

LARS Contract Report 043080

Monthly Progress Report

Training Course Entitled
"Remote Sensing for Mineral Specialists"

Award No. YA-553-RFPO-2

Reporting Period: April 1-30, 1980

submitted to: Bureau of Land Management
Denver Federal Center
Mr. Jean Juilland, Technical Monitor

Principal Investigator: Shirley M. Davis
Laboratory for Applications of
Remote Sensing
Purdue University
West Lafayette, Indiana 47906

May 1980

4) One complete set of imagery for student workshops.

In summary, BLM now has received 31 full sets of student materials, distributed as follows:

14 sets for students who attended course
1 set for Jean Juilland during course
16 sets for use in future courses
31 total

One more complete set of materials will be provided as part of the final report of the project.

Financial Review

Toward the end of April acknowledgement of the additional \$2,545 granted for the contract was received at Purdue and the budget was reviewed in its entirety. At this time I foresee no problems with completing the final reports within the budgeted amount remaining.

Future Course

As part of the monthly report for March, suggestions from LARS were included for an approach to presenting a course on numerical techniques. This was a preliminary report, submitted at that time for review by BLM and recommendations.

To enhance this preliminary report, plans for hands-on work with the IDIMS system at EROS are being developed. Both Shirley Davis and Luis Bartolucci are planning to work there under the tutelage of Donna Scholz. The preliminary recommendations, submitted on April 10, were drawn up based solely on the demonstrations of the BLM system, our conversations with IDIMS users, and our general understanding of the processors implemented in the system. The projected hands-on experience at EROS will give us the contact with the system that we need in order to make more recommendations more specific.

Because of other commitments during May of the LARS staff involved and some system change-over considerations at EROS, we are having difficulty scheduling the visit for May. Should an extension on the contract be required in order to schedule this hands-on work, we will apply for it early in May.

Introduction

Work during April focused on four activities, three related to the training course given in March and the last focused on future courses which BLM is interested in offering. The activities were:

- 1) Summarizing student evaluations for instructor use and for the final report
- 2) Revising student notebook and assembling instructor's materials
- 3) Reviewing financial status of the account
- 4) Gathering information and developing recommendations for follow-on numerical course.

Summarizing Evaluations

Accompanying this report for your records are the original evaluations from thirteen of the fourteen students who attended the course. Since names on the evaluations were optional, the missing evaluation cannot be identified.

Attached as Appendix A is a summary of the evaluations. It was prepared for the final report and as a tool for the course staff to use as they prepare their own evaluations.

Revising and assembling course materials

Materials for the students and instructors were assembled and revised as needed for a smoother documentation of the course. Revisions in the student book included addition of a title page for each workshop activity listing the imagery and supporting material required for that project. In addition, the course schedule was revised and some handouts were corrected or improved. All new material is identified in the revised notebook with a date of April 1980.

Collection and duplication of overheads and slides was completed during April, and detailed written documentation of the presentations was about 65% complete by the end of the month. In addition the videotapes documenting the course have been catalogued and keyed to the revised course outline for easy cross-reference.

Accompanying this report are the remaining materials required to complete the sixteen sets of student materials that were not used. These sets of materials and notebooks were left with Jean Juilland at the completion of the course; fifteen sets were in boxes and unassembled, and the sixteenth was assembled as a model. Materials being sent with this report are:

- 1) Reconnaissance geologic map, Nabesna Quadrangle A-4: 15 copies
- 2) Reconnaissance geologic map, Nabesna Quadrangle B-4: 15 copies
- 3) LARS Technical Report 040479: "Digital Processing of Remote Sensed Multispectral Data" by L.A. Bartolucci: 3 copies

Summary

Course Evaluation

Remote Sensing for Mineral Specialists

March 1980

1. What was the strongest aspect of the course?

2. What was the weakest aspect of the course?

3. To what extent did the course help you meet the stated objectives?
(see list of course objectives)

| <u>Objectives</u> | <u>Completely</u> | <u>Mostly</u> | <u>Somewhat</u> | <u>Not at all</u> |
|-------------------|-------------------|---------------|-----------------|-------------------|
| 1 | <u>8</u> | <u>5</u> | <u> </u> | <u> </u> |
| 2 | <u>8</u> | <u>4</u> | <u>1</u> | <u> </u> |
| 3 | <u>3</u> | <u>7</u> | <u>1</u> | <u> </u> |
| 4 | <u>7</u> | <u>3</u> | <u>3</u> | <u> </u> |
| 5 | <u>7</u> | <u>6</u> | <u> </u> | <u> </u> |
| 6 | <u>4</u> | <u>6</u> | <u>3</u> | <u> </u> |
| 7 | <u>4</u> | <u>7</u> | <u>2</u> | <u> </u> |
| 8 | <u>7</u> | <u>7</u> | <u>1</u> | <u> </u> |
| 9 | <u>5</u> | <u>5</u> | <u>3</u> | <u> </u> |
| 10 | <u>3</u> | <u>9</u> | <u>1</u> | <u> </u> |

