

**Professional Foresters Registration Examination, April 5, 2024**

**PART I**

**Instructions: APPLICANTS, PLEASE READ THESE INSTRUCTIONS CAREFULLY. You MAY complete PART I by:**

**ANSWERING 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**

Professional Foresters Registration  
1416 9th Street, Room 1506-16  
Sacramento, CA 95814

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

### **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.**

<b><u>Acronym or Abbreviation</u></b>	<b><u>Full Text</u></b>
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

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

**April 2024 RPF EXAMINATION – SHORT ANSWER**

**3%**    1. As used in forest engineering, what is Average yarding distance?

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**3%**    2. As used in forest carbon projects, define (do not list individual gases) greenhouse gas (GHG)?

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**3%**    3. Tree windthrow is a threshold event. Aside from wind, list and briefly explain three (3) conditions or events that trigger or predispose trees to windthrow.

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**3%**    4. According to the FPRs, what is the intent of the Selection Regeneration method?

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**3%**    5. As used in forest engineering, what is an Accumulating shear and how does it function?

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**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.** According to the FPRs, what is the intent of the Sanitation-Salvage method?

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**3%**   **7.** As used in forest engineering, what is the Back guy and how does it function?

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**4%**   **8.** According to the FPRs, describe four (4) conditions that indicate a "dying tree"?

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**3%**   **9.** According to the FPRs, what are three (3) of the Beneficial Functions of the Riparian Zone?

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**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%**   **10.** According to the FPRs, describe three (3) characteristics of Functional Foraging Habitat for birds.

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**3%**   **11.** According to the FPRs, what is the intent of Transition Regeneration method?

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**3%**   **12.** In forest economics, what is amortization?

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**3%**   **13.** In forest economics, what is depletion?

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**3%**   **14.** Wildfires produce harmful complex mixtures of air pollutants. List three (3) of these pollutants.

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**3%**   **15.** What is a Silvicultural system?

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**3%**   **16.** As used in forest carbon projects, what is a life cycle assessment (LCA)?

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**3%**   **17.** As used in forest carbon projects, what is additionality?

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**3%**   **18.** According to the FPRs, what is the intent and process of the Shelterwood regeneration method?

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**4%**   **19.** According to section 897 of the FPRs, the goal of forest management on a specific ownership shall meet four (4) objectives. What are these objectives?

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**4%**   **20.** As used in silvics, describe what are four (4) characteristics used to describe Conifers, not just the names of conifers?

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**3%**   **21.** As used in forest certification, what is the chain of custody?

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**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%**    **22.** As used in forest certification, what does certify mean? Name three (3) common forest certification programs used in California.

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**3%**    **23.** Briefly explain three (3) methods of processing small diameter trees.

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**3%**    **24.** What is a Conservation Easement?

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**3%**    **25.** What are Legumes? List two forest legume plants.

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**3%**    **26.** As used in forest mensuration, what is Ingrowth?

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**3%**    **27.** As used in forest carbon projects, what is Carbon Offsetting?

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**3%**    **28.** How does the **Net Present Value calculation** for a proposed crop rotation change as inflation rates change?

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**3%**    **29.** As used in forest management and water quality protection, what are Best Management Practices?

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**3%**    **30.** As used in forest management and products, what is Renewable Energy?

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**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% 31.** What is 3P sampling? Describe the basic field process for 3P sampling.

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**3% 32.** A rectangular piece of land measures 40 chains by 78 chains. How many acres (round to acres) are in this piece of property? Please show your work including the units of measure.

