NRCS Natural Resources Conservation Service

Cedar Mountain Septic System Suitability Study

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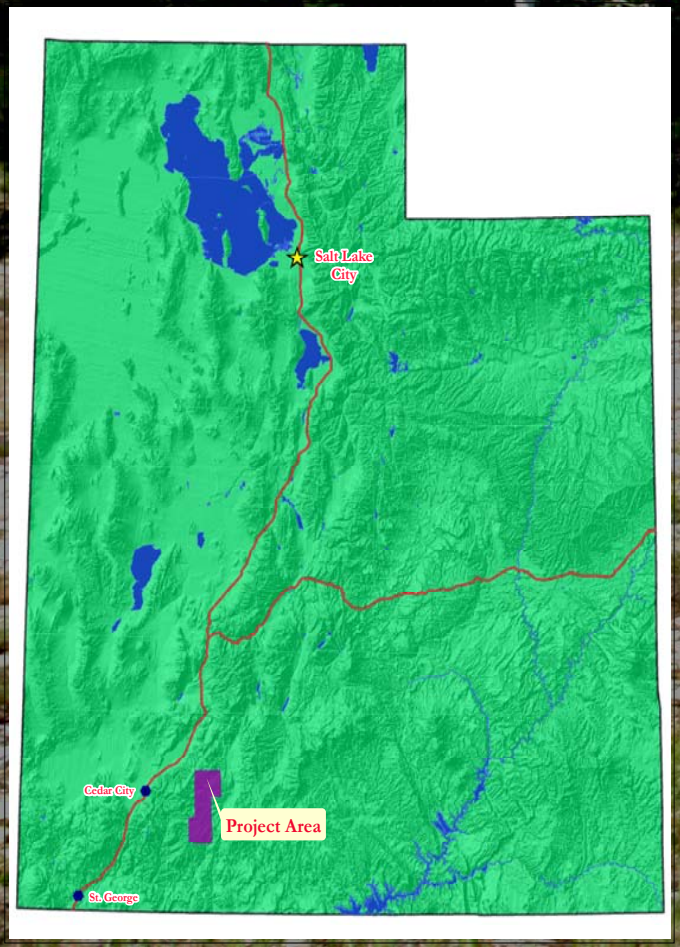
Location



- Southern Utah, East of Cedar City
- Located in Garfield and Kane Counties
- Near Duck Creek Village, Mammoth Creek, and Panguitch Lake

Need

- State and County officials concerned that septic system density is reaching a critical level
- Development occurring on small building lots, with individual septic systems
- Construction of a culinary water system

Need

- Part of the Markagunt Plateau

- Contributes to 3 river systems
  - Cold Creek
  - Sevier River
  - Virgin River

- River systems relied upon for agriculture and culinary water use

Need

- Two major contamination concerns resulting from septic system malfunctions are:
  - Disease producing organism (pathogen) contamination
  - High nitrate (NO_3^-) levels
- Maintain purity of ground and surface water
- No widespread problem currently, but problems have been identified in the past

Problems

Proper septic system function limitations include:

- insufficient soil depth
- excessive slope
- flooding
- percolation rate that is either too fast or too slow

Problems

- Percolation rate measured on site using the "Perc" test by certified soil tester
- Few perc tests fail, despite apparent poor site conditions

Objectives

1) Measure the percolation rate of the soils in selected areas on Cedar Mountain

2) Assess the suitability of these soils as an absorption and percolation medium for septic systems absorption fields

3) Create a soil suitability map for the areas of interest on Cedar Mountain

Areas of Concern

Method

- 260 measurements taken at 88 different sites all on undisturbed Dixie National Forest land
- Measurements were taken at a confining layer, like an argillic layer or most often bedrock

Method

Guelph Permeameter

- Made of high impact polycarbonate
- Inner and outer reservoir
- Creates a vacuum
- Borehole is a 2 inch cylindrical hole

Method

- Measure steady-state rate of water recharge in unsaturated soil
- Constant head of water is maintained at 5 and 10 cm
- Calculations made to determine hydraulic conductivity, soil sorptivity, and soil matrix flux potential
- For this Study only focused on the hydraulic conductivity

