PACFISH STRATEGY AREA

REMOTE SENSING AND GIS FIELD OFFICE NEEDS ASSESSMENT

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**United States Department of the Interior
Bureau of Land Management**

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Executive Summary

The purpose of this assessment and the subject of this report is the identification and documentation of the basic and immediate needs of BLM offices in the PACFISH Strategy area as they relate to equipment, skill mixes, support, general data acquisition, and to determine the level of capability and proficiency each office needs to implement the PACFISH Strategy and ecosystem and landscape management within the strategy area.

The equipment configurations, skills mixes, and capabilities necessary for field offices to accomplish resource management have not yet been adequately identified as part of the modernization process, especially those areas involving landscape and ecosystem management and GIS - Remote Sensing. A basic assessment of needs in these areas is necessary to provide offices with adequate equipment, training and support to accomplish their mission. This type of assessment, although not a complete needs assessment, allows the Bureau to accelerate modernization for resource management in an orderly and cost effective manner. It also helps assure that the field is given adequate tools with which to accomplish their mission and tasks.

This assessment was conducted in Alaska, California and Idaho and designed to identify what is necessary to develop basic capabilities for ecosystem and landscape management using GIS and remote sensing tools in field offices in the PACFISH Strategy area. The BLM offices in Oregon and Washington were omitted from the assessment at the request of the Oregon State Director. Oregon, because of efforts associated with FEMAT and involvement early on with the Salmon Summit and PACFISH, has an infrastructure in place that can accommodate much of their present needs.

Each office in the evaluation states received a questionnaire designed to help assess equipment, data, training, support and networking capabilities and needs. Follow-up meetings, or interviews, were held at the Alaska, California, and Idaho State Offices and those District Offices in the PACFISH Strategy area. These meetings were of an open forum format to allow personnel attending the meetings to interact with each other while they formulated responses to questions and scenarios presented to them by

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the assessment team. The assessment did not address specific data needs or standards. That is a function that must be accomplished within each office within the guidelines set forth by Headquarters.

With the exception of Alaska, all states have a functioning GIS shop that is able to provide support to field offices for resource management within the limitations of existing equipment, software, and staffing. Alaska has had other priorities linked to the patent plan process and conveyance of State and Native Lands that has generally precluded the development of GIS systems for resource applications.

Resources staff in the State Offices were not well integrated with the GIS staffs, or the work performed in GIS and remote sensing, and generally seemed to have less understanding of the principles and uses of GIS and Remote sensing tools than many of their field level counterparts. Much of this is attributable to the workload and functions currently assigned to State Office Resource staffs. The exception is the Alaska State Office, where the wildlife and fisheries program and ARD coordinator is active in use and development of GIS and Remote sensing tools with the field offices. The general consensus of most field level resources staffs was that the resources staff at the State Office level become more knowledgeable in GIS and Remote sensing so they could provide better leadership and assistance. This knowledge will be necessary when coordinating ecosystem management efforts across administrative boundaries.

It is a recommendation that resources staffs be afforded the opportunity to develop the knowledge necessary to help integrate GIS and remote sensing tools with the traditional sciences at all levels of the organization.

Almost all field offices have put together a system that allows use of GIS for some basic resource management. Field offices in Idaho and California have built systems around the Prime computer and ADS/MOSS. Field offices in Alaska are not consistent in their approach, lacking the State Office support capabilities, but have developed functional systems that provide some capabilities. As a general rule, resources staff in the field offices have a much higher level of understanding and working knowledge of GIS, Remote Sensing, and how they are used as resource management tools. All offices identified the need to acquire more knowledge on proper use of the sciences and

identified the need to start training in the use of the software that will be available on the target system.

A wide variety of training, continuing education and information must be made available to resource specialists and GIS/Remote Sensing specialists Bureauwide if we are to be effective in using GIS and Remote Sensing tools for ecosystem and landscape management. Training must not only cover the mechanics of using the software and hardware, but must include training and educational opportunities in principles of ecological methodology, landscape ecology, ecosystem modeling, GIS and Remote sensing and related sciences. These fields of science are moving rapidly and Bureau personnel need to be afforded the opportunity to stay current if we are to fulfill our mission of managing on an ecosystem basis.