4. What activities should be added to the course to better meet the objectives?

5. What objectives should be added to the course to better meet the needs of the participants?

6. What activities or objectives should be deleted from the course? Please include your reasons.

7. What changes would you suggest in the way the course was conducted?

8. Please evaluate the following portions of the course in terms of relevance/ importance and quality of presentation.

(CHECK ONE IN EACH COLUMN FOR EACH TOPIC)

| TOPIC | RELEVANCE/ IMPORTANCE | QUALITY OF PRESENTATION |
|------------------------------|--------------------------------|----------------------------|
| Principles of remote sensing | <u>12</u> Very important | <u>7</u> Excellent |
| | <u>1</u> Somewhat important | <u>5</u> Good |
| | <u> </u> Not very important | <u>1</u> Fair |
| | <u> </u> Unimportant | <u> </u> Poor |

| TOPIC | RELEVANCE/ IMPORTANCE | QUALITY OF PRESENTATION |
|---|--------------------------------|----------------------------|
| Spectral characteristics of Earth-surface materials | <u>12</u> Very important | <u>8</u> Excellent |
| | <u>1</u> Somewhat important | <u>5</u> Good |
| | <u> </u> Not very important | <u> </u> Fair |
| | <u> </u> Unimportant | <u> </u> Poor |
| Detection of EMR | <u>10</u> Very important | <u>7</u> Excellent |
| | <u>3</u> Somewhat important | <u>5</u> Good |
| | <u> </u> Not very important | <u>1</u> Fair |
| | <u> </u> Unimportant | <u> </u> Poor |
| Elements of images analysis and image interpretation | <u>13</u> Very important | <u>9</u> Excellent |
| | <u> </u> Somewhat important | <u>3</u> Good |
| | <u> </u> Not very important | <u>1</u> Fair |
| | <u> </u> Unimportant | <u> </u> Poor |
| Development of a geologic interpretation | <u>13</u> Very important | <u>5</u> Excellent |
| | <u> </u> Somewhat important | <u>5</u> Good |
| | <u> </u> Not very important | <u>2</u> Fair |
| | <u> </u> Unimportant | <u> </u> Poor |
| Image enhancement | <u>8</u> Very important | <u>7</u> Excellent |
| | <u>5</u> Somewhat important | <u>5</u> Good |
| | <u> </u> Not very important | <u>1</u> Fair |
| | <u> </u> Unimportant | <u> </u> Poor |
| Interpretation of mineral potential | <u>13</u> Very important | <u>3</u> Excellent |
| | <u> </u> Somewhat important | <u>9</u> Good |
| | <u> </u> Not very important | <u>1</u> Fair |
| | <u> </u> Unimportant | <u> </u> Poor |

| TOPIC | RELEVANCE/ IMPORTANCE | QUALITY OF PRESENTATION |
|--|--------------------------------|----------------------------|
| Computer Processing of Landsat MSS data | <u>9</u> Very important | <u>7</u> Excellent |
| | <u>4</u> Somewhat important | <u>6</u> Good |
| | <u> </u> Not very important | <u> </u> Fair |
| | <u> </u> Unimportant | <u> </u> Poor |
| Introduction to IDMS | <u>8</u> Very important | <u>3</u> Excellent |
| | <u>5</u> Somewhat important | <u>6</u> Good |
| | <u> </u> Not very important | <u>3</u> Fair |
| | <u> </u> Unimportant | <u>1</u> Poor |
| Future Systems | <u>6</u> Very important | <u>6</u> Excellent |
| | <u>7</u> Somewhat important | <u>6</u> Good |
| | <u> </u> Not very important | <u>1</u> Fair |
| | <u> </u> Unimportant | <u> </u> Poor |

9. Overall the course was: (CIRCLE ONE)

Excellent Good Adequate Fair Poor
 7 5

10. Any additional comments or suggestions would be greatly appreciated.

Use the back of this sheet.

Course Evaluation

Remote Sensing for Mineral Specialists

March 1980

1. What was the strongest aspect of the course?

Excellent Organization, Capable Staff (varied sysles helped keep concentration up), The capability of the instructors and the use of hand-outs and visuals, The whole course was excellent and all parts were presented very well, A good background was provided from which to continue investigations into the use of Remote Sensing for Minerals Management. Instruction was quite excellent and explanation of questions were quite adequate. Distribution and availability of information was good. Technical content; practical exercises. Lab exercises, except the examples did not seem to prove we could find one bocket (?). Knowledge of the instructors - their hands-on experience. Instructional materials. The exercise in image interpretation. Geologic interpretation of Landsat imagery. Professional presentation. The mapping exercise using the various photos and geophysical data leading to potential mineralized areas. Dr. Levandowski's presentations on the elements of image analysis.

