ERTS-1 APPLICATIONS TO CALIFORNIA RESOURCE INVENTORY*

by

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SUMMARY

Several federal, state and private agencies currently are investigating the usefulness of ERTS-1 observations for the making of resource inventories in California. These include the U.S. Forest Service, the Bureau of Land Management, the University of California, several agencies within the Administrative Branch of the State of California (including the California Department of Agriculture and the California Resources Agency), and such private industrial groups as Earth Satellite Corporation, IBM Corporation and Natural Resources Management Corporation.

Most of these groups have only recently received the first ERTS-1 data of their study areas and have indicated that they cannot as yet contribute anything substantive to this report on ERTS-1 applications to California resource inventory. Consequently the report given here pertains primarily to work that has been performed to date by personnel of the Forestry Remote Sensing Laboratory of the University of California. Their NASA-funded study, along with that of 20 other scientists from 5 campuses of the University of California seeks to make an integrated study of earth resources in the state of California using ERTS-1 and

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supporting aircraft data.

Personnel engaged in this integrated project recognize the possibility of achieving two kinds of benefits from studying ERTS-1 applications to California resource inventory: (1) some of the ERTS-based resource inventories should prove to be of direct and immediate benefit operationally to the managers of California's earth resources, even though ERTS-1 was intended to serve only as an experimental system, and (2) resource inventory techniques developed and tested in California should prove to be applicable, with only minor modification, to many analogous areas in developing parts of the globe.

By July 25, 1972, less than 48 hours after ERTS-1 had been launched it was obtaining operationally useful data of vast portions of the state of California. In fact, cloud-free coverage of nearly half of the state was obtained during the three passes made over California by ERTS-1 on July 25, 26 and 27 (see Figure 1).

From the outset we have made a maximum effort to ensure that the analyses which we made of ERTS imagery would be responsive to the expressed needs of the resource managers, themselves. Figures 2, 3 and 4 provide a listing of the major resource management groups with which we are working in such fields as forestry, hydrology, range management, and agriculture as we investigate the usefulness of ERTS-1 imagery to resource management in California. Collectively these groups are representative of most of the resource managers of the state of California. Long before the launch of ERTS-1, and in anticipation of its potential usefulness as a resource inventory tool, we were working closely with these groups. This previously established relationship has greatly

facilitated our working in a meaningful way with these same groups during the limited period of time that actual ERTS-1 imagery has been available to us. We are confident that our findings to date, as reported in the remainder of this summary, are much more than mere pleasant discoveries as to the kinds of features that are discernible on ERTS-1 imagery. Instead they are truly responsive to the needs of these various groups for timely, accurate information relative to the resources which they seek to manage.

Our findings to date will be briefly summarized here under five major categories.