Data inventories, data acquisition plans, use of structured analysis and meta data standards have not been put into use in most cases. All offices contacted had plans to begin implementation of these tools for automated systems. The time and workforce necessary to identify, catalog, and convert existing data is of great concern by all offices. Mechanisms need to be provided to allow the field offices to accomplish this crucial task.

Districts and Resource Areas must be given the capability to perform intensive and complex GIS and Remote Sensing processing and analysis to accomplish their work and remain responsive to changing conditions. This will require a strong network of support from State Offices and other support centers within the Bureau.

Resource personnel do not have sufficient knowledge to fully articulate their needs for remote sensing and GIS tools at this time. However, this will change once they have the opportunity to experience the capabilities of the technology and have sufficient and knowledgeable support from higher in the organization. Advanced work stations will most likely be the minimum equipment configuration for simple analysis and manipulation by resource specialists. Fully equipped advanced workstations or an engineering upgrade to the next level of CPU for advanced workstation capabilities will be necessary for GIS and Remote Sensing specialists to perform analysis and processing for resource applications. Peripherals such as inkjet plotters, CD-ROMs, digitizing stations, and film recorders will be necessary in most field offices for the purposes of providing products for public meetings, field maps, and capturing or receiving data. State Office equipment needs to support the

field offices will also include photogrammetric scanners, video frame-grabbing capabilities, CD-ROM mastering capabilities etc. Field offices with several projects involving remote sensing, GIS, data base use, and statistical analysis will probably require 10GB of hard disk storage for active files.

Data acquisition from sources other than BLM will need to be facilitated so the field can function in a timely manner. The current process is time consuming, often redundant, and prevents the field from acquiring data legitimately that is needed for resource analysis. This may require master agreements at high levels of the Bureau that facilitate this.

All offices identified that an increase in skilled GIS and Remote Sensing specialists will be necessary to support the field operations. It was also recognized that FTE limitations will have an effect on the capabilities to acquire these positions. This may mean retraining and reassigning some staff already on board.

With the advent of more use of GIS and Remote Sensing for ecosystem management, a means to prototype new methodology to answer complex questions will be necessary to save the field time and avoid litigation. Technology transfer will become increasingly important in day to day operations of the Bureau. A support structure within the Bureau, that is oriented toward meeting field needs in these areas is of paramount importance. Without this, the field offices will be hard pressed to accomplish their mission.

FORWARD

Ecosystem and landscape management requires answers to questions of a scale that is greater than has traditionally been employed. The analytical tools necessary to address these questions are provided by modern science and technology. Those tools made available by GIS and Remote Sensing are key to managing landscapes and complexes of ecosystems. Today it is required that managers consider the effects of management decisions and strategies not only at the site level, as in the past, but at the regional and larger level. Not only does the Bureau need to use GIS and remote sensing for general resource management applications, there is the underlying need to use this technology and science for better understanding and study of ecosystems.

The PACFISH Strategy is a landscape and ecosystem approach to management of anadromous fisheries that uses watersheds as management units. As such, the basic tools and principles for ecosystem and landscape management are equally applicable for PACFISH as well as all other ecological studies. Unfortunately, the Bureau has not been able to deploy these tools or consolidate the knowledge necessary to fully utilize them in field offices within the PACFISH Strategy area. This must be remedied if the Bureau is to implement the strategy.

This basic assessment of needs by field offices is a step in the direction of identifying what tools and skills the field needs to accomplish the Bureau's Mission in today's complex and demanding environment. The report that follows would not be possible without the willing and enthusiastic participation of Gerry Edler, Wendy Bullock, Bill Yeager, and all the hard working staff in each office visited. I hope this report helps illustrate some of the needs of each office, and that it serves the purpose of helping the field to gain the capability necessary to manage the landscape more effectively. Any errors of omission or commission in this report are mine. I ask the reader to bear in mind the main purpose of this report, to help the field get the proper tools to do their job. Let's look for ways to help them.

