

Pictures Don't Lie— But the Bigots Can't Be Bothered*

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ABSTRACT: *Although photogrammetrists and photo interpreters are accustomed to relying on photography as an irrefutable source of facts, there are many bigots who refuse to be bothered by the facts which photos offer them. To accept photo facts, these bigots usually would need to abandon certain preconceived opinions which they find it convenient or expedient to hold. In this paper, by means of specific examples, the author attempts to expose certain of these bigots, but warns against our assuming a "holier-than-thou" attitude. He then considers how we might better convince both bigots and the public in general that photos are a rich and unbiased source of facts which should be neither disparaged, denied or ignored.*

THE term "bigot" is defined in Webster's dictionary as "one who is intolerantly attached to an opinion." In effect, then, a bigot is one who says, "My mind is made up; don't confuse me with the facts."

As photogrammetrists and photo interpreters, you and I extract facts from photographs. We know that "pictures don't lie" and we are accustomed to relying on them as irrefutable sources of important truths. Yet, there are many bigots who are so intolerantly attached to preconceived opinions that they refuse to be bothered by the facts which photos offer them. A case in point is the fellow who stood in my office in October 1962, stoutly asserting that the published photos of Russian missile bases in Cuba were faked. He insisted that these were actually photos taken somewhere in the United States where our own government had erected Russian-like installations. Our armed forces had then photographed these installations from the air, he said, for the purpose of deluding the American public into thinking that the Russians had performed a belligerent act. Philosophically, he built for himself a very convincing case; he then became so intolerantly attached to his opinion that he had no interest in my offer to show him irrefutable evidence that these photos were truly taken of areas in Cuba. This man was a bigot who could not be bothered by the photographic facts.

In this paper, by means of specific examples, I propose to expose certain of these bigots. Perhaps, by so doing, I will prompt others to do likewise. This rabble-rousing role is somewhat new to me. I have published nearly one hundred articles which tended to view the *bright* side of the photogrammetric picture; yet there is reason to believe that I might render a greater service by presenting this one paper that deals with the *dark* side. So let's get on with the grand exposé, even though time and space permit us to look at only a few specific examples. In so doing, let us not assume a "holier-than-thou" attitude, lest we be found guilty of the same shortcomings that we so freely criticize in others.

Figure 1 shows three vertical aerial photographs of a navel orange grove in California. The *left* photo, taken with panchromatic film and a Wratten 12 filter, shows essentially what the human eye might have seen from the same vantage point on the same date (April 25, 1958). On it all of the orange trees have essentially the same tone, even though some are healthy and some are not. The *middle* photo of Figure 1 was taken on the same date, from the same camera station, but using infrared film and a Wratten 89 filter. On this middle photo, certain of the trees appear quite dark in tone. There is abundant evidence that vegetation which appears very dark in tone on infrared-89 photography is unhealthy (Colwell, 1956; American Society

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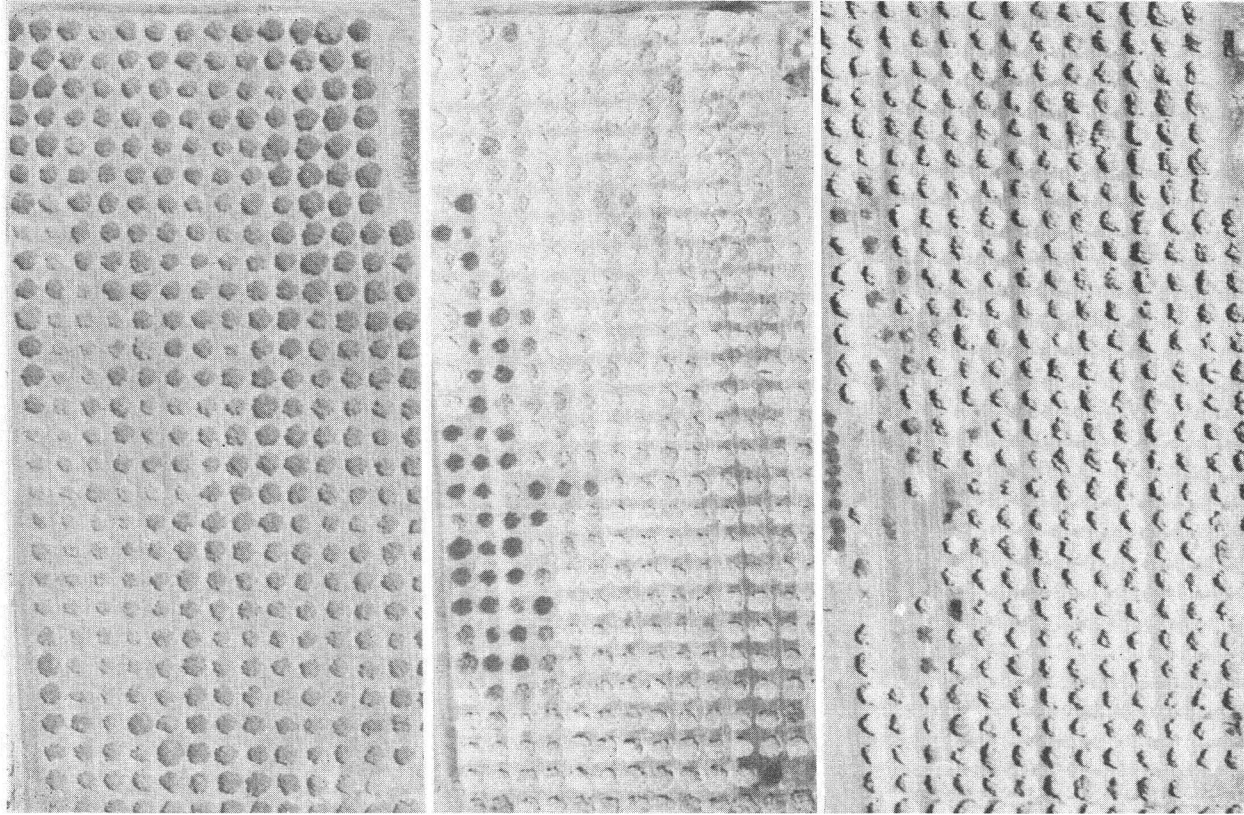


