type of training and certification is required in California to conduct the type of field work discussed above?

END OF QUESTION

Professional Foresters Registration Examination October 2022

Part II

Applicant Must Also Answer Three (3) of the Remaining Five Essay Questions in Part II

Question VI-Forest Mensuration
Question VII-Engineering
Question VIII-Forest Administration
Question IX-Forest Policy
Question X-Forest Management

Professional Foresters Registration
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QUESTION VI - FOREST MENSURATION

OBJECTIVE

To demonstrate your ability to analyze various forest conditions and situations to design and conduct an appropriate cruise.

SITUATION

A client retains you to cruise three separate tracts of timber she owns. She is interested in the volume of net merchantable timber on each tract. The tracts are described below. The client's purpose and her general instructions are also shown for each tract. For all tracts, assume that 1) there is no effect of recovery of value based on forest practice or other environmental regulations and 2) all tracts have nearly the same degree of reasonable access.

Tract I

SIZE: 640 acres

LOCATION: Trinity County, California

TYPE OF TIMBER: Contains larger second growth and old-growth ponderosa and sugar pine, white fir, and associated conifers over entire area.

BOUNDARIES: No information available from client.

CRUISE PURPOSE: For client's use in estimation of minimum acceptable value. Timber to be offered for sale on a per species stumpage basis at public sealed bid and sold for highest bid from a responsible bidder (provided minimum is met or exceeded).

RESTRICTIONS ON INTENSITY, TIME, CONSTRAINTS, or COST OF CRUISE:

Client requests that cruise intensity be adequate to protect her from setting a minimum acceptable bid which would be either too low or too high but cannot afford an intensive cruise. Cruise is to be completed within two months.

Tract II

SIZE: 40 acres

LOCATION: Del Norte County, California

TYPE OF TIMBER: Moderately dense stand of virgin old-growth redwood over entire area.

BOUNDARIES: Blazed, flagged, and K-tagged lines marked by a recent recorded survey by a licensed land surveyor retained by client.

CRUISE PURPOSE: For use in court to support client's claim of substantially higher values than offered by a condemning public agency.

RESTRICTIONS ON INTENSITY, TIME CONSTRAINTS, or COST OF CRUISE:

None

Continued on the Next Page

Tract III

SIZE: 6,400 acres

LOCATION: Placer County, California

TYPE OF TIMBER: Scattered, older residual stands of mixed conifers with patches of young growth timber left after logging in the 1960-1970s. Approximately one-third of the property is in non-timbered areas including brush-fields, rocky land, and meadows.

BOUNDARIES: No information available from client. Intermingled and adjoining large diameter timber, including some not previously logged stands, of other private and public ownership is known to exist.

CRUISE PURPOSE: For client's use in planning for future management. No timber sales contemplated soon.

RESTRICTIONS ON INTENSITY, TIME, CONSTRAINTS, or COST OF CRUISE:

Client stipulates cruise costs should be kept to the minimum needed for management planning on a general basis. Time for completion is one year. Cruise intensity to be adequate to give reasonable estimates by species for the entire property. No breakdown of cruise data by smaller subdivisions is necessary.

QUESTIONS:

Answer the following questions for **EACH** tract:

60% 1. Briefly describe the type of cruise you would recommend. Justify the cruise intensity, layout, and what measurements are needed. Also state what additional resources or sources of information that should be provided to you, or you would procure to accomplish the cruise. Include your reasons for selecting that type of cruise over the alternatives.

15% 2. Explain what field tools/instruments and procedures you would use during the cruise to obtain the measurements you recommended in part 1, above.

10% 3. What steps would you take to identify the property boundary lines?

15% 4. What sources should you use to estimate yield, defect and breakage, and log grade information for this cruise.

END OF QUESTION

QUESTION VII-FOREST ENGINEERING

OBJECTIVE
To demonstrate your knowledge of the Shovel Logging system and methodology.

SITUATION
Shovel logging (often called hoe-chucking in Canada) has been in use since the 1970s. It has been proven to be highly productive and economical and has become increasing utilized on settings with more difficult terrain, previously considered “cable ground”. In some companies, it has become the main method of ground-based logging.