R. Craig Altop

INTRODUCTION

Purpose

The purpose of this assessment and the subject of this report is the identification and documentation of the basic and immediate needs of BLM offices in the PACFISH Strategy area as they relate to equipment, skill mixes, support, general data acquisition, and to determine the level of capability and proficiency each office needs to implement the PACFISH Strategy and ecosystem and landscape management within the strategy area. This report attempts to convey the actual field needs for equipment, training, staffing skills and mixes, and support as identified by staff in each office.

Background and Need

As the Bureau implements the plan for modernization of automated systems much planning and thought has been invested in determining the needs of offices to implement the initial stages such as the lands records systems. This has yet to be accomplished for resource management, which is expected to begin at a later date. Resource management is a major part of the Bureau's mission and is of major concern and importance to the American people. This places a requirement on the Bureau to accelerate implementation of modern automated systems in priority areas to allow use of GIS and remote sensing for ecosystem management ahead of planned schedules. The equipment configurations, skills mixes, and capabilities necessary for field offices to accomplish resource management have not yet been adequately identified as part of the modernization process, especially those areas involving landscape and ecosystem management and GIS - Remote Sensing. A basic assessment of needs in these areas is necessary to provide offices with adequate equipment, training and support to accomplish their mission. This type of assessment, although not a complete needs assessment, allows the Bureau to accelerate modernization for resource management in an orderly and cost effective manner. It also helps assure that the field is given adequate tools with which to accomplish their mission and tasks.

Scope

The PACFISH Strategy area covers all or part of Alaska, Oregon, Washington, California, and Idaho. This assessment was conducted in Alaska, California and Idaho. The BLM offices in Oregon and Washington were omitted from the assessment at the request of the Oregon State Director. Oregon, because of efforts associated with FEMAT and involvement early on with the Salmon Summit and PACFISH, has an infrastructure in place that can accommodate much of their needs.

A complete needs assessment follows a structured format similar to those structured techniques for data management. The basic, generalized format is:

1. Identification of issues or decisions that need to be made.
2. Determination of types of analysis needed to address issues or assist decisions.
3. Identify data necessary for analysis.
4. Identify resources needed to collect and analyze data.

This assessment, because of time and other constraints, concentrates mostly on what resources and capabilities are needed to collect and analyze data. Specific and detailed analysis is beyond the scope of this assessment. This assessment was designed to identify what is necessary to develop basic capabilities for ecosystem and landscape management using GIS and remote sensing tools in field offices in the PACFISH Strategy area.

The following assumptions were made for the purpose of this assessment:

1. Issues and Decisions were generally understood for PACFISH as were the inter-relationships between PACFISH management actions with other system components.

2. A general understanding existed in the offices of the types of analysis necessary for addressing issues or assisting in management decisions. Specific types of analysis may or may not be known at this time but could be incorporated later.
3. The types of data necessary for analysis could be identified. Identification of specific data required for analysis would not be necessary for identification of resources (equipment, personnel, etc) although it will be necessary before actual implementation of on the ground efforts.
4. Equipment configurations, staffing skills mixes, training, and networking/data sharing with other entities, etc., could be adequately identified based on responses from offices and knowledge of other entity configurations for similar types of work.

Methods (Procedures)

Questionnaire

A questionnaire (Appendix 1) designed to help assess equipment, data, training, support and networking capabilities and needs was sent to each State Office involved in this assessment. This questionnaire was distributed to state office personnel and field offices to gain as wide a distribution as possible. The questionnaire was designed to acquire qualitative data and as such will not be subjected to intensive statistical analysis.

Open forum interviews

A team consisting of Gerry Edler, SC; Wendy Bullock, SC; Bill Yeager, IDSO; and R. Craig Altop, BLM/USU, conducted follow-up meetings, or interviews, in the Alaska, California, and Idaho State Offices and those District Offices in the PACFISH Strategy area. These meetings were of an open forum format to allow personnel attending the meetings to interact with each other while they formulated responses to questions and scenarios presented to them by the assessment team. This multi-disciplinary team approach, incorporating technical and resources personnel, allowed the assessment team to take advantage of the consolidated knowledge of each office. The purpose of visiting the offices was to gather first hand knowledge of the needs of each office from the staffs that are actively involved in implementing the PACFISH Strategy and Ecosystem Management.