2. What was the weakest aspect of the course?

Lack of prior experience with BLM (should be corrected now that you've had a chance to see some of us). Using SLAR-what it is and how it is obtained and how to interpret. Possibly the use of the exercises were too long and didn't completely bring you through to a result that could be used. Slides were sometimes used as examples however they weren't fully explained. Course length. It was difficult to get a 'feel' for the subject in just one week; a lot of material was covered. Statistical. Participation by some of the class members-but that is beyond your control. Image enhancement. ratioing and image enhance-ment. Lack of discussion on the newer remote sensing techniques. Lack of precourse study materials. The exercise using stretch, edge, and ratio enhancement photos in Alaska didn't really convince me that I could use them to locate mineralized target areas. No specific aspect identified.

4. What activities should be added to the course to better meet the objectives?

Already fine. As a Government Geologist I would like to see more on how to id gravel deposits and mapping of those deposits. More actual photointerpretation. I felt the objectives were met. For the instructor to go through an image interpretation before having the class try one themselves. Some run-through examples. I would have liked to see information on SLAR data interpretation for geologic uses. Precourse study requirements. More ground related mineral applications within BLM.

5. What objectives should be added to the course to better meet the needs of the participants?

Possibly a more complete example of how remote sensing can be used in the BLM planning process. Needs well met as is. More geologic applications. More on the newer techniques. Could possibly be tied into the BLM minerals program more by the BLM instructors. In other words, at the beginning of the course someone from BLM who has used these techniques could give a convincing discussion on why and how we could better our minerals program by utilizing these techniques. More ground related mineral applications within BLM.

10. Any additional comments or suggestions (from Steven Barrell)

Donna talks too fast and doesn't listen too well.

DAVIS - Crisp style. Positive outlook. Was able to direct progression of course activity throughout with only few period of disorganization (and these were not the result of LARS but DSC). However needs to adjust to more relaxes nature of audience. I got the definite impression that you were disappointed in the lack of enthusiasm (I'm not trying to be negative here; just that it was apparent to me) (I was too). This is a new tool for the Bureau Mineral Specialist and it will just take time before the enthusiasm and interest develops. Notebook, special focus handouts, and all associated support items are trememdous. I have never been involved with a course or workshop where I was as comfortable about having course materials there right when they were needed. I was therefore able to concentrate on absorbing information rather than finding or relating to materials.

EXTRACURRICULAR: Perhaps schedule just an icebreaker session the first night of the course next time. Make it less formal and I bet you'll get more participation.

BARTOLUCCI - Effective relaxed informative. Positive outlook. I was truly amazed at his composure in a new situation. The content of the sections concerning the technical background of remote sensing was very clear. The examples used to illustrate process and mechanism aspects were translated into easily understood concepts. The visual aids including both prepared and spontaneous overhead transparencies, and slides complemented the lecture and the precourse reading assignments. Some people may prefer to have more complete notes on this section, I personally did not feel that was necessary. From a purely audience point of view when he and Donna were both trying to team teach I believe the flow of the course was interrupted. I think that one instructor in the front of the class focussed my attention more on the subject matter. When he was up front with Donna it appeared her confidence was slightly diminished. I don't see how the technical aspects of remote sensing can be reduced any further than Luis did in this course. In its present form I think it is most suited for the diverse backgrounds of the participants. Any expansion of technical level should be weighed carefully. I personally would leave it alone, it's just right. There was a noticeable gap in the transition between what Luis covered in the first day and what Donna did. Perhaps you could add some more transitional material.

If this was Luis' performance when he was feeling ill, you should keep him that way.

DONNA - (next time let someone else run the slide projector and try not to move around so much in front - it's distracting) Energetic, informative. I believe it took you a bit of time to relax. Established a good rapport with the group. Nervousness appeared to stem from lack of confidence about abilities to transfer geologic knowledge to students. This lack of confidence is unfounded. Good technical knowledge. Tended to rush statements occasionally. Slow down a bit and then when up front TAKE CHARGE. Mid-course correction that broke up overlay building worked. Sometimes tended to make explanations more complex than necessary. Answered all my questions, even the dumb ones. Spent time after class and during breaks clarifying problems for me about exercises. Really neat idea to have generated Landsat order example for us that was over our own areas.

