

CONTESTANT NAME _____

2005 UNDERGRADUATE RANGE MANAGEMENT EXAM

Society for Range Management, Wyoming Section Meeting

Casper, Wyoming

November 30 and December 1, 2005

Instructions

This examination consists of 123 questions; 3 are calculation problems and the remainder are multiple choice. Circle the one best answer for each multiple-choice question. Show all work on the calculation problems.

Length of Testing Period

120 Minutes

Grading

Multiple-choice questions are worth 2 or 4 points each for a total of 260 points. Problems are worth 10 or 20 points each for a total of 40 points. The entire examination is worth 300 points.

I. RANGE ECOLOGY (60 points)

1. Soil pH is most often injurious to plants because of its influence on:
 - a. protoplasm of the plant roots
 - b. soil microorganisms
 - c. water absorption
 - d. nutrient availability

2. The study of individual organisms or individual species in relation to their environment is:
 - a. autecology
 - b. synecology
 - c. structural ecology
 - d. macroecology

3. Photoperiodic response that results in flowering initiation in a plant species is an example of:
 - a. compensating factors
 - b. triggering factors
 - c. factor elimination

4. Which of the following is NOT true about energy in ecological systems?
 - a. the sun is the ultimate source of all energy into the biosphere
 - b. energy is efficiently cycled through ecosystems
 - c. the flow of energy through ecosystems drives the hydrologic and nutrient cycles
 - d. it obeys the laws of thermodynamics

5. A locally adapted variant to a species is:
 - a. a biotype
 - b. an ecotype
 - c. a genotype
 - d. a phenotype

6. At which of the following growth stages of a grass plant is a single, close grazing of the plant normally the most detrimental to the vigor of the plant?
 - a. early growth following dormancy
 - b. at boot stage
 - c. during winter dormancy
 - d. during drought dormancy

7. Succession that occurs primarily as a result of change in the habitat caused by organisms is called:
 - a. retrogressive succession
 - b. allogenic succession
 - c. reverse succession
 - d. autogenic succession

8. In the nitrogen cycle, the order of the form of nitrogen from biological fixation of decomposition to atmospheric nitrogen is:
- ammonium - nitrite - nitrate - nitrous oxide
 - ammonium - nitrous oxide - nitrate - nitrite
 - nitrous oxide - ammonium - nitrite - nitrate
 - nitrate - nitrite - ammonium - nitrous oxide
9. An inclusive term that includes not only the physical space occupied by an organism but also its functional role in the community is a(an):
- habitat
 - ecological niche
 - ecological equivalent
 - allopatry
10. Cryptogamic communities are of importance in many arid regions of western North America because:
- they provide protection against wind erosion
 - they may fix atmospheric nitrogen
 - they increase infiltration of water and decrease sediment in the runoff
 - all of the above
 - none of the above
11. The ___ develops into the first leaf of the grass plant.
- scutellum
 - coleoptile
 - coleorhiza
 - plumule
12. The major group of organisms in soils which contribute oxidation processes in the N and S cycles are the:
- bacteria
 - actinomycetes
 - fungi
 - all of the above
 - none of the above
13. Why are such great amounts of materials (biomass, energy, numbers, etc.) at one trophic level required to support the next trophic level?
- not all of the energy fixed at one trophic level is available to the next trophic level
 - much of the energy fixed at one trophic level is lost as low grade heat because it is changed in form as it goes from one trophic level to another
 - organisms at higher trophic levels cannot digest or assimilate a lot of the chemical energy fixed at a lower trophic level
 - all of the above