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**End of Short Answer Question #1**

## QUESTION II-FOREST ECOLOGY

**OBJECTIVE:** Demonstrate your ability to read and comprehend developing forest science information.

**SITUATION:** The abstract of a research report is shown below.

### **Natural range of variation for yellow pine and mixed-conifer forests in the Sierra Nevada, southern Cascades, and Modoc and Inyo National Forests, California, USA**

**Authors:** Hugh D. Safford, Jens T. Stevens

**Year:** 2017

**Type:** General Technical Report

**Station:** Pacific Southwest Research Station

**DOI:** <https://doi.org/10.2737/PSW-GTR-256>

**Source:** Gen. Tech. Rep. PSW-GTR-256. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 229 p.

#### **Abstract**

Yellow pine and mixed-conifer (YPMC) forests are the predominant montane forest type in the Sierra Nevada, southern Cascade Range, and neighboring forested areas on the Modoc and Inyo National Forests. YPMC forests occur above the oak woodland belt and below red fir forests and are dominated by the yellow pines (ponderosa pine and Jeffrey pine); white fir; sugar pine; incense cedar; and black oak, along with a number of other hardwood and conifer species.

We conducted an in-depth assessment of the natural range of variation (NRV) of YPMC forests for the assessment area, focusing on ecosystem processes and forest structure from historical data sources from pre-Euro-American settlement times (16th through mid-19th centuries) and current reference forests (YPMC forests that have retained frequent fire and have suffered little human degradation), and comparing current conditions to the NRV.

The Mediterranean climate of the assessment area, modified by strong latitudinal, topographic, and elevational gradients, plays an important role in shaping the structure and composition of YPMC forests.

Fire was an historically important ecosystem process that occurred frequently, generally burned at low to moderate severity, created a heterogeneous forest structure at a fine spatial scale, and maintained pine dominance in many stands that would otherwise undergo succession to more shade-tolerant fir and cedar species.

Forest structure at larger spatial scales was highly variable but was characterized mostly by relatively low tree densities, large tree sizes, high seedling mortality as a result of recurrent fire, and highly heterogeneous understory structure that could include locally abundant fire-stimulated shrub species. Following Euro-American settlement, wholesale changes occurred in YPMC forests in the assessment area, principally because of extensive logging followed by a century of highly effective fire suppression. Modern YPMC forests have departed from NRV conditions for a wide range of ecosystem processes and structural attributes.

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There is strong consensus among published studies that, on average, modern YPMC stands have much higher densities dominated by smaller trees (often of shade-tolerant species), much longer fire-return intervals, and less area burned across the landscape compared to reference YPMC forests. In addition, fires that escape initial attack are much larger and higher severity on average than the average pre-Euro-American settlement fire.

There is more moderate consensus among published studies that the average modern YPMC stand in the assessment supports greater fuels and deeper forest litter, higher canopy cover and fewer canopy gaps, more coarse woody debris, a higher density of snags, and experiences a longer fire season compared to reference YPMC forests. Among the variables assessed, only basal area, overall plant species richness, and percentage cover of grass/forbs and shrubs appear to be within or near the NRV.

**QUESTIONS:**

**4% 1. Starting from the Sacramento valley heading East name four (4) montane forest types listed in the abstract.**

**6% 2. What climate and location variables shape the structure and composition of the YPMC forests?**

**10% 3. How did the scientists estimate the pre-Euro-American settlement natural range of variation (NRV)?**

**20% 4. How did fire shape the pre-Euro-American NRV?**

**10% 5. Describe the NRV forest structure at larger spatial scales.**

**10% 6. What were the two (2) primary causes of wholesale departures from the NRV following Euro-American settlement?**

**10% 7. What current forest characteristics appear to be within or near the NRV?**

**30% 8. Describe how modern YPMC forests have departed from NRV conditions.**

**End of Question**

## QUESTION III-FOREST ECONOMICS

**OBJECTIVE:** Demonstrate your ability to understand the economic value of California's Forest and Forest Products sectors

**SITUATION:**

Forestry and forest-products industries are important contributors to California's economy. Analysis provides an estimate of the direct economic benefits of current forest management activities and related forest-products manufacturing, not only to rural, forest-dependent communities, but also to urban areas that benefit from downstream, forest-products manufacturing.