Each meeting was begun with a short briefing or discussion on the PACFISH Strategy to assure all participants had a common knowledge of the issues and some of the products that would be required for PACFISH. Because PACFISH is an ecosystem approach to management of anadromous fish, participants were also encouraged to extend their discussions to other related issues within the ecosystems in the PACFISH area. This approach was taken to insure a complete identification of needs were made, avoiding the tendency to focus on single issues.

RESULTS

Alaska

Introduction

Alaska is a two tier organization. The State Office incorporates many of the operational functions of District Offices, in addition to the traditional State Office functions, found in the traditional three tier BLM organization; program leaders generally being more active on the ground with field offices. District offices have all the responsibilities of districts in the traditional BLM organization plus all the functionality of resource areas. Additionally, Districts have been delegated more authority for decision making capability at the ground level than in the past.

Alaska has two very important distinctions in addition to organizational structure that affect management under the PACFISH Strategy and ecosystem or landscape management. First is the large, very remote, and seemingly untrammelled management areas. Second, and as important, is Subsistence. These factors have significant implications when considering the needs of the offices. The remoteness of the areas and lack of surface access require the use of remote sensing to adequately quantify resources. Subsistence requires more intensive consideration of social and cultural values of rural people in natural resource management than is often the case elsewhere. This increases the amount of data that must be gathered and increases the complexity of analysis, spatial and otherwise, that is required to meet the intent and letter of the law.

State Office

The Alaska State office does not have capabilities to support field office resource management needs for GIS or remote sensing outside of photogrammetry and technical advice. This office has one of the better photogrammetry sections in the BLM. Most of the efforts of this section are in support of Cadastral and lands functions (Patent Plan Process). Technical advice for GIS and remote sensing is provided by a highly qualified staff person (Automated Resources Data Coordinator) serving on the Resources Staff. The wildlife and fisheries staff has a high level of understanding of the utility and uses of GIS and remote sensing for ecosystem management and is involved in several field operations utilizing these tools. However, the wildlife and fisheries staff has identified a need to increase their knowledge of the technical aspects and capabilities of remote sensing and GIS analysis to better assist the field offices.

Data

Limited resource data resides in the State Office either as primary data or archive data. Photogrammetry houses a complete set of aerial photography covering almost all of the state. There are numerous nine track tapes of MSS satellite data housed in the State Office but there are not any in-house capabilities to use or manipulate the data at this time. The largest proportion of accessible resource data resides in hard copy format in openfile reports and on map overlays. These data are best suited for presentation purposes and are of limited value for analysis.

Large amounts of data are available from other agencies. These data consist of digital files (spatial and alphanumeric) and hard copy maps or data files. Although most of these data are available for BLM use through file sharing, it is difficult to share these data because of legal and policy constraints concerning data. Additionally, standards for data are inconsistent and a wide variety of software and hardware platforms are being used which impedes data sharing with other agencies. Much of these data are of the nature that makes them desirable for use in addressing PACFISH and ecosystem management concerns.

Meta data standards are not being utilized by BLM and other agencies at this time. However, several meetings have been conducted at the State Office Level to develop the infra-structure necessary to implement use of standardized meta data. At this point in time, use of meta data standards appear to be more academic rather than real because there are few opportunities to store, manipulate, and share data.

Equipment/software

Equipment and software available for use in implementing the PACFISH Strategy and ecosystem management is limited at the state office. PCs are the main tool, and are used primarily for office automation tasks. The Prime computer and ADS/MOSS software are largely unused and considered unavailable for resource use. Modernization hardware and software scheduled to be delivered to the Alaska State Office is dedicated for use in the lands records system and the patent plan process and is not configured or available for use in ecosystem management. Equipment to scan aerial photography for image processing, digitizing capabilities, data archive, as well as major image and GIS processing capabilities at the State Office level are needed to support field offices. Capabilities to perform analysis and develop hardcopy products on a statewide basis are also necessary. Additional needs are for GPS equipment and support of GPS base stations necessary for differential correction statewide.