QUESTIONS

45% 1. Describe how this logging system is A) equipped, B) techniques used, and C) operational considerations to be considered. Please draw a basic equipment diagram to support your written answer.

20% 2. Shown on the next two pages are two logging units that will be logged by shovel. Unit A is on gentle terrain (e.g., flat to 25%). Unit B is a steeper unit (e.g., up to 40-50%), but within acceptable limits for shovel logging. Draw a typical, efficient shovel logging pattern for each unit that accommodates the machinery and its limitations. Be sure to indicate where the shovel will start and end it’s bailing, how many swings will be required, the direction of movement across the logging unit, and the basic movement of swinging logs so as to end up with them all down at the road.

15% 3. In many states, shovel logging is permitted under wet and rainy conditions whereas other ground-based systems are often curtailed by Forest Practice Rules. Explain how this may be allowed in light of current erosion and stream water quality concerns.

20% 4. How can a system employing an expensive piece of equipment with high maintenance and operating cost that requires the repeated handling of each piece be cost effective? List and briefly discuss four (4) reasons this is an economical system.

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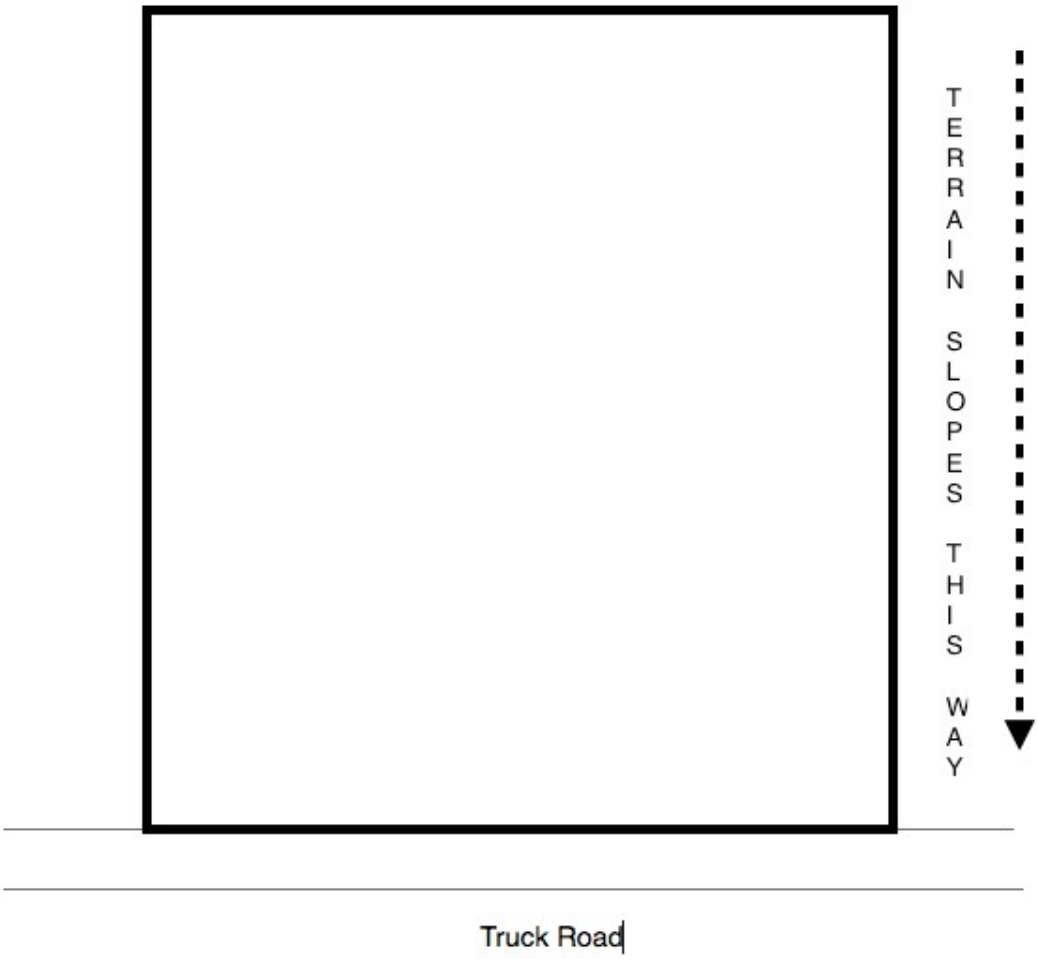
UNIT A: GENTLER TERRAIN