14. The “greenhouse effect” which may cause global warming appears to be associated with:
- the release of heat from industrial processes
 - the depletion of atmospheric ozone (which enables the amount of ultraviolet radiation reaching the earth’s surface to increase)
 - an increase in the amount of cloud cover (which causes more heat energy to be trapped in the earth’s atmosphere)
 - an increase in atmospheric CO₂ concentration (which increases the capacity of the atmosphere to absorb longwave radiation)
 - decreased cloud cover (which results in an increase in the amount of solar radiation reaching the earth’s surface)
15. A plant species that accumulates salt in cell sap and is adapted to grow in saline soils is called:
- a phreatophyte
 - a halophyte
 - a hydrophyte
 - a xerophyte
16. Phosphorus is a limiting nutrient in most soils because:
- it tends to be volatilized as a gas by soil bacteria
 - it readily forms insoluble complexes with other elements
 - most phosphorus is in gaseous form and cannot be utilized by plant
17. Which is the correct order of photosynthetic capability?
- perennial > annual and evergreen > deciduous
 - annual > perennial and deciduous > evergreen
 - perennial > deciduous > annual and evergreen
 - annual > perennial and evergreen > deciduous
18. Organisms compete for resources via which mechanisms?
- exploitation competition
 - interference competition
 - allocation priority
 - a and b
 - b and c
19. An agricultural drought is defined as:
- rainfall below values considered to be “normal”
 - when soil moisture availability to plants has dropped to such a level that it adversely affects production
 - period when surface and ground water is inadequate to supply established uses
20. Competition occurs when:
- abundance of resources exceeds demands by organisms
 - when demands on resources by organisms are greater than resource supply
 - resources are superabundant
 - one organism depletes a resource that is not required by another organism

21. "Islands of fertility":
- occur when the distribution of soil nutrients is strongly associated with the presence of shrubs
 - are localized beneath canopies of plants, while adjacent, interplant areas are comparatively devoid of soil nutrients
 - are the product of both physical and biological processes
 - all of the above
 - none of the above
22. During drought periods:
- rangeland soils are net sources of carbon
 - plants suspend all meristematic activity
 - plants cease production of new roots
 - all of the above
 - none of the above
23. Decomposition of roots:
- decreases with increasing soil depth
 - increases with increasing soil depth
 - is uniform throughout the soil profile
24. Root life span:
- decreases with increasing root diameter
 - increases with increasing root diameter
 - is similar regardless of root diameter
25. CO₂ enrichment can indirectly benefit plants by:
- greater biomass accumulation
 - increasing soil water availability through greater water use efficiency
 - increased photosynthesis efficiency
 - all of the above
 - none of the above
26. Which of the following generally occur in most CO₂ enrichment studies?
- greater biomass accumulation
 - lower digestibility of plant material
 - greater response by C₃ than C₄ plant species
 - all of the above
 - none of the above
27. As a result of increased concentrations of greenhouse gases in the atmosphere, which of the following are predicted to occur?
- global warming
 - more intense storms
 - altered precipitation patterns
 - all of the above
 - none of the above

28. Which of the following greenhouse gases has the greatest warming potential per unit?
- carbon dioxide
 - methane
 - nitrous oxide
 - water vapor
29. For rangelands:
- soil carbon storage increases with increasing precipitation
 - soil carbon storage decreases with increasing precipitation
 - soil carbon storage is independent of precipitation
30. Which is the correct order regarding carbon storage in rangelands?
- roots > soil > aboveground biomass
 - aboveground biomass > soil > roots
 - soil > aboveground biomass > roots
 - soil > roots > aboveground biomass

II. GRAZING MANAGEMENT (50 points)

31. In order to maintain a consistent cattle production schedule, brood cows should be bred within _____ days post calving.
- 40 to 60
 - 75 to 85
 - 100 to 130
 - 200 to 220
32. (4 pts) If feed stuff weighing 100 g contains 2 g of nitrogen, what percent crude protein is the feedstuff?
- 2.0
 - 3.1
 - 12.5
 - none of the above
33. Under deferred grazing systems in perennial grassland, the primary purpose of deferment until seed formation is to:
- assure the production of seed for grass reproduction
 - allow normal early season growth and food storage by the plant
 - assure an adequate food supply for livestock
 - maintain a natural looking stand
34. Expressed as a percentage of body weight, what is the normal range of daily intake of dry forage which would be expected of cattle on rangeland?
- 0.1% to 0.5%
 - 1% to 3%
 - 10% to 30%
 - 20% to 40%