Skill/Staff mixes

The Alaska State Office is lacking staff dedicated to GIS and Remote Sensing analysis needs of renewable resources. The staff that is available is dedicated to the patent plan process and lands records, the number one priority for Alaska. A complete support staff that can provide GIS/Remote Sensing support is necessary to support the field offices and the State Office resource specialists. Skills needed at the State Office include, spatial statistician/statistician, GIS/Remote Sensing analyst and technician(s), resource specialists proficient in GIS/Remote Sensing principles and use and in ecosystem management principles. The State Office resource specialists are the senior technical specialists and require continuing education in GIS Remote Sensing, ecosystem and landscape management, modeling, etc to be able to provide the support necessary for field offices.

Support

State offices have an important role in providing support and technical assistance to the field. In Alaska, this is difficult without the in-house capabilities to provide it. At present, all support for GIS and Remote sensing must be provided by vendors, other agencies, and the Service Center, often with significant time delays that detract from the field accomplishing their mission. The capability needs to be built into the State Office to provide this type of support. Technical support for GIS and Remote sensing must be well integrated with resources program support to be effective and useful for the field. Additionally, statewide (and national) agreements to facilitate data sharing need to be implemented. The current process of data share agreements for each project is too time consuming and cumbersome to allow the field the flexibility to accomplish their mission in a timely manner.

Service Center support was viewed as being necessary. This support needs to be an integrated approach, consisting of resources, remote sensing, and GIS. Large projects, programming assistance, technical advice and assistance, and technology transfer are some of the functions identified as necessary. The general feeling is that support from the Service Center should be provided in the manner in which the states and field offices need to work, full integration.

Training, Continuing Education, and Information Needs

Although the resources staff in the Alaska State Office is well versed in the traditional sciences of their disciplines, and there is a very higher level of awareness and knowledge of GIS and Remote Sensing than most offices, there is an urgent need to continue their education and gain additional training in new technology, landscape ecology and advanced principles of ecosystem management if they are to continue their support and advisory functions for field offices. The resources staff needs to develop and maintain a high level of proficiency in spatial analysis and modeling, statistical analysis, and be able to achieve at least an advanced basic level of proficiency in the use of ARC/INFO and ERDAS Imagine if they are to provide adequate support for the field. Development of geographic information systems requires a structures and systematic and structured approach. Training in this area is needed to provide support for field offices.

Information in the form of videos, newsletters, bulletins, and other publications, with wide distribution, was requested to stay current with new developments and uses of GIS, Remote Sensing, and related sciences. Videos were the most requested media. Additionally, information on texts, papers, and courses that may be available was felt to be beneficial. The general consensus was that resource personnel did not have the time to adequately search for current literature or courses and would find a periodic listing (with abstracts) of all literature and other material available quite valuable to accomplishing their jobs.

Anchorage District

The Anchorage District has developed GIS (ARCINFO) and limited image processing (PC ELAS) capabilities to assist in 3809 compliance, development of a hydrography data base coded with fisheries data, and map and evaluate waterfowl and big game habitats. The resource specialists make extensive use of the analysis products of the GIS, especially in administering mining law (3809) which affects anadromous fish streams. Image processing using a PC based version of ELAS developed by Ducks Unlimited is mostly unused at this time. Image processing is generally "farmed out", most of the work being done under a cost sharing agreement with Ducks Unlimited, the final classified products are brought into ARC for view only capabilities.

The resource staff is enthusiastic about using GIS and remote sensing to help in management. Their demands for using the technology far exceed the capabilities of the existing hardware and technical staff.

