B  COMBINING LANDSAT MSS, AERIAL PHOTOGRAPHS & GROUND MEASUREMENTS
TO ESTIMATE RANGELAND PRODUCTIVITY

Michael J. Gialdini        (Sr Member Technical Staff – ESL Incorporated –
                                    Sunnyvale, CA)

## Problem

1    Produce a vegetation map over 2.2 million acres with detail down
     to the plant community level.

2    Produce estimates of rangeland productivity (pounds of usable
     forage per acre for cattle), for a 500,000 acre subset of area
     with a design goal for accuracy and precision of $\pm$ 20% at the
     80% confidence level.

## Approach

1    Specification of Data Inputs and their contributions

- Maps of area (ownerships/allotments/pastures)

    — Control extent of processing
    — Basis for summarization of estimation results

- Landsat data

    — Spectral classification as a stratification for
      subsequent sampling
    — Basis for map output

- Digital terrain data

    — Topographic description of spectral classes

- Large scale aerial photography

    — Sample of spectral classes, photointerpreted for
      vegetation composition
    — Stratification for selection of ground plots to
      measure productivity

- Ground Plots

    — Estimates and measurements of productivity, re-
      lated through the aerial photography back to the
      Landsat data.

## Data Collection

- Map entry via digitizing and initial Landsat classification carried on in parallel

- All data registered to a 50 meter UTM grid (Zone 12)

- Survey planning model applied to determine the number of samples required to produce the productivity estimates to the specified accuracy and precision ($\pm$ 20% at .80 probability)

- Samples allocated and selected from Landsat spectral classification, located on USGS 7-1/2 min, quads of the area

- Samples flown with large scale aerial photography (1:750 nominal scale)

- Large scale photography "bin-sort" interpreted to select plots for ground visit

- Large scale photography interpreted in detail to produce species composition estimates

- Ground plots visited and measured for pounds per unit area of usable, available and palatable species using BLM-SVIM methodology


## Data Reductions

- Ground plots provided estimates of pounds per acre of forage for cattle, adjusted for utilization and availability

- Ground plot estimates combined with Landsat classes to produce estimates of pounds per acre of forage by class

- Aerial photography interpretations combined with Landsat classes to produce quantitative descriptions of vegetation by class

- Digital terrain data combined with Landsat classes to produce topographical descriptions by class.


## Results

1   Vegetation Map

   - Quantitative descriptions of the vegetation by Landsat class used to produce vegetation map to the plant community level based on the BLM Arizona Vegetation Framework

2    Productivity Estimates

- Pounds per acre by class combined with digitized pasture and allotment maps to produce pounds per acre by pasture and allotment

3    Application Example

- Productivity estimates by class combined with new data input, identified water sources, to produce a map of all areas at or above a specified level forage per acre within a specified distance of water

4    Comment

- It is currently felt that the major benefit of the program was the development of a geographically-referenced data base that could be exploited further, even though this data base is a residual of the project, i.e., not the original objective.