35. Livestock distribution (uniformity of grazing) increases:
- as topography becomes steeper
 - as pasture size per number of cattle increases
 - if water and salt are located together
 - as stocking density increases
36. Grazing a pasture during the same season every year is called:
- repeated seasonal grazing
 - deferred grazing
 - continuous grazing
 - range resting
37. Many times, clipping studies do not simulate grazing because:
- livestock tend to remove plant parts and defoliate species nonselectively
 - grazing animals select what and where they eat
 - different animals graze by pulling, breaking, or biting at uniform heights
38. A nutrient deficiency will:
- increase the rate of digestion and passage of ingesta
 - reduce consumption and production
 - increase consumption and production
 - slow digestion and increase passage of ingesta
39. **(4 pts)** You are evaluating a four-pasture rotational grazing system (single occupation) and are asked to calculate the stocking rate. All pastures contain 120 hectares, and the system is grazed for 3 months with 160 animal units. The stocking rate is:
- 0.25 AUM/ha
 - 1.0 AUM/ha
 - 2.3 AUM/ha
 - 3.8 AUM/ha
40. **(4 pts)** Using the same information given in question #39 (above), the stocking density for this system is:
- 0.3 AU/ha
 - 0.7 AU/ha
 - 1.0 AU/ha
 - 1.3 AU/ha
41. A system that has 9 pastures and a 135-day cycle is grazed ____ and rested ____:
- 9 days:126 days
 - 15 days:120 days
 - 18 days:117 days
 - 30 days:105 days

42. Which of the following are higher for tallgrass than shortgrass plant species?
- C/N ratios
 - lignin/N ratios
 - % lignin
 - all of the above
 - none of the above
43. Which of the following are ways to increase uniformity of use on rugged-terrain landscapes?
- select offspring from animals that preferentially use rugged terrain
 - select breeds that preferentially use rugged terrain
 - utilize attractants to move animals to the rugged terrain
 - all of the above
 - none of the above
44. Grazing bouts typically occur:
- during the hottest part of the day
 - at night
 - in the early morning and late afternoon
45. "Virtual fence" is an emerging technological tool that may be used to increase utilization of preferred areas and restrict use in environmentally-sensitive areas.
- true
 - false
46. Grazing by small ruminants in arid environments may promote ecosystem stability by:
- controlling weeds
 - constraining brush encroachment
 - reducing the risk of fire
 - all of the above
 - none of the above
47. Which of the following breeds of cattle is most likely to preferentially select level terrain that is close to a water source?
- Hereford
 - Santa Gertrudis
 - Tarentaise
 - Brahman
48. Young, inexperienced animals can improve their foraging skills by associating with older, experienced animals.
- true
 - false
49. During a grazing bout:
- rate of intake is greatest at the beginning
 - rate of intake increases with increasing length of grazing bout
 - rate of intake remains similar throughout the grazing bout

50. Ruminants:

- a. generally develop preferences for feeds that provide a high satiety level rapidly
- b. control meal size and diet composition by anticipation of post-ingestive effects to avoid nutritional excesses or deficiencies
- c. select a diet of higher nutrient quality than that on offer
- d. all of the above
- e. none of the above

51. Methane emissions from ruminants:

- a. generally peak with corresponding peaks in eating activity of animals
- b. are greater when animals are eating than ruminating
- c. decreases as rumen content declines
- d. all of the above
- e. none of the above

52. Which of the following is most correct regarding grazing of crop residues?

- a. crop residues are most effectively utilized in maintenance rations
- b. crop residues are low in fiber and lignin
- c. crop residues are high in protein and phosphorus
- d. all of the above
- e. none of the above

IIa. GRAZING MANAGEMENT PROBLEM (10 points)

SEE END OF TEST

III. RANGE IMPROVEMENT (50 points)

53. Heavy rates of phosphorous fertilizer application on grass-legume mixtures on mesic sites:

- a. stimulate the grasses while depressing the legumes
- b. stimulate the legumes so they become dominant over the grasses
- c. do not affect the botanical composition of the mixture
- d. none of the above

54. Vegetation conversion for off-site water yield increases is primarily dependent on:

- a. evapotranspiration (ET) reduction and snowpack management
- b. decreased bulk density
- c. increased soil moisture storage

55. The main purpose of surface mulch is to:

- a. protect emerging seedlings from defoliation
- b. smother annual weeds
- c. improve soil-seed contact
- d. conserve soil moisture