Data

Data useful for implementing the PACFISH Strategy within the District is a combination of ARCINFO data files, digital alphanumeric files on PC platforms, and paper copy (map and alphanumeric). Meta data are not available at this time and must be developed. Statewide data is available from various agencies that can be utilized by the District. This data includes escapement numbers for anadromous fish, general spawning habitats, upper limits data, and harvest data, water quality etc. Data on micro habitat is limited and needs to be acquired. Techniques to gather microhabitat data using remote sensing technology are being employed as funding and processing capability allow.

Subsistence data, both spatial and alphanumeric are available from the State of Alaska and other agencies. Agreements are not in place to allow sharing of these data as of yet. This data is necessary to formulate management strategies for anadromous fish in Alaska.

A data inventory has not been completed at this time, neither has a full assessment of the amount of data that is available from other sources. The storage requirements for these data will be significant. Additional data that needs to be gathered for PACFISH and ecosystem management will

require significant amounts of storage capability. Data to address management issues is and has been a limiting factor. Data acquisition plans and the collection of data are highly important if the District is to accomplish its mission under current mandates.

Equipment/Software

Anchorage District currently is running ARCINFO on a Data General Unix workstation. A PC configured to operate the Ducks Unlimited PC ELAS modules is also available but generally is unused for reasons stated above. The remainder of the equipment in the office are PCs and used primarily for office automation. Use of the Prime in the State Office is negligible by resource personnel and GIS specialists. The District has capability to capture vector data with a digitizing tablet for use in ARCINFO. A line plotter is also available for map products.

There are insufficient workstations and digitizing stations available to accommodate the volume of work necessary to accomplish basic resource management. The hardware and software in the office do not allow for processing of remote sensing imagery, nor is there sufficient storage for large files. Memory configurations are minimal and preclude use of several modules of ARCINFO.

Workstations are unavailable for resource specialists to do simple analysis and queries necessary for their work.

Skills and Staffing Mix

Resource specialists are generally sufficient to maintain a basic program providing sufficient temporary help is available to collect data and conduct field operations. A significant limitation in implementing a workable GIS and Remote Sensing approach to PACFISH, ecosystem management and landscape analysis, is the lack of sufficient GIS/Remote Sensing Technicians, or similarly proficient personnel, working with the analyst and resource staff in the District. An ideal staffing level for GIS and Remote Sensing and Data support for the District includes the analyst, a GIS technician, a Remote Sensing technician, programmer, and data administrator. GIS and Remote Sensing are very involved disciplines and should not be lumped together, rather there should be two positions working closely together to support the District at a minimum.

Support

The District recognizes that the ideal staffing mix and level is not probable given the funding and FTE limitations. Even under their optimal scenario, they cannot operate well without a strong support structure of an integrated remote sensing, GIS and resources staff available in the State Office, the Service Center, and other offices. The State Office should have sufficient equipment and staff to assist the District in GIS development, image processing, programming, and analysis.

Training, Continuing Education, and Information Needs

Resource staff skills need to be enhanced by providing training in basic GIS and remote sensing principles and use, including basic skills in using the software. This will free up the analyst and technicians to concentrate on complex analysis and processing problems. Additionally training is needed in spatial analysis, modeling, and statistics. Other training identified that is needed is information modeling, ecosystem and landscape management concepts, ecological methodology and hierarchy theory as it relates to ecosystem management, and resource uses for GIS and remote sensing.

Glennallen District

Glennallen is a remote District Office with few of the amenities of the other District Offices in Alaska. At present it does not have any capability for GIS or remote sensing processing or analysis. It must rely on the State Office for any support along these lines. Automation in the office is primarily personal computers used for office automation tasks. Almost all spatial analysis done to date has been through the use of hand drawn overlays for land use planning and is general in nature.

Data

There has not been a data inventory, nor are meta data standards being applied at this time. Most data is on maps or in alphanumeric paper files. Some has been captured to spreadsheet or data bases on PCs. TM imagery is available for much of the District, this being the first area in Alaska Ducks Unlimited initiated waterfowl habitat classification and evaluation. Other satellite images (MSS) are available for use.

Fisheries and fisheries habitat data available are generally in the form of reports from Alaska Department of Fish and Game. Some data are available in digital format (alphanumeric) within the office.