APPLICANT'S NUMBER = _____#
QUESTION NUMBER = VII



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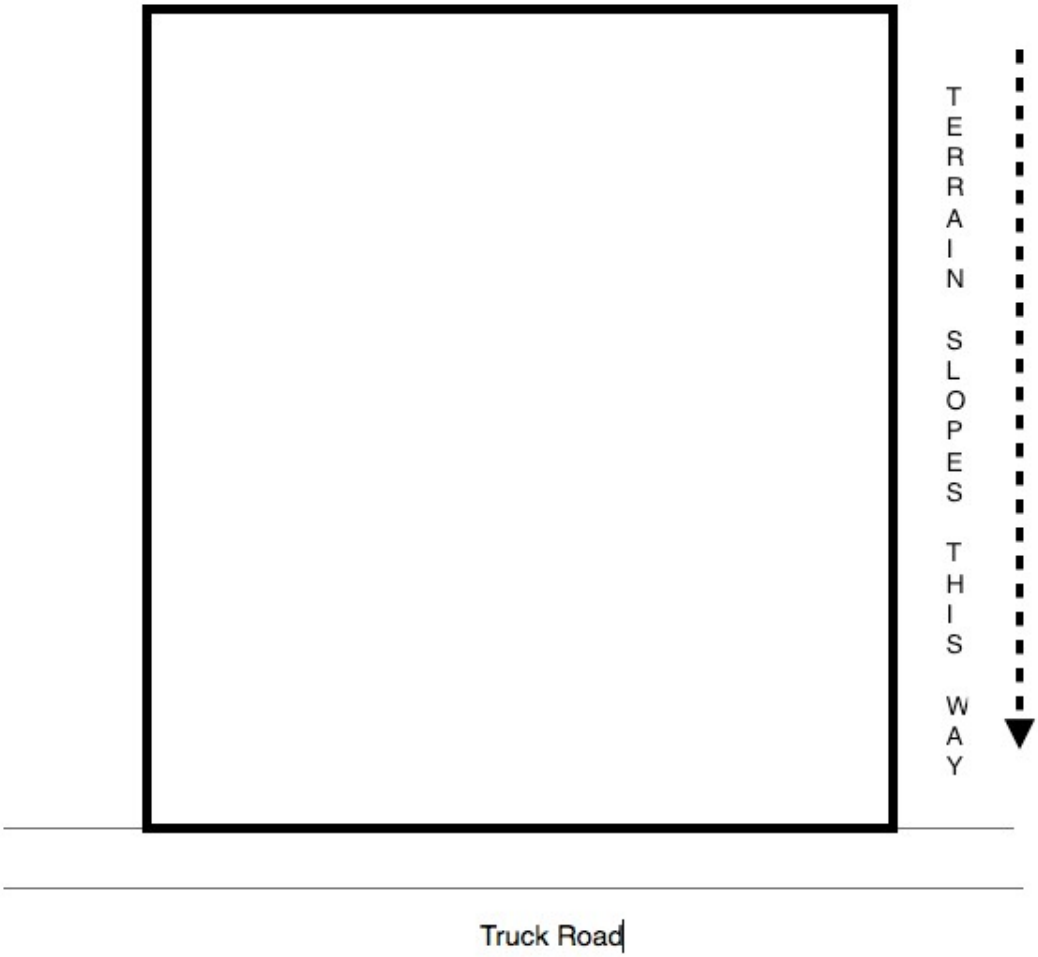


END of QUESTION

QUESTION VIII- FOREST ADMINISTRATION

OBJECTIVE:

To demonstrate your knowledge about evaluating forest programs requiring monitoring.