Guelph Permeameter

Advantages

- Portability
- Speed of measurements (2 to 3 hours per site)
- More repetitions per day than any other Ksat measurement technique

Disadvantages

- Relatively small surface area being measured
- Affected by soil heterogeneity

Results

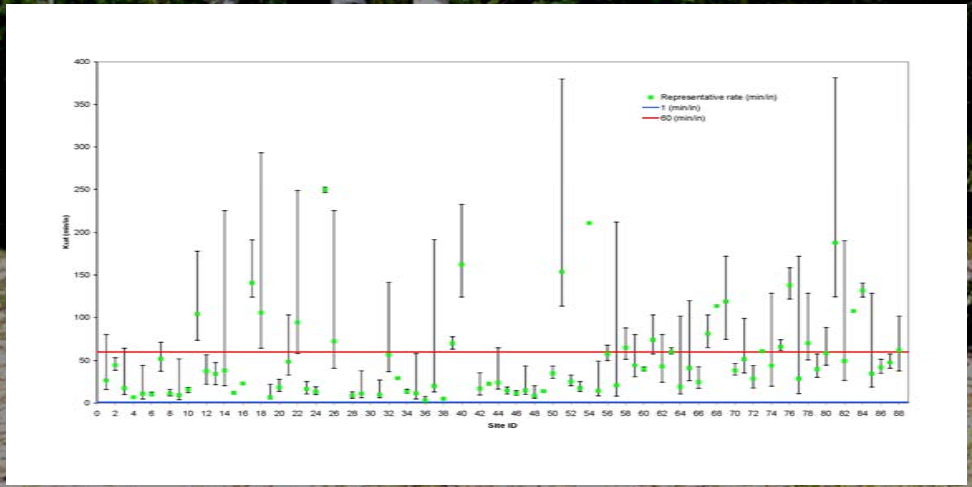
- Percolation rates were slower than the allowed (60 min/in) at 21 sites
- No sites exceeded the maximum rate of 1 min/in
- 26 of the 88 sites had a representative value within the allowable limit, but had a range slower than the allowable limit

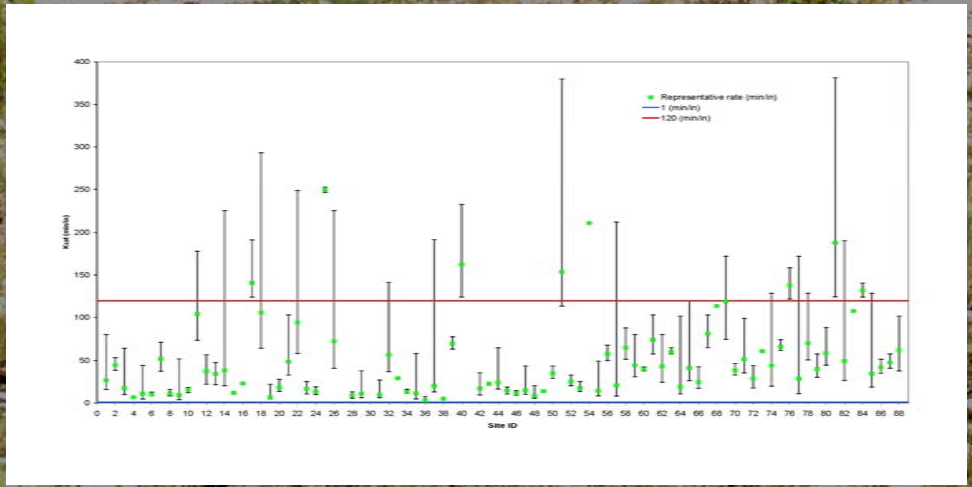
Results

- Ksat increased with clay percent
- Soil structure plays a significant but often understated role
- Rodent burrows, hollow root channels, or other macro pores affected the results

Results

- Raise allowable limit from 60 min/in to 120 min/in
- Passing sites increased from 42 sites to 62 sites