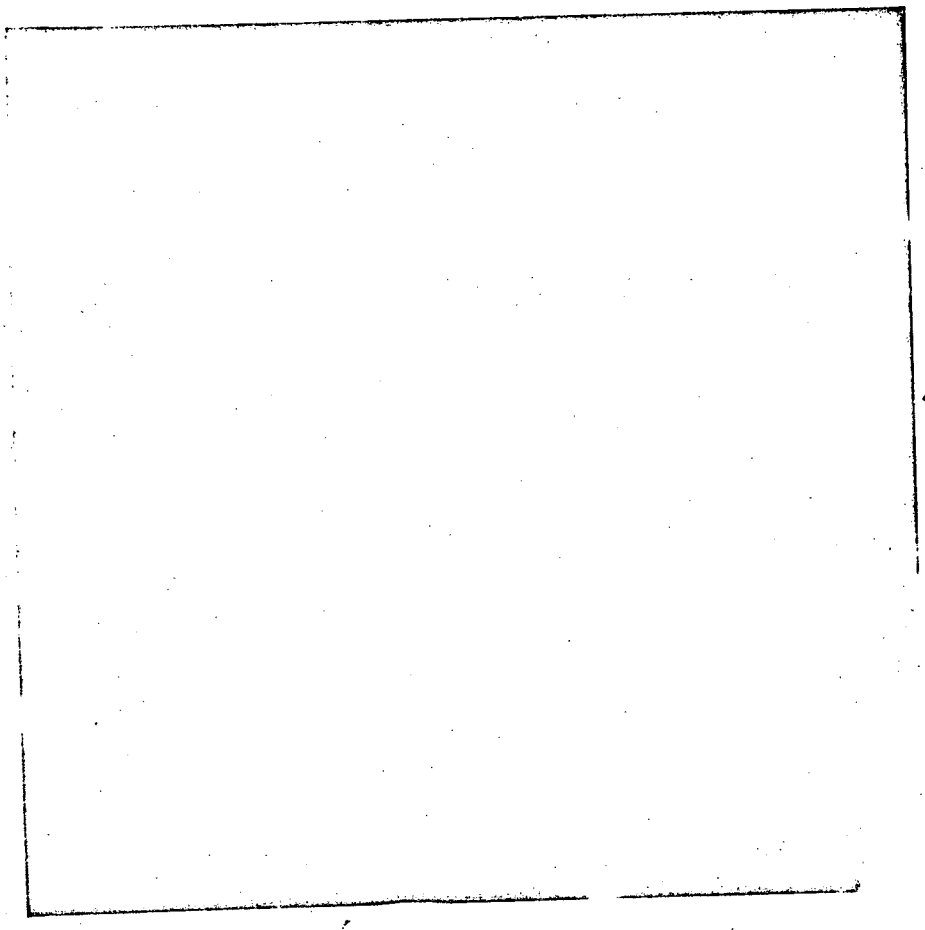


Figure 1. Shown here at a scale of approximately 1:250,000 is an enlarged portion of the MSS imagery from bands 4, 5 and 7 that was obtained by ERTS-1 from an altitude of 500 miles on July 25, 1972 while orbiting over San Joaquin Valley in California. The imagery as shown here has been color-combined by NASA in order to provide "false colors" which simulate Infrared Ektachrome photography. Most of the fields shown here are 160 acres in size. Virtually every field can be classified by either human or mechanical means into one of 5 color classes that are indicative of crop type or other land status, as indicated by the following color code: Yellow = small grains, mostly barley; Brown = saffleur (also called "safflower"); Black = burned stubble from small grains that have recently been harvested; Blue-Grey = fallow ground; Red = healthy green crops, mostly sugar beets and alfalfa. While similar colors might appear on a later date, they would be indicative of other crop types, consistent with the "crop calendar" concept. Oblique aerial photos of portions of this area, taken a few days after the ERTS-1 overflight and from an altitude of 10,000 feet, are shown in the following 3 pages. Arrows and letter annotations on the above photo indicate the approximate camera stations and camera orientations used in taking the corresponding oblique photos. The final page shows a "computer printout" of part of the above area, made by scanning the 3 black-and-white MSS images and programming the computer to print out a unique symbol for each of the 5 categories. (Material prepared by the Berkeley Campus of the University of California.)