SITUATION:

Tens of millions of dollars are invested annually by California forest landowners in habitat restoration-rehabilitation, both terrestrial and aquatic. Well-designed monitoring must be an integral part of any restoration project. Monitoring is technically defined as systematically checking or scrutinizing something for the purpose of collecting specified categories of data. Besides monitoring types and methods, the appropriate scale, both geographical and temporally, must be considered. Assume that you are in charge of an aquatic restoration effort for your ownership to establish sufficient large wood structure (LWS) and to improve salmonid habitat and function. Answer the following questions:

QUESTIONS:

60% 1. Using the assumed project given above, For <u>each</u> of the six (6) monitoring types

listed below:

I. Baseline Monitoring:

II. Status Monitoring:

III. Trend Monitoring:

IV. Implementation/Compliance Monitoring:

V. Effectiveness Monitoring

VI. Validation Monitoring:

(42%) a) Give a concise definition for each type of monitoring. State the key questions(s) you will try to answer with each type of monitoring.

(18%) b) Give an example of what might be monitored in this project for each type of monitoring.

28% 2. Explain how the placement of large wood structure into selected stream locations will improve or impact the following four (4) major restoration-rehabilitation beneficial conditions: **Pools, gravel, channel complexity and flow**. Limit yourself to direct benefits to salmonids, even though there may be benefits to other biota.

Continued on the Next Page

12% 3. Assuming that the addition of large wood structure is needed in the stream locations selected, discuss how past forest and fisheries management have led to this deficit in California (and other western states).

END OF QUESTION

QUESTION IX FOREST POLICY

OBJECTIVE:

To demonstrate your understanding of Federal Laws that effect private forests in California and other states.

SCENARIO:

Private forestry operations are regulated by a fairly complex set of laws, regulations, and non-regulatory policies at the federal, state, and local level. The resulting framework can be complicated and can vary widely between jurisdictions. While RPFs are expected to understand State of California forest practice regulations and policy, they are also expected to understand certain Federal Laws that also must be understood and complied with in forestry operations in California.

QUESTIONS:

50% 1. The **Federal Clean Water Act.)** is arguably the predominantly federal law impacting private forest land operations. Write a relatively complete explanation of what this Act or set of Regulations covers and how these laws have been implemented in California for forestry on private lands from a RPF's standpoint.

50% 2. Listed below are five other Federal Acts. Write a relatively complete explanation of any TWO (2) of these acts including what each of the two (2) Acts or set of Regulations covers and how these laws have been implemented in California for forestry on private lands from a RPF's standpoint.

A. Clean Air Act
B. Endangered Species Act
C. Insecticide, Fungicide, and Rodenticide Act
D. Coastal Zone Management Act
E. Migratory Bird Treaty Act

END OF QUESTION

QUESTION X- FOREST MANAGEMENT

OBJECTIVE:

To demonstrate your understanding of basic forest management concepts of even age stand growth.

SITUATION:

You must answer these questions with written explanations, definitions, and graphs. For the graphical illustrations, please draft them on the graph sheets provided for your use. You may remove them from the examination packet, for ease of use during the examination, but **YOU MUST hand in the graph** sheets with your written answers. Be sure to place your **Applicant's Number** in the provided space on the graph sheets. Be sure to adequately label graph axes with titles, units, and/or values to make your graph understandable.

QUESTIONS

60% 1. Assume that you are depicting the following attributes for a well-stocked even-aged young growth stand of Douglas-fir.

(10%) A. For part A, further assume that no intermediate stand manipulations will be done. On a single graph, depict what the number of trees per acre by diameter class would look like at 40, 80 and 100 years stand age. Explain what is happening in biological terms. Assume there will be no **catastrophic losses** to fire or pests over those stated ages. (Note-Graders will be looking for a correct answer that is in the "ballpark" as to numbers of trees being depicted and relative changes in number of trees as the stand ages, not exact numbers.)

(5%) B. What commonly performed stand management treatment attempts to take advantage of the biological behavior you have described in 1A above?

(15%) C. Depict a graph of **total** stand volume per acre as a function of stand age.

Define the term total stand volume and explain why your graph behaves in the way you have drawn it.

(15%) D. On a single graph, depict typical curves for periodic annual growth increment (PAI) per acre and mean annual growth increment (MAI) per acre. Clearly label which curve is PAI and MAI. Define the terms and explain why the curves behave in the way and position you have drawn them.

Continued on the Next Page

(15%) E. Explain and define the concept of culmination of mean annual growth increment and the age that it occurs for a stand.