Conclusions

- Slow percolation increase likelihood that untreated effluent can resurface due to:
  - Capillarity (unsaturated)
  - Ponded (saturdated)
  - Laterally on a slowly-permeable layer (lateral flow)

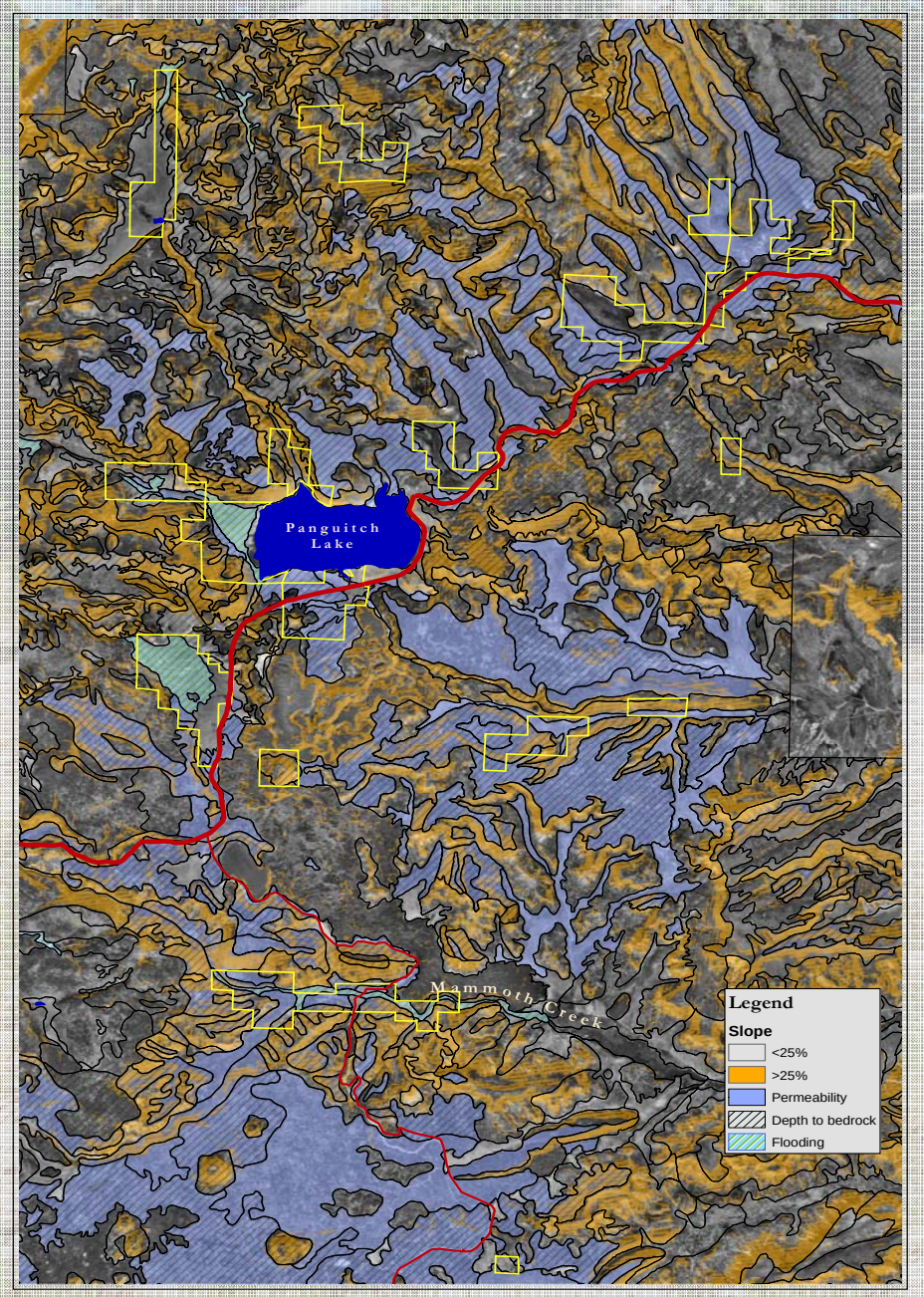
- After resurfacing, effluent can contaminate surface water and groundwater