**QUESTIONS:**

**5%** 1. What is forestland?

**5%** 2. How much forested area does California have? What proportion of California is forested?

**5%** 3. Only about 50% of California forestland is unreserved thus available for forest management. Approximately what proportions of these available forest lands are managed by each of Federal, corporate and noncorporate owners?

**20%** 4. Forest economists utilize input-output sector analysis to measure the scale of California's forest resources sector and the interconnectedness of other economic sectors. This methodology analyses indirect and induced economic effects of forest management and direct processing of harvested trees. The method develops multipliers which capture economic values beyond direct effects of forestry and forest products. Describe these indirect and induced economic effects.

**(40%)** 5. The direct impact of California's Forest and forest products sectors is about \$ 22 billion employing ~ 82,000 workers, with ~\$5 billion in payroll. Only ~5,700 workers and ~\$437 million are directly from forestry and logging. The remainder comes from solid forest products, pulp and paper, and furniture manufacturing.

**25%** 5.a. Paper board and bag manufacturing employs ~ 22,000 adding ~\$11 billion in value. Furniture manufacturing employs ~27,000 adding ~ \$4.2 billion in value. None of the pulp and very little of the resources used in these sectors are produced in California. Only a small proportion of California's biomass is used in these sectors.

Discuss the prospects for changing the raw material to California sources and the resultant effect on California forestland.

**15%** 5.b ~43,000 forest product manufacturing jobs are located in Southern California, compared to ~ 5,700 jobs in Forestry and logging primarily located in Northern California. Discuss the social and political ramifications of so many Forest product jobs located in Southern California.

**25%** 6. The total direct, indirect, and induced economic effects of the Forest and Forest Products sectors in California includes ~ 177,000 jobs, ~ \$11 billion income and ~\$39 billion in output. California has the largest number of employees in the Forest Products sector of any state. California agriculture creates \$83 billion in output, the highest of any state.

Northern California Forest watersheds provide 75% of the state's water of which ~40% is used by agriculture.

About what proportion of the annual precipitation that falls on these Northern California Forest watersheds is delivered to groundwater and watercourses to support fish and wildlife then downstream to support populations, agriculture, and commercial uses?

What proportion of the Gross output of California's Forest sector is contributed by the water supplied by the forest?

**End of Question**

## QUESTION IV FOREST SILVICULTURE

### OBJECTIVE:

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

### SETTING:

The timberland of California. Understanding the genetic impacts of silvicultural practices is crucial for conservation and management of forest genetic resources. Survival and productivity of both tree and non-tree species can be compromised or, possibly, enhanced.

### QUESTIONS:

- 5% 1. What is **biological diversity**?
- 5% 2. What is the **basis** of biological diversity?
- 5% 3. What are the main **sources of biological diversity** in forests?
- 5% 4. Why is an understanding of the **genetic impacts of silvicultural practices** crucial for conservation and management of forest genetic resources?
- 20% 5. What determines the **extent of genetic impacts** of forest management on trees? **Compare and contrast management effects versus natural disturbance effects on genetic diversity.**
- 15% 6. Discuss in general terms what determines the **genetic impacts** of **Selection** Forest management regimes **utilizing natural seed fall regeneration** on commercial tree species? Discuss how your concepts apply to a high site Sierra Mixed Conifer stand managed by Single Tree Selection with a residual basal area of ~150 sq. ft. / ac. basal area.
- 15% 7. Discuss in general terms what determines the **genetic impacts** of **Seed tree** forest management regimes **utilizing natural seed fall regeneration** on commercial tree species? Discuss how your concepts apply to a high site Sierra Mixed Conifer stand managed by Seed Tree seed step silviculture with a residual basal area of ~15 sq. ft. / ac. basal area.
- 15% 8. Discuss in general terms what determines the **genetic impacts** of **Shelterwood** forest management regimes **utilizing natural seed fall regeneration** on commercial tree species? Discuss how your concepts apply to a high site Sierra Mixed Conifer stand managed by Shelterwood seed step silviculture with a residual basal area of ~50 sq. ft. / ac. basal area.
- 15% 9. What determines the genetic impacts of forest management regimes utilizing **plantation regeneration** on commercial tree species?