56. **(4 pts)** An application rate of 4.5 kg a.e. per hectare of 2,4-D is required to control an invasive weed. The herbicide that you have purchased contains 0.9 kg a.e. per liter. How many liters of 2,4-D are needed to spray 10 hectares?
- 15
 - 45
 - 50
 - 96
57. Fire is commonly used on rangelands to:
- remove shrubby species of low-forage value
 - remove herbaceous vegetation that accumulates where rank-growing species are common
 - control basal sprouting shrubs
 - a and b
 - none of the above
58. **(4 pts)** A drag-type boom sprayer is used to spray broadleaf weeds in a tame pasture. The sprayer delivers a 5-meter-wide swath and can safely travel at 5 kilometers per hour over the pasture. At this speed, how many hectares per hour can be covered?
- 2.0
 - 2.5
 - 20.0
 - 25.0
59. Which of the following upland sites has the greatest potential for improvement by either management or manipulation practices (assume all conditions are equal except for those mentioned)?
- good condition; shallow, rocky soil
 - poor condition; deep, loamy soil
 - poor condition; shallow, rocky soil
 - good condition; deep, loamy soil
60. Watering facilities for cattle distribution purposes should be:
- developed wherever water can be found
 - spaced so that cattle have to walk no further than 0.4 km in any direction
 - no further than 3.2 km apart on level terrain
 - located next to salt
61. **(4 pts)** You are seeding a species that has a seed count of 800,000 per bulk kg and is tested at 80% germination and 75% purity. How many kg of bulk seed would you need to plant per hectare using the standard rule of 200 pure live seeds (PLS) per square meter for upland range sites?
- 3.6
 - 3.8
 - 4.0
 - none of the above

62. Which of the following is characteristic of an intensive range improvement?
- low cost
 - high risk
 - low production potential
 - easily accomplished
 - applicable in all situations
63. Soil-applied herbicides are translocated in the:
- phloem
 - xylem
 - cambium
 - epidermis
64. When planted at the same depth, how does a cool-season grass have an advantage over a warm-season grass?
- subcoleoptile internode does not elongate
 - primary root system is smaller
 - relative growth rate is lower
 - possesses the C_3 photosynthetic pathway
65. When conducting a prescribed burn to kill undesirable plant species, what plant factor will reduce the effectiveness of the burn?
- growing points near the soil surface
 - stolon production
 - sprouting ability
 - low carbohydrate reserves
66. What does contour furrowing do to change the physical environment that gives an increased response in aboveground biomass production?
- decreases infiltration, increases runoff, and decreases leaching of cations
 - increases infiltration, decreases runoff, and increases leaching of cations
 - increases infiltration, increases runoff, and decreases leaching of cations
 - decreases infiltration, decreases runoff, and increases leaching of cations
67. A _____ is more likely created when a head fire meets a backfire.
- fire whirl
 - front fire
 - fire break
 - all of the above
 - none of the above
68. C_4 grasses are most negatively impacted if they are burned in what season?
- Winter
 - Spring
 - Summer
 - Fall

69. Fire whirls are most likely in heavy fuels on the:
- lee side of obstructions, when the atmosphere is stable
 - windward side of obstructions, when the atmosphere is unstable
 - windward side of obstructions, when the atmosphere is stable
 - lee side of obstructions, when the atmosphere is unstable
70. Indicators of a stable atmosphere include:
- intermediate winds, layered clouds, haze
 - gusty winds, vertical clouds, haze
 - steady winds, layered clouds, good visibility
 - gusty winds, vertical clouds, good visibility
71. Mixing height is the:
- region where flames extinguish and smoke appears
 - distance from the ground to the base of an inversion
 - region where woody canopies and herbaceous plants intersect
 - height to which ash is lifted by convection
72. Smoke dispersion is generally best with _____ atmospheric conditions.
- very stable
 - neutral to stable
 - neutral to unstable
 - very unstable
73. Reducing the density of shrubs in shrublands with herbicides can:
- increase production of understory grasses
 - increase potential sites for invasion by non-desirable plants
 - increase plant diversity
 - all of the above
 - none of the above
74. Interseeding a legume into native rangelands can:
- increase soil nitrogen
 - increase forage production
 - increase soil carbon sequestration potential
 - all of the above
 - none of the above

IIIa. RANGE IMPROVEMENT PROBLEM (10 points)