Conclusions

- No sites exhibited Ksat that was too fast
- Resulting in contamination due to effluent moving though the soil substrate too quickly
- Data indicates that a properly installed septic system may not pose a threat

Conclusion

- Measurements only applicable for the layers where they were taken
- No means of mechanical digging were employed
- Mechanical disturbance could open up fractures in bedrock creating very fast percolation rates



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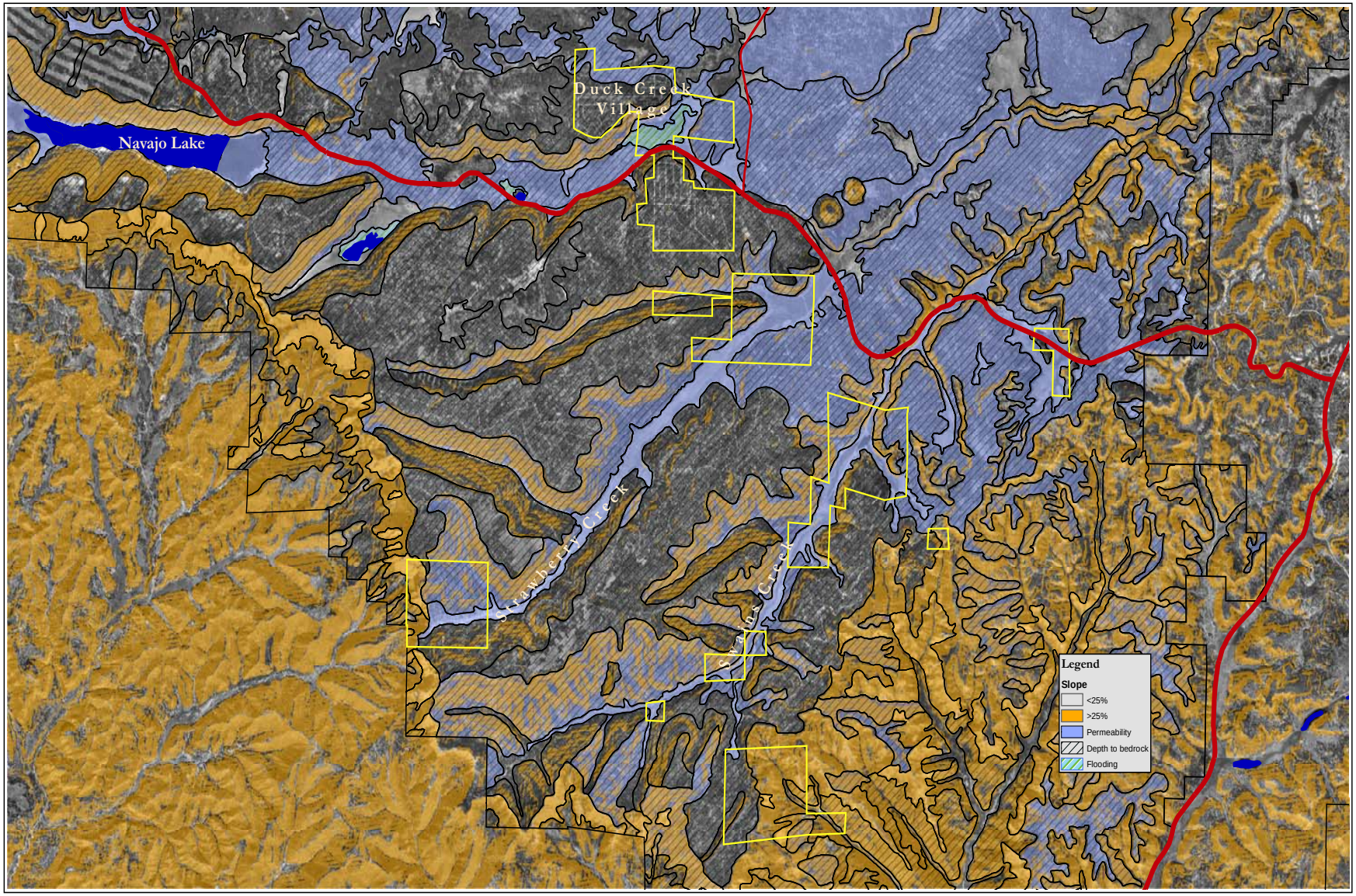