End of Question

## QUESTION V FOREST PROTECTION

**OBJECTIVE:** Demonstrate your ability to understand and mitigate post fire soil impacts.

**SITUATION:** Wildfire can impact soil and vegetation, and lead to various effects that can increase or decrease post-fire runoff and erosion. Intense wind driven canopy stand replacement wildfires impact soils the most. Consider the effects of these fires when answering the questions below.

### QUESTIONS:

- 10%** 1. What is the primary immediate direct effect of wildfire on a forest?
- 10%** 2. How do the effects of wildfire on the forest change the initial fate of precipitation?
- 15%** 3. How does wildfire affect the forest soil?
- 20%** 4. Describe how post fire hydrologic and soil condition changes affect surface runoff and sedimentation.
- 15%** 5. How does rainfall determine post-fire erosion response?
- 30%** 6. Roads and skid trails are critical for moving salvage-logged timber to processing facilities, and landings facilitate the loading of forest products from logged areas onto trucks. With exceptions, most of the road and landing network is usually established prior to the fire and salvage logging. Describe how roads and skid trails are subject to increases in runoff and erosion following wildfire.

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**End of Question and Answer**



**Professional Foresters Registration Examination April 2024**

**Part II**

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

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

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## Question VI-Forest Mensuration

**OBJECTIVE:** Demonstrate your ability to analyze raw data, understand the resulting stand structure, and project its growth over time. Demonstrate your ability to utilize data to develop stand management options.

**SITUATION:** One of your consulting company’s clients has recently acquired a quarter section of timberland. The acquisition includes a management file from former owners. The file includes an 80-acre THP dated 35 years ago, and some raw regeneration survey data from 30 years ago. There is an accepted completion report and satisfactory stocking report in the file.

The THP describes the stand as Site II mixed conifer on North facing tractor operable ground. The THP designated Shelterwood Seed Step regeneration method retaining an average of 15 well-spaced seed/shelter trees per acre from the ~60-year-old at preharvest even aged stand. The seed trees are described as the best codominants and dominants of each commercial tree species averaging ~ 22” dbh. Several dbh boring records confirm the stand age and an average 5 rings per inch growth rate.

No other stand treatments have occurred since that THP. There has not been any substantial fire or pest activity since the previous THP.

**QUESTIONS:**

**20% 1.** Data from a standard regeneration survey from 30 years ago is presented below. The data consists of 40 1/300-acre tree count plots. The plots were on a rectangular grid covering the “least stocked” 40 acres. Metadata shows each letter represents one countable tree of the species where p=Ponderosa Pine, i=Incense Cedar, s=sugar pine, d=Douglas-fir, and w=White Fir. Each cell in the data below represents one plot. Summarize this data to thoroughly describe the regeneration at the time of that survey.

pp	iii	lp	s	ddd		pp	sdp
p	d	S	wpi	dd	ip	id	p
d	wpi	spd	wpisd	dpp	iii	ip	pp
pp		pd	ip	wd	ww	pd	dd
ww	iii	dd	wpi	pd	dpp	dd	pp

**Regeneration data above:**

**10% 2.** Obviously, the true current stand conditions cannot be determined without adequate current field survey. However, foresters learn by observing how various stands develop over time, with and without treatments. You might be tempted to use a digital growth simulator to estimate current stand conditions from available past data. Briefly describe, explain, and justify, which if any, simulator you would use.

**30% 3.** Using manual calculations, thoroughly describe your estimate of current stand conditions based on previous information provided and calculated by you. Site curves and volume tables are provided on the following pages. Show your work and justify the projection process you use.

**Continued on the next page**

10% 4. Estimate the tree gross sawlog volume in the current stand encompassing the data file THP area. The minimum merchantable tree is 14" dbh.