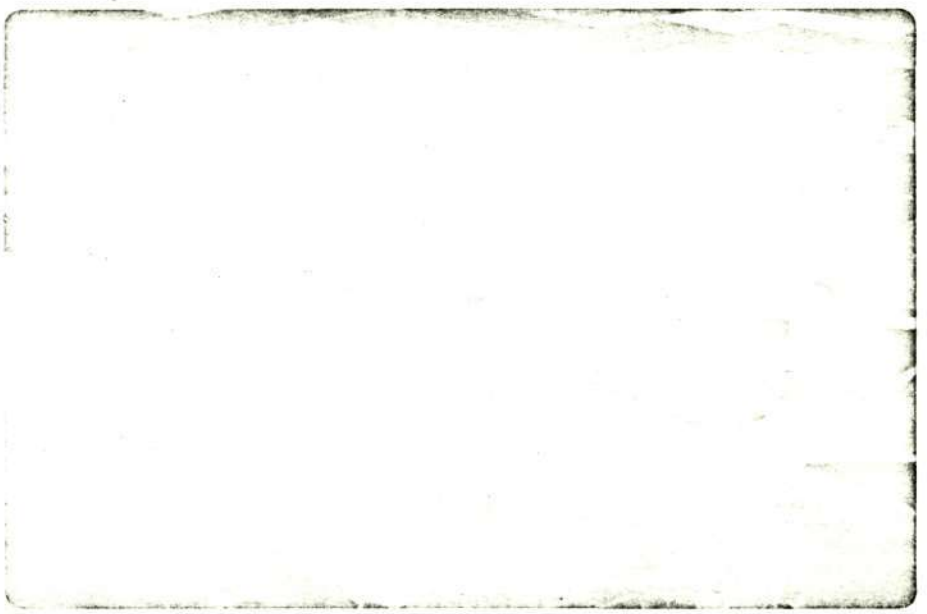


Photo A

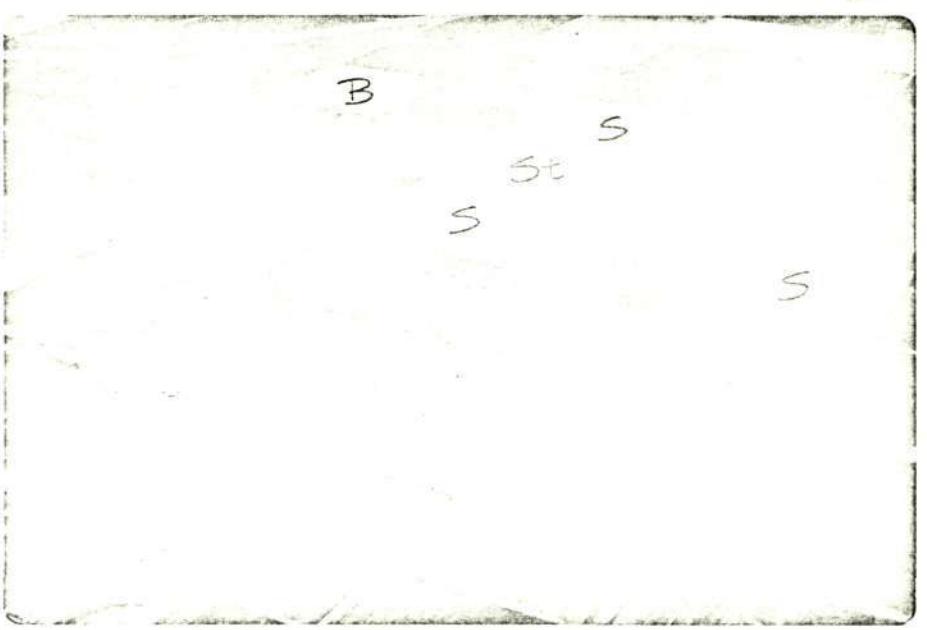
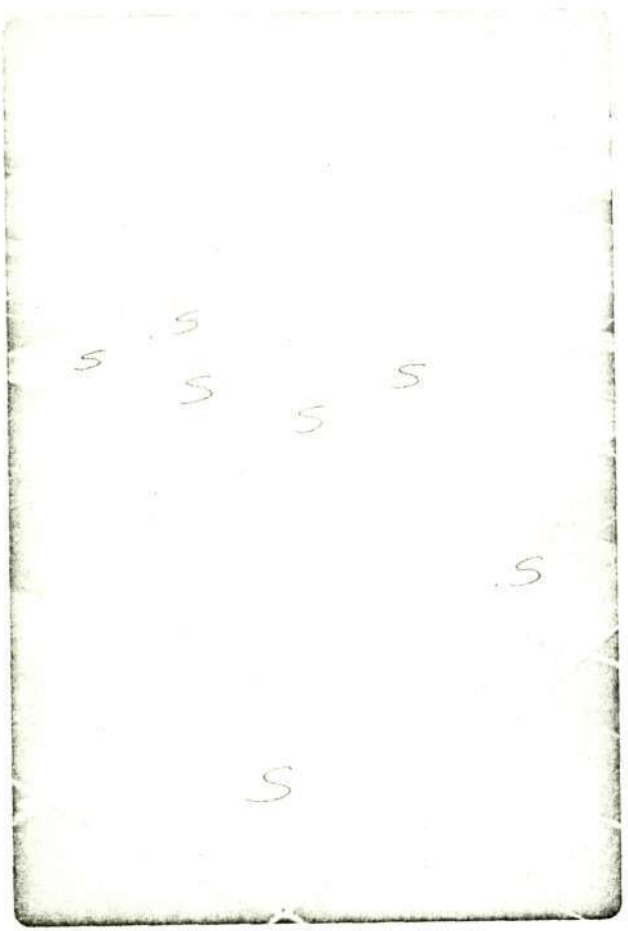