FIG. 1. *Left.* Pan-12; April 25, 1958. *Center.* Infrared-89; April 25, 1958. *Right.* Infrared-89; April 25, 1961. For evidence contained in these photos, but denied by the bigots, see text.

of Photogrammetry, 1960; Brenchley and Dadd, 1962; etc.). The *right* photo of Figure 1 also was taken with an infrared-89 fm-filter combination. By design, it was taken exactly three years later than were the left and middle photos, and at the same time of day. On this right photo, it is apparent that several trees have died and have been removed. Close comparison of the right photo with the middle one shows that the only trees which have died by 1961 are those which appeared dark in tone on infrared-89 photography three years previously. Further comparison shows that, by 1961, a few trees which previously lacked vigor are in the process of recovering.

These irrefutable facts serve to set the stage for a grand entry of the bigots. The scene is the local county courthouse. Joe Farmer, who owns the orange grove, is there; so is his clever lawyer. Their "preconceived opinions" are these: (1) approximately 2,100 trees in Joe's 40-acre orange grove are dead or dying. (Part, but not all, of Joe's grove is shown in the photos of Figure 1.); (2) the trees are being killed by a fungus which thrives in the soil when there is a high-water-table in the orange grove; and (3) the United States Government is to blame, because all of the trees were healthy before the government-built canal, nearby, was put into use. Then water from the canal allegedly seeped into the orchard, elevated its water table, promoted the growth of the fungus, and thus killed the trees.

While there may be truth in some of these opinions, the crux of this case relates to the number of trees killed. If, as the plaintiff maintains, there are 2,100 trees in a "dead or dying" condition, his grove can no longer be managed profitably. Therefore, someone must pay him several hundred thousand dollars in damages whether this condition has resulted from an act of God or of the government. (In recent years, at least, it has been more fruitful to sue the government, rather than God, so this is Joe's course of action.) On the other hand if, as the aerial photos indicate, only 61 trees are dead or dying and the remainder have actually been *gaining* in vigor during the past three years, this might conceivably be regarded as normal mortality in an overmature orange grove, whereupon the suit should be dismissed. If the latter statements are indeed true, Joe might, instead of suing his government, take the almost unprecedented action of writing a letter of thanks to his government

for building him such a splendid canal at taxpayers' expense.

On the assumption that "pictures don't lie," the government introduces into these court proceedings aerial photographic evidence such as that shown in Figure 1. The facts revealed by these photos are explained to the court by an expert photo interpreter who uses words that the layman can clearly understand. Comparison of the 1958 photos with those taken in 1961 leaves little room for doubt that only 61 trees are dead or dying—not 2,100.

Sensing that this unbiased and clearly-documented testimony might do damage to his case, the attorney for the plaintiff derisively asks the photo interpreter: "Are you trying to tell the court that you can determine more about the condition of individual trees in that orange grove, simply by studying infrared aerial photos taken at an altitude of 4,800 feet, than can my citrus experts who have been in practice for twenty-five years and have examined this grove, tree-by-tree, have counted and measured the fruits, examined the foliage, parted the foliage and examined the interior of each tree crown? Is this your testimony?"