Instream flow work has been accomplished for the Gulkana and Delta Rivers, data is available from these efforts.

The District generally has a paucity of data and needs to develop a data acquisition plan and acquire data necessary to implement ecosystem management and the PACFISH Strategy.

Equipment

The District does not have any GIS or Remote Sensing processing capabilities. Additionally, space is a limiting factor should the District decide to acquire even the basic equipment found in the Anchorage District. The District's needs for equipment at this time are generally limited to the capability to do basic queries, analysis, and overlays. There is a need to be able to generate maps (plotter) for public meetings, field use and other purposes. A network link with the State Office will be

necessary to provide additional processing and analytical capabilities or support.

Support

This District is dependent on the State Office and other sources for most of its GIS and Remote Sensing needs. Even under optimum conditions, physical and staffing limitations will require that the State Office provide the majority of the up front processing and analysis for GIS and remote sensing.

Training, Continuing Education, and Information Needs

The resources staff of the Glennallen District have little hands on experience in remote sensing and GIS and will require basic training in the use of ARCINFO, ARCVIEW and ERDAS Imagine. Additionally, training and continuing education is needed in the principles of ecosystem and landscape management, watershed analysis, spatial analysis, and the use of GIS and remote sensing for resource management.

Kobuk District

The Kobuk District is developing capabilities to utilize GIS and Remote Sensing as tools for resource management. A position has been assigned to provide GIS and Remote Sensing coordination and support for the District. Placer mining, grazing (reindeer), road construction and maintenance, and subsistence use are major considerations for the District when managing for anadromous fish and maintaining ecosystem integrity. Use of GIS capabilities has been constrained by lack of equipment and staff. The need to utilize GIS as a tool for management has led the District to begin development of capabilities to meet immediate, basic management needs until the target system is available for resources. Because of workloads and limited staff, very little GIS and no remote sensing analysis is being accomplished at this time although projects are "waiting on the shelf".

Data

Although a data inventory has not been completed, the District has identified types and sources for most data needed for PACFISH Strategy implementation and ecosystem management. Types of data in digital, hardcopy alphanumeric, and map format include subsistence use data, fisheries and fisheries habitat, topography, soils, economic, vegetation, etc. Within the District, only 2% of the data is in digital format. Other agencies and organizations have digital data that may be available if it is determined that it meets the District's needs. Meta data standards are not being utilized at this time by the District, and are not known to be in use by other agencies. Substantial effort will be necessary to apply meta data standards to existing or desired data. Detailed resource data at a level necessary for PACFISH and ecosystem management is considered scarce and must be collected and/or located for proper analysis. Remote Sensing data are not in use by the District but are available in some locations through other agencies.

The District has formalized written plans to collect fisheries inventory data in place. These plans are included in activity plans. It is unknown whether these plans meet the needs of PACFISH data requirements, however they do meet the requirements of the District for management decisions made in the land use plans.

Compatibility problems and issues that impede data sharing with other agencies are primarily centered on lack of meta data standards being implemented by all parties and lack of hardware/software/expertise at the local level.

Equipment/Software

At present the District is using personal computers for much of their data storage and manipulation. They are sharing the use of a Data General workstation with one other District housed in the same office building by means of a terminal. Capabilities of the system are limited.

The District has identified workloads that would require at least one GIS/Remote Sensing workstation, with peripheral equipment for input and output, that would be used for major processing within the District. Additionally, there is a need to provide resource specialists with the capability to perform analysis using GIS software to solve resource questions.

Skills and Staffing Mix

The current staffing mix is not sufficient to accomplish the needs of the District for GIS and remote sensing. There is sufficient staff in resources to meet most basic management needs providing sufficient temporary help is available to collect data and conduct field operations as needed. The GIS/Remote Sensing coordinator needs to complete training to be effective. Additionally, this position, to provide adequate support for the resource staff, needs to be full time. Resource staff needs to gain or increase basic knowledge and skills in applications of GIS and remote sensing, GIS and remote sensing software, and principles of landscape and ecosystem management and analysis. Spatial modeling and programming skills are also necessary to implement self sufficient GIS and remote sensing capabilities at the District.