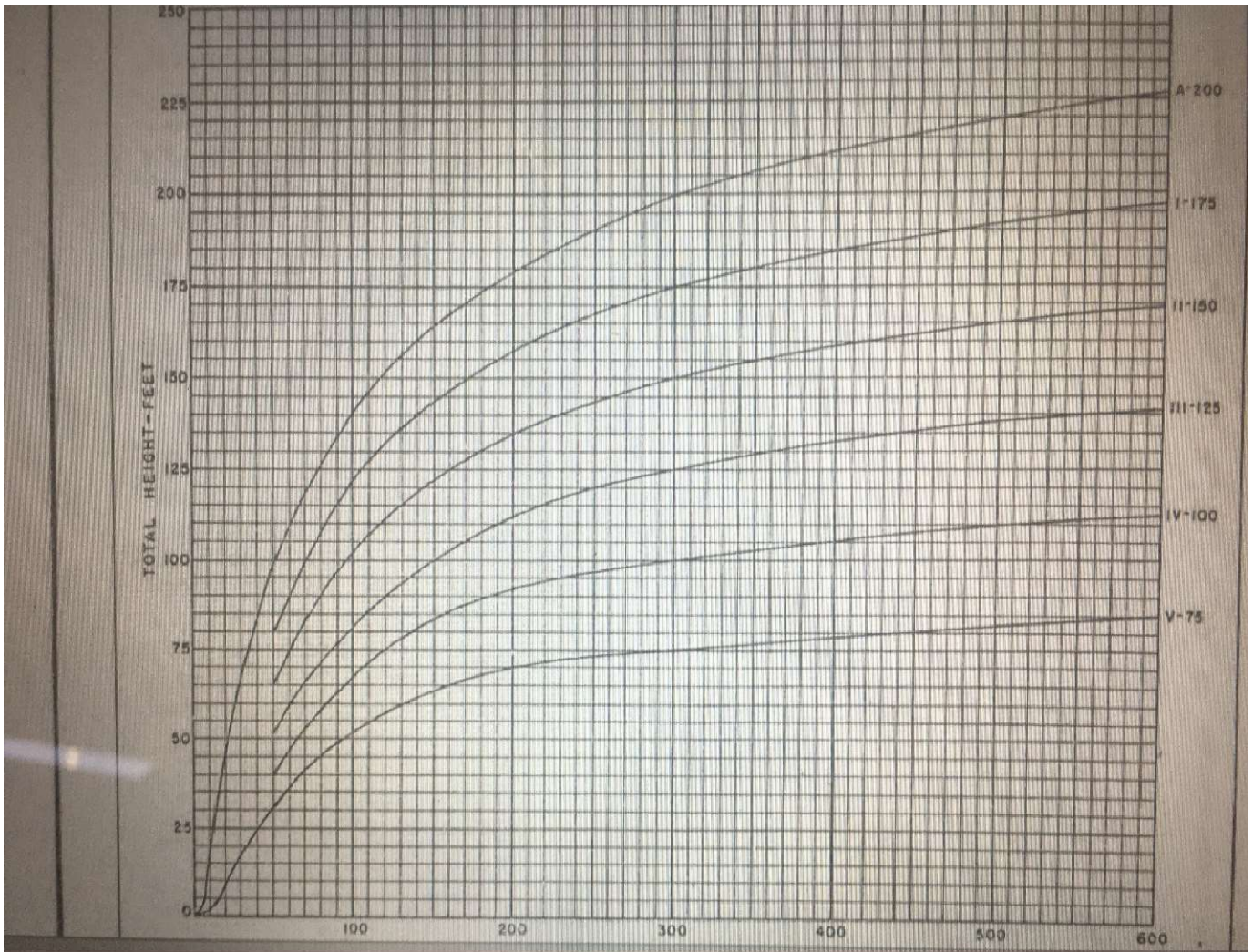
**FORM CLASS 75 Scribner log rule**

VOLUME (board feet) BY NUMBER OF USABLE 16-FOOT LOGS

DBH	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
10	14	25	32	38								
11	19	34	43	52								
12	23	42	54	66	74	83						
13	29	52	68	84	96	107						
14	35	63	82	102	116	131	140	148				
15	41	74	98	122	141	160	172	184				
16	47	86	114	142	165	188	204	220				
17	55	100	133	166	193	220	240	260				
18	62	113	152	191	222	253	276	299				
19	70	128	173	218	255	292	318	344				
20	79	144	195	246	288	331	360	389	412	435		
21	88	160	218	276	324	372	406	441	470	498		
22	97	177	242	306	360	413	453	493	526	560		
23	108	196	268	340	401	462	505	548	588	629		
24	119	216	296	375	442	510	556	603	650	698		
25	130	236	324	412	486	560	615	670	722	774		
26	141	257	352	448	530	611	674	736	794	851		
27	154	280	385	490	580	669	736	804	869	934		
28	166	302	416	531	629	727	800	872	944	1017	1080	1144
29	179	326	451	576	682	789	868	946	1027	1108	1183	1258
30	193	351	486	620	736	851	936	1021	1110	1199	1286	1373
31	207	377	522	667	794	920	1014	1108	1202	1296	1392	1488
32	222	403	558	714	851	988	1092	1195	1294	1392	1497	1602
33	238	432	599	766	914	1062	1174	1285	1391	1497	1614	1730
34	253	460	639	818	976	1135	1255	1375	1488	1602	1730	1859
35	269	489	681	873	1043	1213	1342	1472	1596	1720	1853	1986
36	285	518	723	928	1110	1291	1430	1568	1704	1839	1976	2114
37	301	548	767	986	1182	1377	1524	1671	1818	1965	2112	2258
38	318	579	811	1043	1253	1463	1618	1774	1932	2091	2246	2402
39	337	613	860	1106	1328	1550	1718	1887	2050	2214	2379	2544
40	356	647	908	1169	1403	1637	1818	2000	2168	2337	2512	2687