To this, the modest photo interpreter replies, "Yes sir; the one thing that your experts haven't developed with their twenty-five years of experience is infrared-sensitive eyeballs!" Then the photo interpreter once more invites the bigots to examine the facts as portrayed on the aerial photographs.

For reasons best explained by bigots, the unbiased photographic facts in this case are considered not worth bothering about. It is concluded that Joe's orchard has been so severely damaged, by seepage from the government's canal, that oranges can no longer be grown there at a profit.

Figure 2, taken of the same orange grove in the summer of 1963, provides an interesting sequel to this case. New orange trees are being planted where the few old ones had to be removed. Now that the hearing has been concluded, the area apparently has been found suitable for orange production, after all. The farmer can always hope that some misfortune eventually will befall these new trees; also, so that the government can again be sued. Meanwhile the precedent established

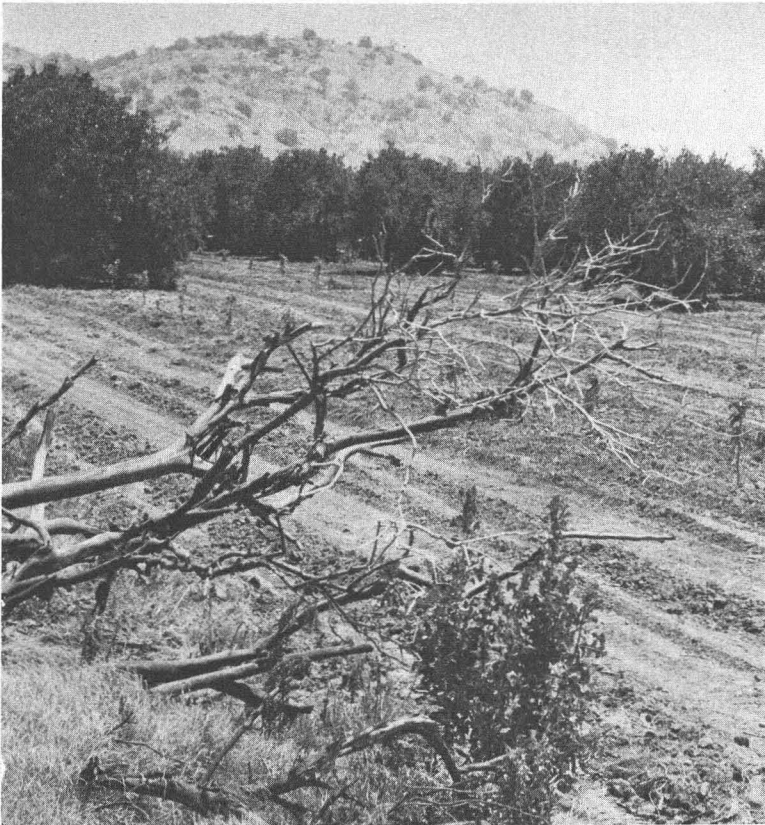


FIG. 2. This photo, taken in July 1963, shows a portion of the same orange grove as is illustrated in Fig. 1; it provides an interesting sequel to the testimony of the bigots. Now that the hearings have been completed, the actions of these bigots show that the photos of Fig. 1 did not lie, after all. The only trees which have been removed from this grove are those which, five years before, photographed dark in tone on infrared-89 photography (See middle photo of Fig. 1) and which therefore were given the "kiss of death" at that time by the photo interpreter. The bigots seem to have made a 34-fold error, or misstatement of fact, in telling the court that 2,100 trees were "dead or dying"; and, contrary to their solemn testimony in court that this land was no longer fit for the production of oranges, they have now planted new orange trees to replace the few old ones that have been removed.

by the decision reached in Joe's case will no doubt be of interest to other suit-minded farmers owning property near the canal. In fact, a suit for nine million dollars is to be heard as soon as Joe's hearing is concluded.

As we leave this case, we might well ask ourselves whether there is a moral principle involved here that far transcends the photogrammetric one. Most of the readers and hearers of this paper can well remember that, twenty years ago, when we were embroiled in a world war, the average adult American was commendably asking himself, "How can I best *serve* my government?" With the encouragement of certain fee-hungry attorneys, this question is being replaced in the minds of many adult Americans by a far more selfish one: "How can I best *sue* my government?"