SEE END OF TEST

IV. RANGE REGIONS (30 points)

75. The genera of a common woody perennial invader of desert grasslands is:
- Atriplex*
 - Prosopis*
 - Celtis*
 - Opuntia*
76. The most ubiquitous grass in shortgrass and mixed prairies is:
- Pascopyrum smithii*
 - Hesperotipa comata*
 - Buchloe dactyloides*
 - Bouteloua gracilis*
 - Bouteloua curtipendula*
77. Characteristic shrub species in the cold desert of North America include:
- Artemisia nova* and *Atriplex confertifolia*
 - Larrea tridentata* and *Flourensia cernua*
 - Cowania mexicana* and *Purshia tridentata*
 - Acacia greggii* and *Juniperus scopulorum*
78. Representative shrub species in the chapparal vegetation type in California include:
- Adenostoma fasciculatum* and *Arctostaphylos pungens*
 - Prunus virginiana* and *Quercus gambelii*
 - Quercus stellata* and *Cowania mexicana*
 - Cercocarpus montanus* and *Ceanothus fendleri*
79. The dominant grasses of the Boreal Forest are:
- Calamagrostis canadensis* and *Elymus innovatus*
 - Festuca scabrella* and *Danthonia intermedia*
 - Agropyron trachycaulum* and *Elymus canadensis*
 - Calamagrostis rubescens* and *Festuca scabrella*
80. Which of the following factors is dominant in maintaining the coniferous forest of the southeastern United States?
- seasonality of precipitation
 - humidity
 - fire
 - periodic freezes
81. The two shrubland regions with characteristic open canopies are:
- pinon-juniper and cold desert shrub
 - hot desert shrub and cold desert shrub
 - mountain brush and pinon-juniper
 - mountain brush and cold desert shrub
 - hot desert shrub and pinon-juniper

82. Which is most correct about tree leaves growing under shade conditions in eastern deciduous forest?
- thin leaves, high concentrations of RUBISCO, high photosynthesis rate, low respiration rate
 - thick leaves, high concentrations of RUBISCO, high photosynthesis rate, high respiration rate
 - thin leaves, low concentrations of RUBISCO, low photosynthesis rate, low respiration rate
 - thick leaves, low concentrations of RUBISCO, low photosynthesis rate, low respiration rate
83. Which of the following are growth strategies for herbs and shrubs growing under eastern deciduous canopies?
- spring ephemeral
 - evergreen
 - shade tolerant
 - all of the above
 - none of the above
84. Which of the following characteristics are true concerning evergreen shrubs growing in Boreal forest?
- photosynthetic period is about a month longer than deciduous shrubs
 - their phenological growth is very slow
 - they account for a major portion of the above ground biomass
 - all of the above
 - none of the above
85. Generally, as the ratio of fine to coarse fuels increases the following occurs:
- Fire intensity decreases
 - Fire longevity increases
 - Length of time to reduce fuel moisture increases
 - All of the above
 - None of the above
86. Prescribed fire in the Fescue Prairie is used to accomplish:
- increase production of *Fescue* spp.
 - increase water run-off
 - control woody species
 - all of the above
 - none of the above
87. Mediterranean climate can be described as having:
- cool, wet winters and warm, wet summers
 - cool, wet winters and warm, dry summers
 - cool, dry winters and warm, dry summers
 - cool, dry winters and warm, wet summers

88. The salt desert is best described as:
- receiving equal amounts of total precipitation in winter snows and in spring/fall rains
 - having the lowest precipitation of all range types
 - occurring at high elevations
 - all of the above
 - none of the above
89. Which of the following range types occurs at the highest altitude?
- Oak woodland
 - Pinon-juniper
 - Mountain browse
 - alpine tundra

V. RANGE INVENTORY AND ANALYSIS (40 points)

90. Which of the following plant characteristics is least subject to annual fluctuations?
- basal cover
 - frequency
 - areal cover
 - biomass
 - density
91. The scale of an aerial photograph is determined by:
- flying height and camera focal length
 - flying height and topography
 - flying speed and topography
 - flying height and flying speed
 - flying speed and camera focal length
92. Which of the following statements is NOT always true?
- systematic sampling in a regular population is random
 - random sampling in a regular population is random
 - systematic sampling in a random population is random
 - random sampling in a random population is random
 - a, b and c
93. **(4 pts)** A range utilization study of a pasture indicates that 50% of the key species on the key areas has been utilized to date. The management goal for proper use is 60%. The pasture has been stocked with 200 animal units for the past 4 months at the time of the survey. What is the estimated grazing capacity of this pasture in AUM's?
- 133
 - 300
 - 533
 - 960
 - 1200