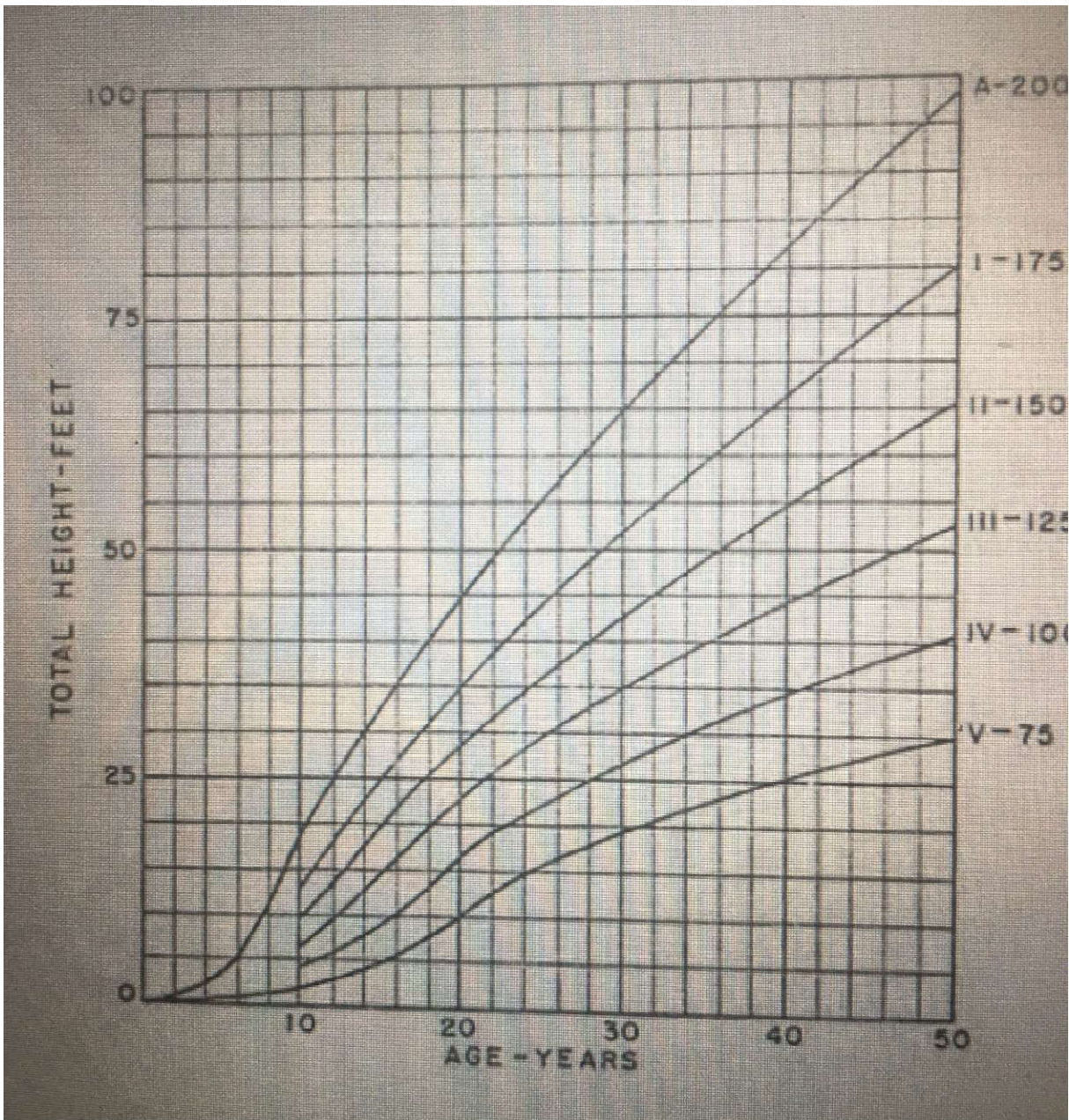
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**Base age = 300 Site Curves**



**Breast Height Stand Age**

Continued on the next page



Site Curve Base age = 300

30% 5. Explain and justify the timing and type of treatment(s) you recommend from now to the next regeneration point. Your clients want to maximize board foot LTSY.

End of Question

## QUESTION VII- FOREST ADMINISTRATION

### OBJECTIVE:

To demonstrate understanding of environmental mitigation measures and effectively apply them.

### SETTING:

The timberland of California. Understanding how to mitigate the potential adverse effects of timber operations is critical to developing and implementing Timber Harvest Plans.

### QUESTIONS:

- 10%** 1. What do the FPRs and CCRs require about environmental effects of activities proposed under a THP?
- 10%** 2. With regard to THP mitigations, how do the FPRs define feasible and economic feasibility?
- 10%** 3. As required by CEQA for THP review, what is a THP project alternative (not an alternative practice)? State three (3) typical THP project alternatives.
- 15%** 4. What are the five (5) general types of mitigations listed in the CCRs?
- 5%** 5. Who is responsible for implementing mitigations that are part of a THP?
- 10%** 6. In developing THP mitigations, what degree of specificity must be used to explain the proposal? Give an example.
- 15%** 7. When developing THP mitigations, what specifically must be stated about why an alternative practice to standard FPR mitigation is appropriate?
- 15%** 8. What constitutes an enforceable standard for a proposed mitigation? Give an example.
- 10%** 9. What are the processes and limits imposed on State Agencies (not Cal Fire) when reviewing proposed THP mitigations?

**End of Question**

## QUESTION VIII-FOREST ENGINEERING

### OBJECTIVE

To demonstrate your knowledge of watercourse crossing design and installation on forest roads as required in the California Forest Practice Act.

### QUESTIONS

**10%** 1. For permanent and seasonal roads, the FPRs require a minimum design storm flood flow for watercourse crossings. Define the term flood flow and specify the minimum flood flow required by regulation on these types of roads:

- a) permanent road stream crossings and
- b) temporary road crossings.

