

**Geology 202**  
**Outline for Term Paper**

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- I. Introduction
  - A. Settlement of area over recorded history, perception of abundant water
  - B. Knowledge of water supply limits relatively recently learned
  - C. General climate of area
    - 1. semi-arid, rainfall between 6 and 14 inches / year
    - 2. most of water resources in underground aquifers
- II. Geologic Overview
  - A. tectonic setting
    - 1. Upper Klamath Basin
      - a. transition area between Cascades and "Basin and Range" provinces
      - b. mountains to West "squeeze" rain out
      - c. faultlines trend north-south
    - 2. Lower Klamath Basin
      - a. bounded by Franciscan formation on all sides
      - b. located within Yuroc Indian reservation
    - 3. Lost River sub-basin
      - a. located within "Basin and Range" province
      - b. faults trend north-south
  - B. geologic history
    - 1. Miocene era (7 to 8 Million yrs.)
      - a. Bryant Mountain eruption of calc-alkaline basaltic tachyandesites
      - b. Faulting in basin & range
      - c. erosion processes creating low hills & broad valleys
    - 2. Pliocene era (4 to 5 Million yrs.)
      - a. vent eruptions producing more calc-alkaline basaltic tacydandesites of different chemistry over time
      - b. sediments carried through valleys loaded with basaltic tuff and cinders.
    - 3. Pliestocene era
      - a. Lake Modoc inundated all current valleys (4,240 asl max.)
      - b. Lacustrine mudstone deposition in lakebed
      - c. Miller Creek formed gravel delta where it flowed into lake
      - d. other rivers in area formed alluvial fans on entry into lake
    - 4. Present day
      - a. recession of Lake Modoc left current water bodies
        - 1. Upper Klamath Lake
        - 2. Tule Lake
        - 3. Alkali Like
        - 4. Swan Lake
        - 5. Lost River

- b. subsequent deposition
      - 1. playa deposits
      - 2. windblown sand
      - 3. colluvium
      - 4. stream alluvium
      - 5. landslide deposits
    - c. hot springs
      - 1. centered around Klamath Falls and Klamath Hills
      - 2. temp between 140 and 235 degrees
      - 3. water source is deep and unknown
- III. Water Resources
  - A. geology of water supply
    - 1. earliest volcanic rocks have greatest aquifer potential
    - 2. later layers of sediment
      - a. some serve as aquicludes
      - b. some are only poor aquifers rather than aquicludes
    - 3. hot springs
      - a. capped by aquicludes, cracks allow venting
      - b. water for steam vents not dependent on rainfall
  - B. human occupation
    - 1. residential
      - a. greatest water usage
      - b. increased heavily since 1950, growth nearly exponential
    - 2. Farmers
      - a. planting – slowly increasing usage of water since 1950
      - b. livestock – mostly flat usage of water over last 50 years
    - 3. Yuroc Indian reservation
      - a. integrity of fish population in waterways is primary concern
      - b. other uses of water mostly flat growth curve
  - C. management of resources
    - 1. Oregon side
    - 2. California side
    - 3. current management policy
      - a. successes – disaster averted or at least delayed
      - b. failures – notably in area of public relations
- IV. Summary and Conclusion
  - A. most intelligent usage of currently known resources
  - B. potential future of area
    - 1. if new source of water is somehow discovered and tapped
    - 2. if no new source of water is found
- V. References
  - A. Koch, J. G., 1963, Late Mesozoic Orogenesis and Sedimentation, Klamath Province, Southwest Oregon Coast, University Microfilms International

- B. Peterson, Norman V. & James R. McIntyre, 1970, The Reconnaissance Geology and Mineral Resources of Eastern Klamath County and Western Lake County, Oregon, State of Oregon dept. of Geology and Mineral Resources
- C. Grondin, Gerald H., 2004, Oregon Ground Water Report, Ground Water in the Eastern Lost River Sub-Basin, Langell, Yonna, Swan Lake, and Poe Valleys of Southeastern Klamath County, Oregon, Oregon Water Resources Department, Salem, Oregon
- D. State of California, 2001 (updated 2004), North Coast Hydrologic Region Upper Klamath Groundwater Basin, Bulletin 118: Internet web resource, URL: [http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/pdfs\\_desc/1-2.01.pdf](http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/pdfs_desc/1-2.01.pdf)
- E. State of California, 2002, DWR's Northern District Helps Bring Water to Drought-Stricken Klamath Basin, Roger Canfield, Internet web resource, URL: <http://www.news.water.ca.gov/2002.fall/1.02fall.html>