94. An assessment of the direction of change of range condition based on measurements at two points in time is called:
- resource value rating
 - apparent trend
 - actual trend
 - ecological rating
95. Which of the following samples yields the most precise estimate of a population mean? (means \pm Standard Error of the Mean)
- 100 \pm 10
 - 300 \pm 10
 - 10 \pm 10
 - 900 \pm 20
96. (4 pts) The net cost per cow unit is \$430.50. If the calves weaned per cow exposed to a bull is 90%, what is the breakeven cost (\$/kg) on weaned calves weighing 230 kg?
- \$1.68
 - \$1.87
 - \$2.08
 - \$2.13
97. (4 pts) Using the photo scale of 1:50,000, what is the area of a rectangular pasture with sides of 2 cm and 3 cm?
- 24 ha
 - 60 ha
 - 150 ha
 - 600 ha
98. The Palmer Drought Severity Index is used to monitor drought conditions.
- true
 - false
99. Which of the following tools has been widely used recently to gage the impacts of grazing use in riparian areas?
- range condition assessment
 - plant cover
 - stubble height
 - paired grazed and non-grazed plots
100. A product of the Advanced Very High Resolution Radiometer (AVHRR) is the Normalized Difference Vegetation Index (NDVI). What is the utility of NDVI?
- ability to predict live biomass in rangeland
 - ability to assess rangeland health
 - ability to assess changes in plant communities
 - all of the above
 - none of the above

101. Increasingly, researchers are combining close-range vertical photography and computer digital analysis to measure changes in plant cover. Which of the following is an advantage of this method over traditional methods?
- less expensive
 - involves minimal field time
 - photos can be archived
 - all of the above
 - none of the above
102. Which of the following nitrogen isotopes is commonly used in labeling studies to examine nitrogen cycling?
- ^{13}N
 - ^{14}N
 - ^{15}N
103. Water use by plants can be assessed using which of the following natural isotope ratios?
- $\delta^2\text{H}$
 - $\delta^{13}\text{C}$
 - $\delta^{18}\text{O}$
 - a and b
 - a and c
104. **(4 pts)** Clipping of grazed plots (25 cm X 20 cm) results in the estimate of 15 grams of remaining residue per plot. What is this value expressed as kg/ha?
- 3
 - 30
 - 300
 - 3000
105. Assessments of plant diversity incorporate:
- plant species richness and abundance
 - plant species evenness and abundance
 - plant species richness and evenness

Va. RANGE INVENTORY AND ANALYSIS PROBLEM (20 points)

SEE END OF TEST

VI. MULTIPLE USE RELATIONSHIPS (30 points)

106. Multispecies grazing:
- is best employed where there is a broad diversity of vegetation and habitats
 - nearly always causes competition among those animals
 - is the most common cause of overgrazing
 - all of the above

107. Elk are highly successful competitors with mule deer because:
- they are heavier and taller, and can access greater forage resources
 - they have a more efficient digestive system for handling fibrous feeds
 - they have a greater plasticity in diet selection
 - all of the above
108. The equivalent water depth of a snow pack can be estimated using a snow pillow. To convert a snowpack to equivalent water depth the appropriate calculation is:
- density of snow divided by weight of snow
 - density of snow multiplied by volume of snow
 - volume of snow divided by surface area of the snow pillow
 - weight of snow divided by surface area of the snow pillow
109. Semiarid rangeland watersheds differ from forested ones in that:
- more water and less sediment per unit area are generated from rangeland watersheds
 - more water and more sediment per unit area are generated from rangeland watersheds
 - less water and more sediment per unit area are generated from rangeland watersheds
 - none of the above
110. As grazing pressure is increased from moderate to heavy, the general hydrologic impact would be:
- increased bulk density, decreased infiltration rate, and increased sediment yield
 - increased runoff, increased infiltration rate, and increased sediment yield
 - decreased vegetative cover, decrease infiltration rate, and decreased sediment yield
111. The most important single element determining the rate of soil blowing by wind erosion is:
- vegetation
 - atmospheric humidity
 - soil organic matter
 - soil structure
112. You have a grassland range and want to use it with both wild and domestic ungulates, which of the following species would be **least** useful:
- cattle, bighorn sheep, and horses
 - bison, elk, and horses
 - mule deer, angora goat, and pronghorn antelope
113. Riparian areas are a function of:
- geomorphology
 - topography
 - catchment size
 - all of the above
 - none of the above