Does this concept apply to both even-aged and uneven-aged stands? Explain and justify your answer.

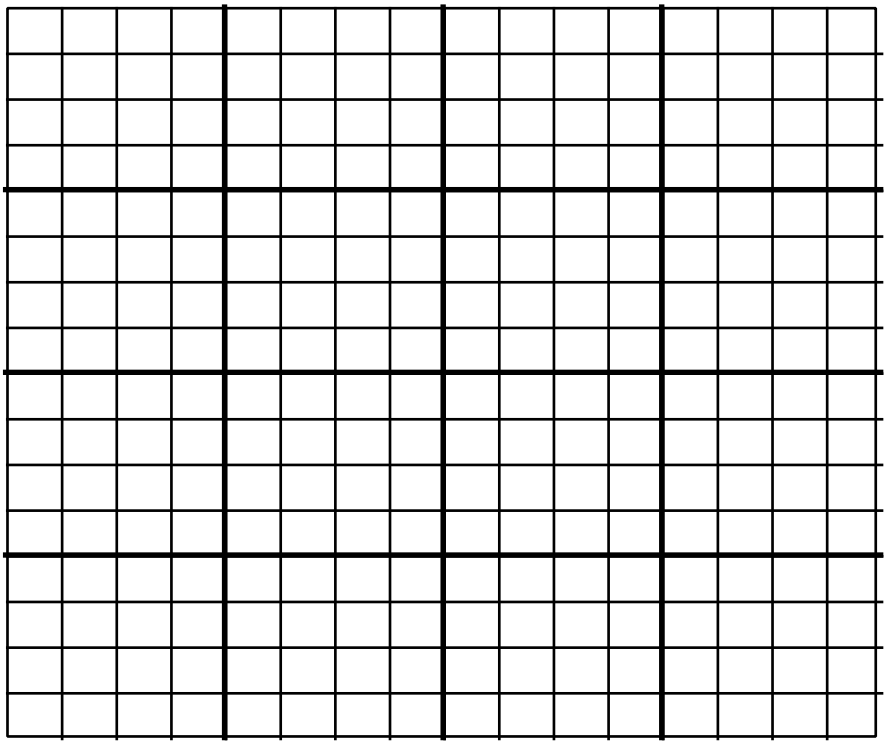
20% **2A**. Assume that you are interested in expressing the above concepts in relation to useable or net volumes, rather than total volumes. Explain the affect that switching from a total volume basis to a net volume basis would have on the calculation of the age of the culmination of mean annual increment.

20 % **2B.** Assume that your management plans include a change in volume rule from Scribner Board Feet to Cubic Feet or from a minimum top diameter of 8-inches to a minimum top diameter of 4-inches. Explain the affect that switches in utilization standards such as these would have on the calculation of the age of the culmination of mean annual increment.