**30%** 2. Three common methodologies used to determine design peak flows for a return period are A) the Rational Equation (also known as the California Nomograph Method) , B) the U.S. Geological Survey (USGS) Regional Flood Frequency Equations (aka: Magnitude and Frequency Method), and C) Talbot's Equation.

For any **TWO** (2) methodologies, define the equation in terms of a mathematical expression or in text (word) terms. Define all symbols and/or variables used and give the units of output and input variables. Be sure to clearly discuss limitations and special circumstances, assumptions built into these methodologies. Where data is to be obtained from special charts, such as precipitation, clearly indicate the source you use. Be specific.

**15%** 3. As most mountain watercourse crossing culverts on forest road systems operate under "Inlet Control" conditions, define the term inlet control and discuss three (3) variables that influence a culvert's discharge capacity under inlet control.

**15%** 4. If the watercourse crossing under consideration is a salmonid stream, briefly discuss five (5) items that you would consider in the crossing's design, location, and/or installation to facilitate and enhance fisheries considerations needs at this crossing.

**15%** 5. For the temporary class of roads in the FPA, describe the watercourse crossing requirements required by the FPA and the steps in final disposition of such crossings.

**15%** 6. Multiple Atmospheric rivers have recently dropped unprecedented amounts of precipitation. Describe how this might affect reconstruction of existing crossings and future crossing designs.

**END OF QUESTION**

## QUESTION IX- FOREST POLICY

### OBJECTIVE:

To determine your general understanding of timber and timberland taxation policy in California.

### SITUATION:

As a RPF, you have been contacted by a newspaper journalist who is writing an article on State taxation of timber and timberlands in California. You want the story to be written accurately and attempt to answer her questions, shown below, without using too much Forester's jargon:

### QUESTIONS:

- 20% 1. Can you tell me how the State taxation of timber and timberland in California generally works? I would like to know the appropriate law(s) that govern this area. Please clearly define any terms, concepts, and acronyms that you think I should know.
- 20% 2. What is the public interest policy objective of the creation of this current method of State taxation of timber and timberland?  
Why not just tax timber and timberland like a home or shopping mall?  
Which State agencies get involved in administering and collecting the taxes from this taxation scheme?
- 15% 3. Can you briefly explain to me **three (3) advantages** that this method of taxation has for the owner and the general public?
- 15% 4. Are there any disadvantages to the owner and public? I'd like to have a balanced view, so tell me **three (3)** disadvantages if you can.
- 20% 5. Is there any way for a landowner to get out of this method of taxation? Suppose he or she wants to build a subdivision on the land? Can he do it right away? Are there financial consequences?
- 10% 6. Can you briefly tell me how the Tax liability on cut timber differs if the owner sells timber as cut logs which the LTO delivers to the mill or if he makes a lump sum sale to the mill of the timber to be cut?

**END OF QUESTION**



## QUESTION X- FOREST MANAGEMENT

**OBJECTIVE:** Demonstrate your ability to plan and execute reforestation for even age management in California.

**SITUATION:** California's forests are often regenerated after harvest or natural disaster.

Planning reforestation of conifers in California is a complex, site specific, time sensitive process.

### QUESTIONS:

**10% 1.** What are five (5) major principles of plantation reforestation?

**50% 2.** Write a complete detailed generic order of operations for planning planted reforestation of a future industrial scale clearcut through age 20.

**10% 3.** As a recent RPF you have experience in inventory and post fire salvage harvest, but not reforestation of industrial scale clearcuts. A client asks for your assistance in finding a RPF highly qualified in reforestation. How would you go about finding candidate RPFs and what would you like to know about them?

**30% 5.** Discuss the issue of funding for reforestation projects. What are some of the sources for funding reforestation after natural disaster? Include options for small forest owners, industrial forest owner, and government agencies.

**End of Question**

**END OF EXAM**