114. Discharge levels from streams can be affected by:
- Rainfall intensity
 - topography
 - soil type
 - all of the above
 - none of the above
115. The amount of surface runoff in a basin determines the volume of water in a perennial stream.
- true
 - false
116. What physical force(s) determine the amount and size of sediment a stream will carry?
- elevation
 - discharge
 - slope
 - a and b
 - b and c
117. A stream channel will undergo a series of changes to adjust to new conditions if:
- sediment load changes
 - temperature changes
 - stream discharge increases
 - a and b
 - a and c
118. Elk use patterns are related to topography and protective cover:
- True
 - False
119. From the perspective of a land manager, which of the following recreational activities is not advantageous to a livestock operation?
- fee hunting
 - camping near stock ponds
 - horseback riding
 - all of the above
 - none of the above
120. Tree density in forests influences:
- water infiltration
 - runoff
 - browse production
 - all of the above
 - none of the above

GRAZING MANAGEMENT PROBLEM (10 points)

The Bar H Bar Ranch, located in the northern mixed-grass prairie ecosystem, has decided to dramatically alter their livestock operation by switching from a traditional, year-round, cow-calf operation to a seasonal grazing operation. The owners have hired you as a range consultant to determine proper kind and numbers of cattle needed for the upcoming year. Here is the information the owners have provided you:

Land holdings: 1945 hectares

Previous grazing management: 120 head of cows-calf pairs (1.3 AU) grazed pastures from April 1-January 1, fed hay and supplement during other months

Desired grazing management: 2/3 of grazing animals should be yearling heifers (0.65 AU), remaining 1/3 of grazing animals are cow-calf pairs (1.3 AU). Yearling heifers will graze pastures from June 1 to August 15, while cow-calf pairs will graze from May 15 to November 1.

Please determine how many yearling heifers and cow-calf pairs are needed to graze the Bar H Bar Ranch according to desired management by the owners.

RANGE IMPROVEMENTS PROBLEM (10 points)

You have been asked to consult the city of Casper, Wyoming in applying well composted “Original Steer Manure” to a nearby rangeland area. Testing of a sample of oven-dried manure reveals a grade of 0.12 – 0.92 – 0.58 (%N - %P₂O₅ - %K₂O, with P₂O₅ containing 44% P and K₂O containing 83% K). Regulatory requirements for application of this manure are a maximum of 80 kg/ha of actual N and/or 95 kg/ha of actual P, and/or 75 kg/ha of actual K. If the manure is 52% moisture, how much manure can you legally apply to a 259 ha pasture? Answer in metric tons.

RANGE INVENTORY AND ANALYSIS PROBLEM – 20 points total**A. (10 pts)**

You are asked to conduct a vegetation survey for an ecological site. The objective of the survey is to estimate the mean standing crop of forage within ± 20 kg/ha. You have data available from a previous survey that reported a mean standing crop of 240 g/m^2 and a standard deviation of 7.5 g/m^2 . Given the formula for calculating estimated sample size,

$$n = \frac{t^2 S^2}{d^2},$$

and an estimated value of 2.0 for t , calculate the number of 1 m^2 quadrats you will need to clip to achieve the desired degree of accuracy in your estimated mean.

B. (10 pts) Determine the Similarity Index given the following information in the table.

Client: Straight Arrow Ranch

MLRA: 67 – North Central High Plains

Ecological Site: Loamy 15-17 inch precipitation zone

Reference vegetation state: Rhizomatous Wheatgrasses/Needleandthread/Blue grama (HCPC)

A	B	C	D	E	F
Species	Green wt. (g/m^2)	% dry weight	Annual production (kg/ha)	kg/ha in ecological site description	kg/ha allowable
<i>Bouteloua gracilis</i>	12	75		210	
<i>Pascopyrum smithii</i>	45	60		380	
<i>Koeleria macrantha</i>	25	60		40	
<i>Poa secunda</i>	5	80		40	
<i>Hesperostipa comata</i>	50	50		460	
<i>Nassella viridula</i>	15	50		125	
<i>Artemisia ludoviciana</i>	5	40		15	
G. Total normal annual production in reference vegetation state				1680	
H. Total kg of allowable present					
I. Similarity Index (H divided by G X 100)					