To continue with my unpleasant task, I will now direct your attention to Figure 3. Recently a careful teen-age driver was issued a citation for driving through a red light at the nearest of the intersections shown in this figure. The teen-ager insisted, when pulled to the curb a block further down the street, that there was *no* red light at said intersection. This argument caused the citation which he received to be all the more severe. He elected to appear in court to challenge the citation. Upon doing so, he presented a 16- \times 20-inch enlargement of the photo shown in Figure 3; this photo showed all pertinent details, including the absence of a stop light at the intersection. Nevertheless the arresting officer, perhaps to save face, stoutly maintained that there was, indeed, a stop light at said intersection, and thus won his case, the

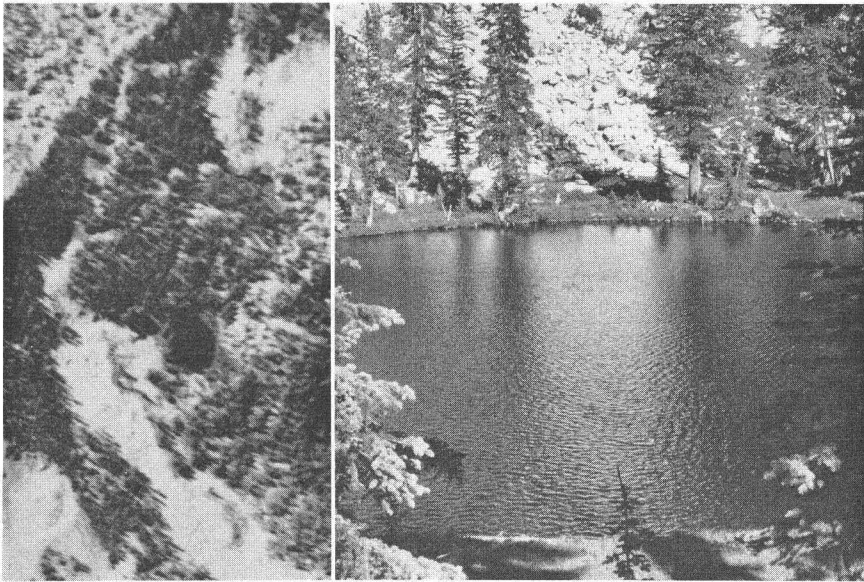


FIG. 3. A bigoted policeman insisted in court that the nearest intersection shown here had a stop light facing the onrushing traffic. The bigoted judge could not be bothered by this photographic proof to the contrary; hence a careful driver was unjustly convicted of a serious traffic violation.

photo and the fact notwithstanding. If I seem to speak with some feeling on this matter, it is because I took the picture, and the teen-age driver was my son, who was justifiably proud of his record for careful driving.

Teen-agers with less moral fiber than he have been induced to a life of crime by such injustices.

Figure 4 provides still another example of



FIGS. 4 (left) and 5 (right) showing one of many lakes ideally suited to the production of trout. Those charged with development of fish and game resources in the local area continue to maintain that all lakes suitable for the production of trout have long since been stocked. They can't be bothered with the facts which these two figures, and Figure 6, show regarding the inadequacy with which they are performing their jobs.

factual data derivable from photos, but ignored by certain bigots, despite their "need to know." The lake shown in this aerial photo is ideally suited to the production of trout; yet, like many other lakes that are difficult of access, it remains unstocked.

Let us consider specifically what aerial photo interpretation tells us about this lake: (1) the absence of underwater detail in this granite basin indicates that most of the lake is at least twenty feet deep; hence the lake would not freeze solid in the winter and kill the fish; (2) the water-weed that is seen fringing much of the lake is an ideal habitat for fresh-water shrimp and other food on which trout can thrive; (3) there is evidence of a sufficient flow of water into this lake from the surrounding granite peaks, and of a sizable outlet from the lake, to ensure against stagnation of water in the lake; (4) as a corollary, excellent spawning beds for the trout are offered by the lake's inlets and outlet; and (5) the perimeter of the lake, when studied stereoscopically on the aerial photos, is seen to offer the fisherman highly favorable terrain for fly-casting and spin-fishing.

For nearly twenty-five years I have been locating such lakes on aerial photos, and then visiting them on the ground to confirm that they are both unstocked and ideally suited to the production of trout.

Authorities charged with the responsibility for stocking such lakes often cannot be bothered by the photos, judging from my experience. At one time I was told that it was not feasible to stock such lakes because steep granite terrain prevented the lakes from being reached by pack animals. Later, I was told that the art of stocking such lakes through the use of aircraft has been perfected and that consequently all lakes suitable for the production of trout had long since been sought out from the air and adequately stocked. My own experiences continue to demonstrate that neither of these claims is true. Yet, year after year, certain bigots can't be bothered with photographic evidence that they are failing to develop the recreational potential of an important natural resource with which they have been entrusted.