Photo B

Figure 2. These are photos A and B which were taken from an altitude of 10,000 feet with camera locations and orientations being as indicated by the corresponding annotations of Figure 1. A unique color for the categories of fields labelled above will be found by locating the same fields on the space photo of Figure 1. S = saffleur; B = barley; and St = burned stubble from recently harvested small grains. (Material prepared by the Berkeley Campus of the University of California.)



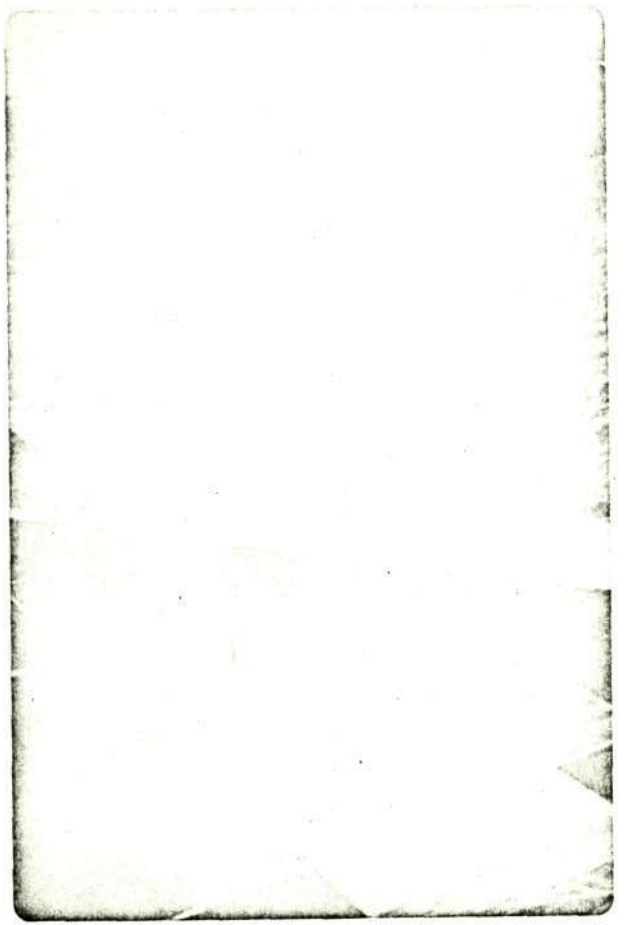


Photo C

Photo D

Figure 3. These are photos C and D which were taken from an altitude of 10,000 feet with camera locations and orientations being as indicated by the corresponding annotations of Figure 1. As in Figure 2, S = saffleur; B = barley; and St = burned stubble. (Material prepared by the Berkeley Campus of the University of California.)

