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TIMBER RESOURCE INFORMATION SYSTEM

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a. Timber Resource Information System (TRIS)
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b. IN 053

c. As reported in past progress reports lack of adequate viewing equipment is the biggest problem the TRIS investigators have in using the ERTS data. The State of Washington viewed the ERTS imagery in a 9X9 format with an 18 times enlargement on their micro-fiche reader but had difficulty registering a grid over the screen of the reader. The strategy was to call the predominant cover type group within a 100-acre sample point on a 100 chain grid. The State of Washington strongly recommends the display of the Township and Range grid on the ERTS imagery to help with this registration problem and as an aid to finding the location of their scattered lands. One of the reasons Principal Investigator, Arthur Woll, obtained a Top Secret Clearance for the USGS special mapping center at Reston, Virginia was to have equipment available for viewing ERTS imagery. To bring ERTS into operational programs the land manager must be able to obtain rather inexpensive viewing equipment for enlarging and presenting a workable surface. NASA-Goddard in filling the product order for the Quinault Reservation extended the longitude too far East so that only 3 of 18 sets of data received covered the Quinault Indian Reservation. I have placed a retrospective order with my Technical monitor for two scenes that will give the imagery for all seasonal periods.

d. The State of Washington Department of Natural Resources has completed ERTS interpretations in the forest of western Jefferson County in the State of Washington and adjacent to the Quinault Indian Reservation. They interpreted band 5-MSS for an 8 January 1973 and 25 July 1973 scenes. These scenes were viewed in a 9X9 transparent positive format with an 18 times enlargement on their micro-fiche reader. They laid a 100 chain grid on the screen of the reader and call the predominant cover type group within a 100 acre sample point. Preliminary investigation convinced the interpreters the originally planned 10-acre sample point was too small so they developed a plan for using a 100 acre sample point. They were able to interpret the following cover type groups:

	Approx. Origins
Recent clear cut . . .	.1966 - present
Forest Reproduction . . .	.1956 - 1965
Conifer Second Growth. . .	.1886 - 1955
Conifer Old Growth . . .	.1885 or before
Hardwood . . .	.1955 or before

The winter scene, 8 January, was extremely important for distinguishing the Hardwood cover type but did not help in identifying mix-conifer Hardwood. The mixed classification was dropped from the study.

Because of the change in sample point size, 10 to 100 acres, the State must reprogram their cellular computer program they call GRIDS (Gridded Resource Inventory Data System). The change in the computer program has delayed the States comparison of their ERTS interpretations with their existing inventory within the "GRIDS" system. They expect the ERTS interpretations will update their recent cutting as the last GRIDS survey was on 1965 aerial photographs. The GRIDS reprogramming and a statistical comparison with the ERTS survey is planned for the next reporting period.

"Ground Truth" collected from the Quinault Tribe was laid to a planimetric base map compiled on an A-10 plotter from U-2 false color infra red photography taken by NASA in August 1972. The map is at a scale of 1" = 1000' and includes a large number of cultural features that facilitate orientation of the ERTS imagery to the base map and in turn the "ground truth." For example, the map shows the major timber clear cut blocks as of that date in August 1972. Shape and size of these cutting blocks are unique to that particular area and their arrangement can be readily identified on the ERTS imagery (at the 9X9 format or enlarged). Other features that are used to orient the "ground truth" to the ERTS imagery include - roads by legend of paved, all weather, limited use; streams; rock pits; and obvious property boundaries.

The investigation of the Quinault Reservation will include ERTS-RBV bands 1, 2, and 3 from a July 30, 1972 orbit that was flown within 1 day of the NASA U-2 flight used for compiling the base map that controls all the "ground truth." This imagery includes a color composite prepared by G.E. that has limited use because band 3 included a large amount of haze that caused the composite scene to be quite fuzzy. An October 1972 orbit is being interpreted; this includes all bands of MSS-4, 5, 6 and 7. This scene misses the eastern part of the Reservation but gives a good full look at the management or watershed units that are in the scene. We will use all MSS bands from 8 January 1973 and 25 July 1973 that the State of Washington used in their investigations. These scenes are on retrospective order with my Technical monitor. The last scene will be the MSS from August of 1973; this has very sharp detail and completes 5 ERTS scenes over a one year period.

Interpretations and correlations are being made from the ERTS imagery using different viewing equipment, i.e. - ITEK viewer with 20 and 30X enlargement capability for projecting transparencies, a POST viewer that has been modified to handle a "9X9" format with 18X enlargement. This enlargement capability is needed to get the ERTS imagery at a working scale for correlation with the "ground truth." The 9X9 transparencies are also being studied through a Diazo process for change detection and general interpretation. Best results to date have been - band 4 yellow for 1 time period on the machine, band 5 magenta for 3 time periods, and band 7 blue for 2 time periods. To show change we have used band 5 blue and a year later band 5 magenta, and the same for summer to winter scenes.

At the end of January 1974, 1 to 250,000 enlargements of the July 1972 and August 1973 scenes will be available from the USGS special maps photo laboratory. These will go through a special processing that will give a black and white print with 50 percent of the band detail from band 5 enhanced with 50 percent of the detail from band 7. These photos will be the base manuscript for delineations of the management units and changes within these units as interpreted from ERTS and correlated with the collected ground truth. Ground truth correlations have been facilitated by automated tree type classification work done by McDonnell Douglas from five channels of data from their multispectral scanner flown at 9,000 feet altitude in July 1973. This work ratioed 4 channels against a fifth thermal channel as the map background. Next period an outline for the final report will be prepared showing the utility of ERTS imagery as investigated under this contract for: (1) timber resource survey as conducted by the State of Washington and (2) a monitoring tool for resource management units on the Quinault Indian Reservation. An extension of time, at no additional cost to NASA, is being requested to contract for automated interpretation of ERTS computer compatible tapes and imagery to correlate with the collected "ground truth" and interpretations done by methods described within this progress report. The Quinault Tribe is progressing with the computerization of their resource management units in to a Raytheon type "NRIS" information system, that includes periodic update they hope to receive from an operational satellite.

e. The State of Washington Department of Natural Resources has completed ERTS interpretations from band 5-MSS for the forest they manage in western Jefferson County. They used an 8 January 1973 and 25 July 1973 scenes to call predominant cover type groups within a 100 acre sample point on a 100 chain grid. They were able to interpret the following cover type groups: Recent clear cut (approximate years of origin - 1966 - present), Forest Reproduction (1956-1965), conifer second growth (1886-1955), conifer old growth (1885 or before), and Hardwood (1955 or before). The winter scene, 8 January, was extremely important for distinguishing the Hardwood cover type but did not help in identifying Mix-conifer Hardwood. The mixed classification was dropped from the study. Changing the sample point size from 10 acres to 100 acres has prevented their completing a statistical comparison with their computerized GRIDS survey data. Resource management unit boundaries can be interpreted and delineated on ERTS from a "ground truth" 1" = 1000' planimetric map prepared from NASA flown high altitude color Infrared Aerial photography. McDonnell Douglas has had encouraging results with automated tree type classification interpretation of aircraft multispectral scanner data they flew on the Quinault Indian Reservation.

f. No publications.

g. The State of Washington request Township and Range projections be displayed on ERTS imagery. The principal investigator request an extension of time, at no additional cost to NASA, to contract for automated interpretation of

ERTS computer compatible tapes and imagery to correlate with the collected "ground truth" and interpretations done by methods, described within this Progress Report.

h. None

i. No change

j. None

k. None