By way of demonstrating that this situation is, indeed, a current one, I took the photo shown in Figure 5 less than three weeks ago, on August 26. This terrestrial photo is of portions of the same lake. An



FIG. 6. These rainbow trout were one inch long in 1940, when they were used to stock a previously barren lake similar to that shown in Figs. 4 and 5. They averaged 20 inches when caught on a fly eight years later. The trout continued to reproduce satisfactorily and the lake continues to yield fine catches of fish. Such results are consistent with the announced objective of fish and game experts, "to spread the impact of fishermen over the maximum water surface." Yet the experts charged with achieving this objective continue to insist that all lakes suitable for the production of trout have long since been stocked—the photos and the fact notwithstanding.

on-the-ground check confirmed the accuracy of the previous aerial photo interpretation and also provided evidence that the lake had never been stocked.

One might ask, however, whether the lake might have been stocked on previous occasions, and the fish, for some reason, had failed to survive. Once more, on the assumption that pictures don't lie, I offer photographic evidence that this is highly unlikely. Twenty-three years ago I stocked two other lakes very similar to this one, and less than three miles from it. At that time operators of the State's nearby fish hatchery insisted that it was virtually impossible to stock such lakes. However, they kindly provided me with one-inch trout from their hatchery when I offered to do the job myself. The success of these stockings (Colwell, 1950) are indicated by Figure 6 which shows a representative catch from one of these lakes taken eight years after stock-

ing. Similar success has been achieved over the years in the stocking of other nearby lakes. There appears to be no reason why the lake shown in figure 5, and many others like it, could not have been producing equally good catches of fish all these years.

It is, perhaps, fortunate that this paper has nearly reached its allowed length. Accusations of the type I have been making, and could continue to make, are not pleasing to hear, particularly at this meeting where we are assembled to honor the great Professor Earl Church. Yet I sense that he might have welcomed the presentation of at least one paper that sounded a sour note. Otherwise we might have been sweet-talked by some of the more optimistic papers into thinking that the value of photography, as an unbiased source of truth, is universally recognized.

Let us realize that there still is a big job to be done in selling photogrammetry and photo interpretation. To this end, let us appreciate the selling opportunity that is ours at meetings such as this; to this end let us also recognize the importance of our continuing, as a

Society, to produce manuals and periodicals of the highest possible quality. In addition, let us not overlook the many opportunities for selling photogrammetry and photo interpretation that are afforded to each of us individually. Then let us proceed to do our selling job, both individually and corporately, with the same vigor, skill and enthusiasm as Professor Church himself exhibited in his lifetime of service to our profession. I suspect that he would regard our solemn resolve to do this as the highest tribute we could pay him on this commemorative occasion.

LITERATURE CITED

- American Society of Photogrammetry, "Manual of Photographic Interpretation," George Banta Company, Menasha, Wisconsin, 868 pages, 1960.
- Brenchley, G. H. and C. V. Dadd, "Potato Blights Recording by Aerial Photography," *N.A.A.S. Quarterly Review*, London England, Vol. 57, pp. 21-25, 1962.
- Colwell, R. N., "Uses of Aerial Photographs in Forest Recreation," *PHOTOGRAMMETRIC ENGINEERING*, XVI (1), pp. 21-23, 1950.
- Colwell, R. N., "Determining the Prevalence of Certain Cereal Crop Diseases by Means of Aerial Photography," *Hilgardia*, 26(5), pp. 223-286, 1956.

*Adjustment of Elevations Derived from Instrumentally Bridged Aerial Photographs**

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ABSTRACT: *Elevations derived from instrumentally bridged strips of aerial photographs exposed at a flight height of 9,000 feet were adjusted by three different methods: with a graphical method, with the ITC-Jerie analog computer, and with a mathematical method. The RMSE values of the adjusted elevations for the three methods were 4.6, 3.0, and 3.3 feet, respectively. Because of the accuracy and expediency found in the mathematical approach, the method will be evaluated under operational conditions.*

INTRODUCTION

IN U. S. Geological Survey quadrangle mapping, supplemental elevations are determined for three principal purposes: to provide vertical control for individual stereo-models in photogrammetric compilation, to

furnish map spot elevations, and to provide data for map accuracy evaluations. Because the required field operations are time-consuming and costly, the Topographic Division of the Geological Survey is investigating office methods of establishing supplemental elevations. In an earlier study, photogrammetri-

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