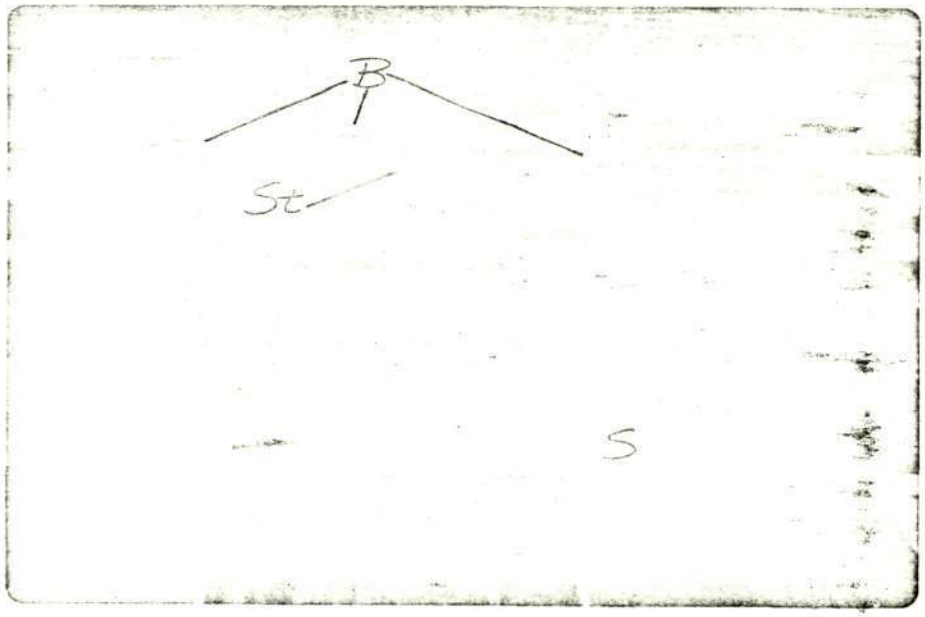


Photo E

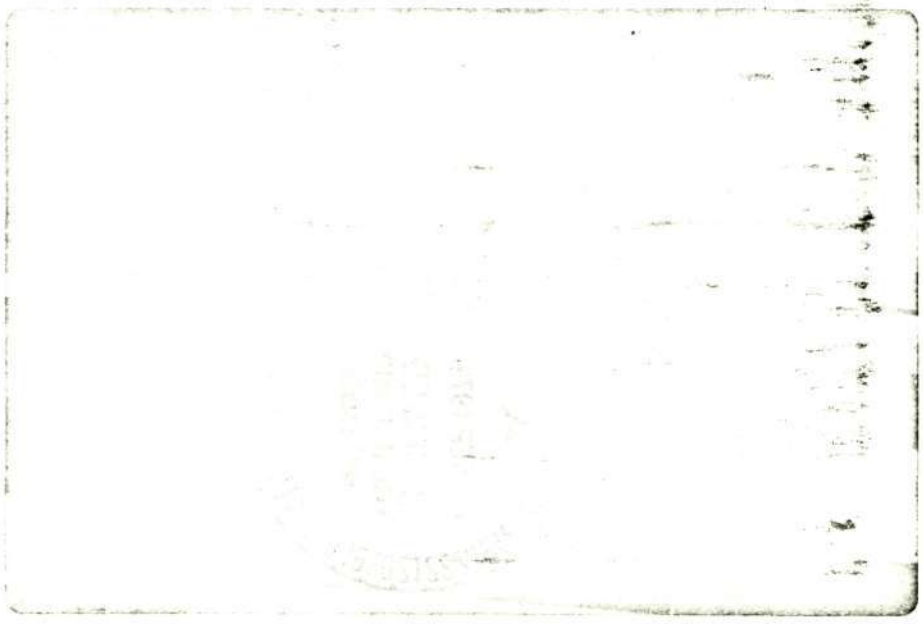


Photo F

Figure 4. These are photos E and F which were taken from an altitude of 10,000 feet with camera locations and orientations being as indicated by the corresponding annotations of Figure 1. A unique color for the barley fields labelled above will be found by locating the same fields on the space photo of Figure 1. Since these two photos were taken a few days after Figure 1, a few fields have different appearances due to changes in them during the interim, e.g., a few barley fields have been harvested and the black "T" formed by fields of burned stubble has become less conspicuous due to settling and weathering of the ash. (Material prepared by the Berkeley Campus of the University of California.)