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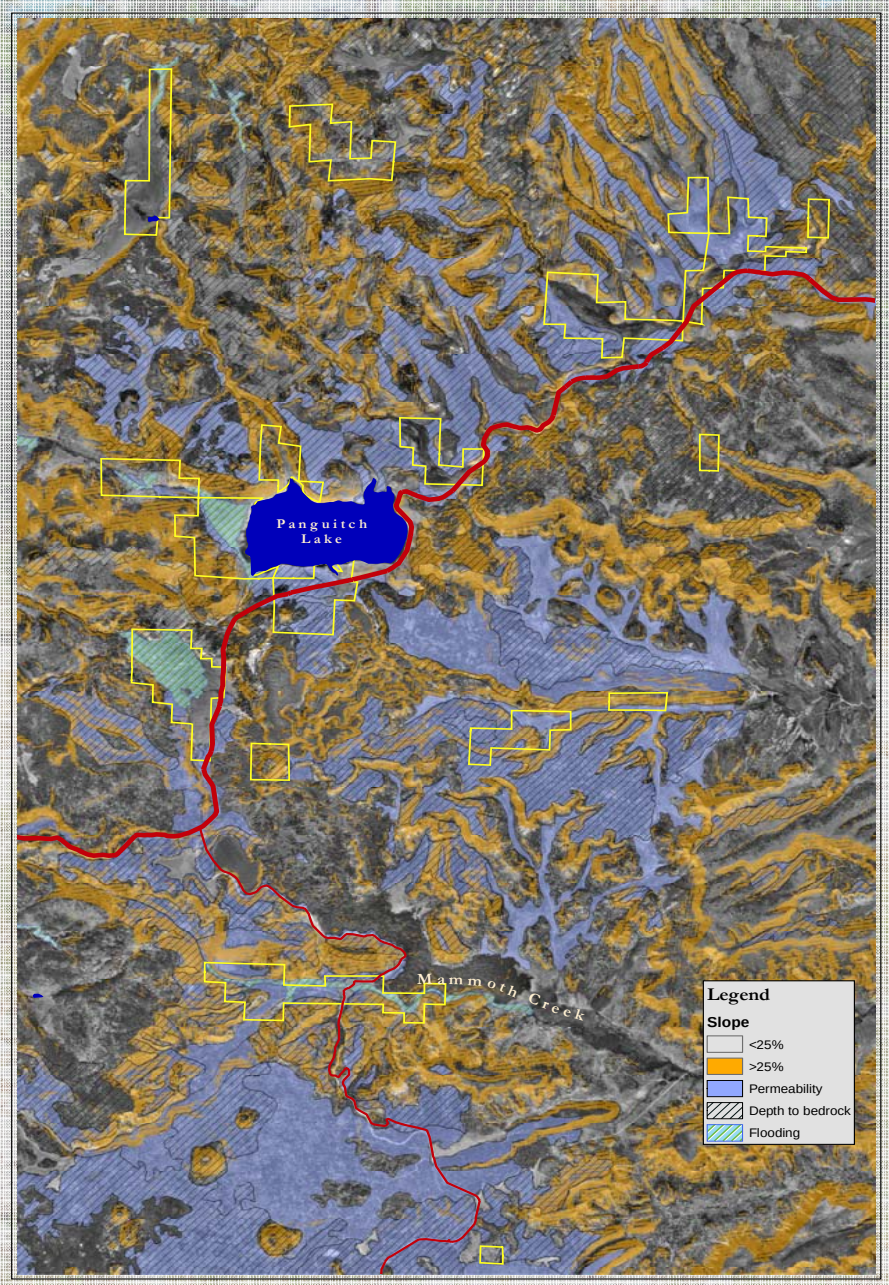