GRAPH FORMS FOLLOW
On Next Pages

GRAPH FORMS FOR USE WITH MANAGEMENT QUESTION X APPLICANT NUMBER_____

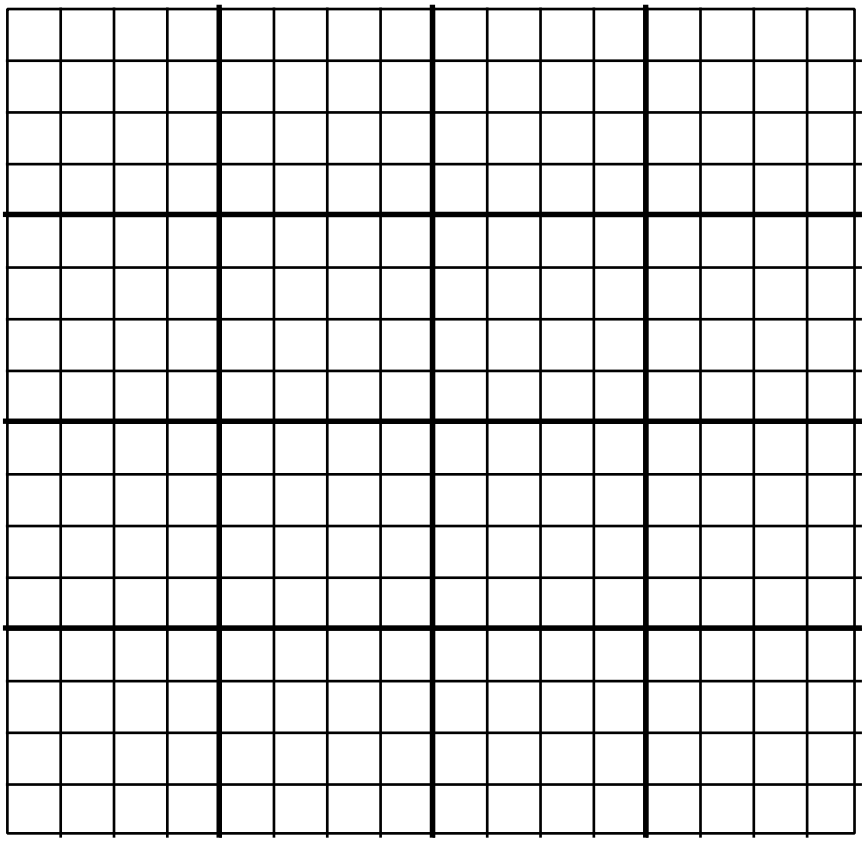
GRAPH FOR QUESTION #1A & B



HAND IN WITH ANSWERS AND EXAM

GRAPH FORMS FOR USE WITH MANAGEMENT QUESTION X **APPLICANT NUMBER _____**

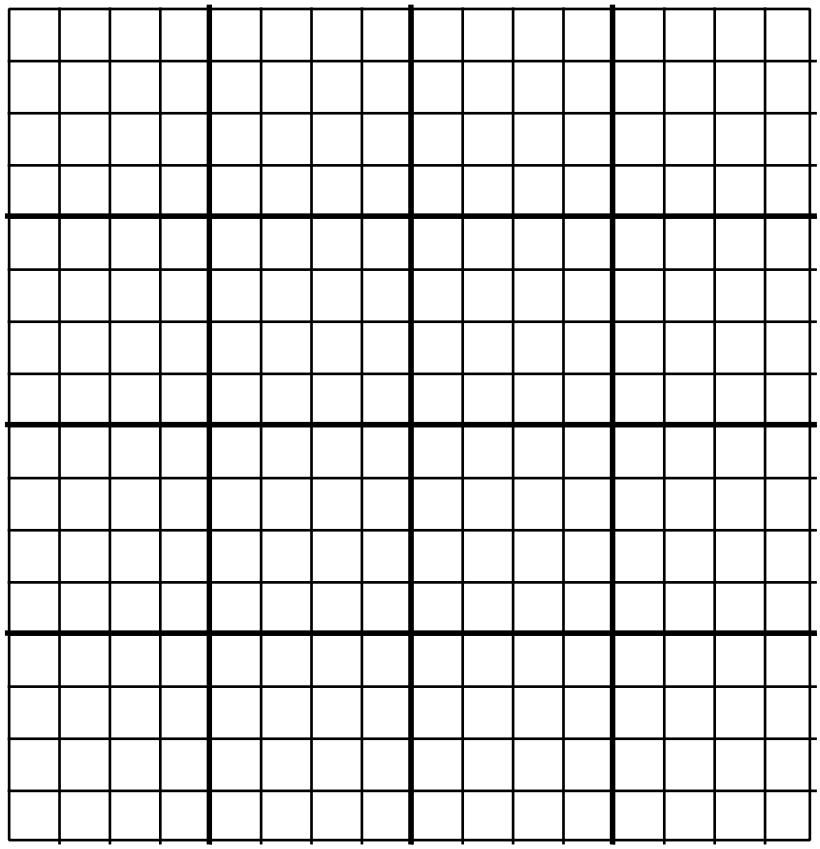
GRAPH FOR QUESTION #1C



HAND IN WITH ANSWERS AND EXAM

GRAPH FORMS FOR USE WITH MANAGEMENT QUESTION X APPLICANT NUMBER _____

GRAPH FOR QUESTION #1D



HAND IN WITH ANSWERS AND EXAM

END of QUESTION

END OF EXAM