LEVANDOWSKI - Effective relaxed, informative. Overcame a very brief initial disorientation with who he was talking to and where slide advance control was to do a fine job. Personable style captured audience concentration. Good coordination between lecture, handouts and slides. During the exercises his assistance on an individual basis was very important; part of the learning process could be lost with much increased class size. I would recommend that Bill Dipaolo be conscripted to act as an assistant providing individual assistance on the exercises and become more heavily involved with the class.

Pre-Training Session Required Readings

The pair of readings transmitted prior to the course provide an excellent overview of what platform or satellite remote sensing technology entails. I read Simpson's paper first and the USGS professional paper second. You might want to include Raeves, Offield, and Santo's paper on uranium mineralization identification as a third. The photogeology minicourse may have particular use as a training aid for those students who have not had much experience with airphoto geology. However, I believe that this lack of experience should be identified through a precourse questionnaire which would request the prospective student to identify his experience or lack of it. Thus you could more fully prepare these students so that they would benefit more from the airphoto geology section of the course. This precourse familiarization could take place several weeks before attendance. I briefly scanned the other available minicourses and it may be that your precourse questionnaire might be coordinated with the availability of each minicourse from the Denver Service Center's Remote Sensing Branch's or with copies held at each State Office. In this manner you could strengthen the understanding of your audience, and increase information reception during the lectures.

For example:

Prior to attending course 9100-11 we would like to know how much experience you have in the following areas:

| | Little | Some | A Lot |
|--------------------|--------|-------|-------|
| Photogeology | _____ | _____ | _____ |
| Side Looking Radar | _____ | _____ | _____ |
| Etc. | | | |

Several minicourses which discuss in general terms these areas are available from either your State Office or the Branch of Remote Sensing DSC. If you are interested, please indicate below

| | |
|--------------------|-------|
| Photogeology | _____ |
| Side Looking Radar | _____ |
| Etc. | |

The course outline that was sent was very helpful. My Area Manager, and the Training Committee in my District reviewed it. Perhaps it could be reproduced in the overall BLM Training Catalog, which is where most training courses are found by area and district specialists, because the general description that I found in this years Catalog was not as good.

6. What activities or objectives should be deleted from the course? Please include your reasons.

I would have liked to have gotten into Geomorphology (mapping), as that seems like it could relate to finding mineral deposits and if you do geologic interpretation it seems geomorphology is or should be part of it. Okay as is. I think it's fine.

7. I would like to do more lab (photo) interpretation, as the more you do the better you get and the more you can relate to the objectives of doing the interpretations. I mainly came to learn how to and what to look for in doing photointerpretation for minerals. I thought the course was conducted quite well. Felt that most of course information could have been learned from textbooks. Would have benefited from more personal experience of instructors i.e. real world approaches, pitfalls, expediences, etc. Put the Franch film or something similar at the beginning. More precourse material. Perhaps several exercises 35-45 days in advance which could be completed and sent for correction. No specific suggestions, however I assume with time the instructors' presentations will become more "polished."

ADDITIONAL COMMENTS (That arrived later)

1. What was the strongest aspect of the course?

Don Levandowski - Geology
Luis Bartolucci - Classification process
Both well organized

2. What was the weakest aspect of the course?

Some speakers were not as prepared as could have been (although I understood the circumstances). Some presentations seemed confusing. Hydrology example was too drawn out - possibly only northern or U.S.A. half of scene could have been analyzed.

4. What activities should be added to the course to better meet the objectives?

I thought all activities and outline as presented were good. Maybe an activity on very simple geologic mapping based on a visual analysis of imagery may have been helpful. Hints were mentioned such as different types of drainage occurring on different parent materials, but a small practical exercise may have been useful.

5. What objectives should be added to the course to better meet the needs of the participants?

Since this part of the course was on image analysis (mainly), possibly as an objective we could have the use and incorporation of various forms of imagery (B/W, color, CIR aircraft photos, U-2 or RB-57 type, Skylab, and Landsat imagery) into the daily work routine of the BLM District Geologist. Also, the use of digital classification and enhancement for smaller areas (i.e. planning unit) as a working tool for the BLM District Geologist. Also maybe more on planning or funding of Landsat projects.

6. What activities or objectives should be deleted from the course? Please include your reasons.

Again - possibly decreasing the length or area of some of the overlay exercises (expecially hydrology); don't delete it, but somehow cut down time. Also, length of time spent on learning how to acquire Landsat imagery could have been cut down by just showing code strip which comes with all orders and interpret computer search sheets. Also, no mention was made of procedure for ordering NASA aircraft photos and indexing of photo strips.

7. What changes would you suggest in the way the course was conducted?

Knowing this was a first cut, I think the general outline was good. The first part on the EM spectrum was a little confusing. I think the whole first day may have been presented more in a step-wise building fashion. I think this was the intent, but somehow it was confusing. Maybe too much time was spent on mathematical laws or solar curves?