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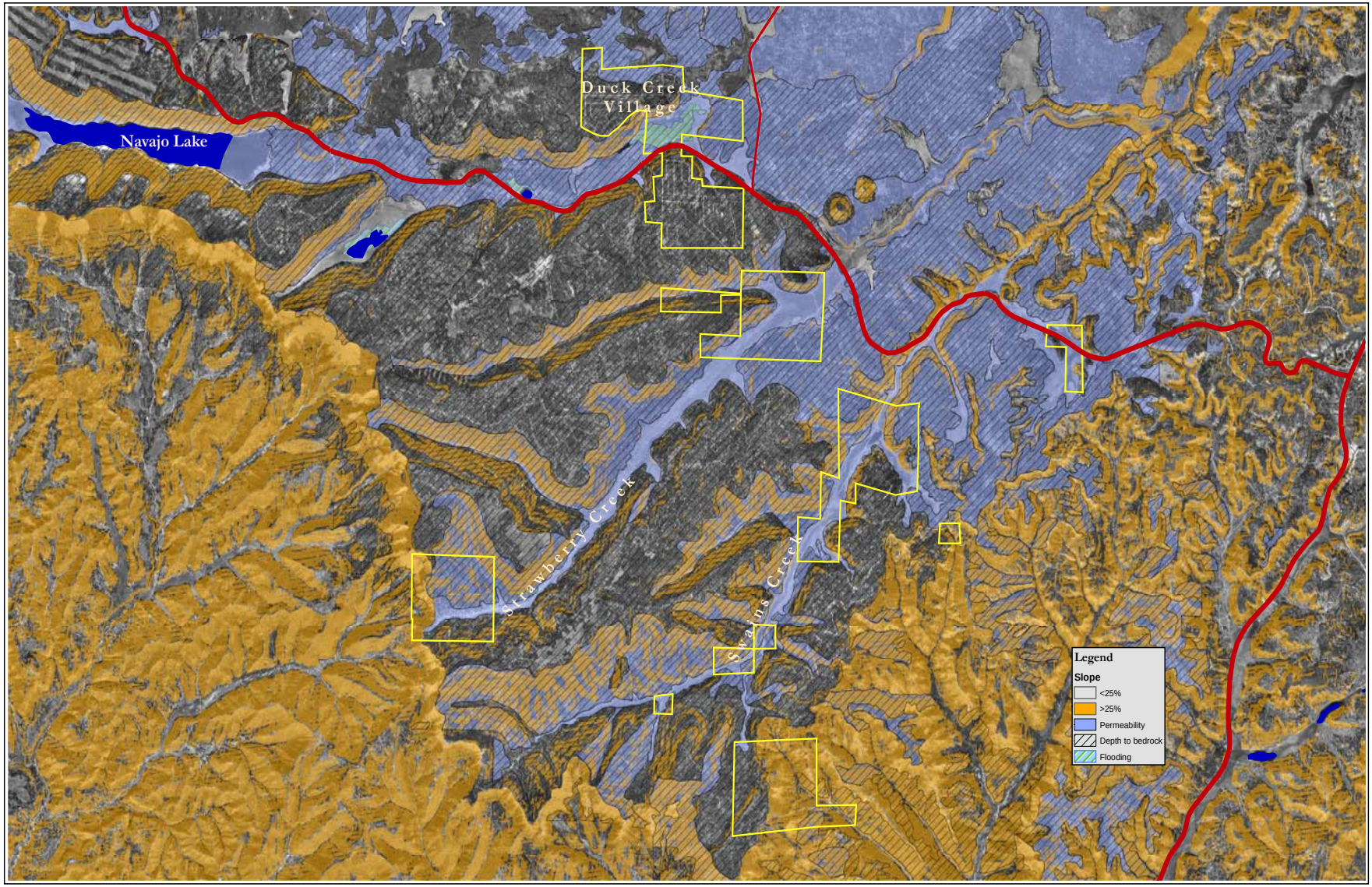

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