Support

While the District wants to develop as much capability to manipulate and analyze GIS and remote sensing data, they recognize they will need the support of technical staffs in the State Office and elsewhere for programming, initial processing of scanned imagery or videography, and acquisition of satellite and other data.

Training, Continuing Education, and Information Needs

Training in the form of workshops, seminars, etc on the principles and capabilities of GIS and remote sensing is needed. Additionally, the District has identified the need to acquire intensive training in GIS and remote sensing software for the GIS/RS coordinator and technicians and at least basic training for resource specialists that will be performing queries and simple analysis. Training in spatial analysis, modeling and statistics is needed for those staff involved in designing projects and programmers. Additionally, general training is identified for managers so they can develop a better understanding the utility of the technology etc.

Arctic District

The Arctic District is currently without any in-house capabilities for GIS or Remote Sensing analysis. Significant amounts of remote sensing has been used by various agencies, including BLM in cooperation with other agencies in what is now the Arctic District. Most of these remote sensing data are only available, in usable format, to the District in hardcopy maps or included in reports. The District is in the process of acquiring remote sensing data and will be in need of capabilities to perform analysis on these data to assess resource values.

Data

A data inventory has not been accomplished at this time. However, the district has been able to identify several sources of GIS and Remotely sensed data that may have use in PACFISH and ecosystem management efforts. Of the total amount of data that has potential for use as attribute files for as spatial data in the District, approximately 40% is digital. Only 2% of the total data is spatial although other sources and current efforts to gather more can raise that number significantly. Data that can be acquired from other sources is primarily in ARCINFO format or one of the more common image processing formats which is usually easily transported from one system to another.

Other than email capabilities, the District does not have network capabilities for data manipulation or sharing. A network will be necessary to link the District with other offices and get adequate support for future GIS and remote sensing analysis from the State Office or other offices.

Meta data standards are not being used at this time. It is unknown if other agencies or data sources are using meta data for their data.

Other than guidance from Bureau Manual 6720, the District does not have any formalized data collection plan. This is needed to develop a GIS and associated ancillary data.

Equipment/Software

The only hardware platforms in use in the District are personal computers. Software is mainly of the office automation type (word processor, spread sheet, data base). Some "spatial" data is captured in autocad files.

The District has identified a need for equipment sufficient to perform image processing, and GIS analysis at a moderately sophisticated level. Storage capabilities will need to be commensurate with the large amount of satellite and other image data. Included in these equipment needs is the capability to prepare maps for public meetings, field use, and distribution to partners. Additionally, digitizing capabilities will be needed.

Skills and Staffing Mix

A few of the District personnel have used MOSS in the past, but that capability has not been maintained. There is the normal mix of resource staff, but no staff assigned or made available to provide technical expertise in remote sensing or GIS. A minimum compliment of staff for GIS and remote sensing support within the District is a coordinator/analyst, GIS remote sensing technician, and resources staff trained in the basic use of ARCINFO and Erdas Imagine.

Support

The District has indicated a preference for a GIS-Remote Sensing support staff for the northern Alaska Districts in Fairbanks in addition to any other support that may be available.

Training, Continuing Education, and Information Needs

Basic training in the use of GIS and Remote Sensing is needed for all resource specialists. Additionally, spatial analysis, modeling, and statistics is highly recommended for all District Personnel. Beginning training in the use of target system software is also necessary for the resources staff. More advanced training should be made available to the GIS/Remote Sensing Staff when they are identified.

Steese-White Mountain District

The Steese-White Mountain District has taken the initiative and developed GIS and Image Processing capabilities to meet their immediate management needs. Most of this was accomplished on a volunteer basis by staff members. The District has shown a great amount of innovation in putting together a workable system from scratch and essentially public domain software while waiting for the Bureau's target system to come on line for resources use.

Data

Data available in the District for use in implementing the PACFISH Strategy consists of species occurrence data, upper limits data, channel typing, hydrography data, DEM, and coarse landcover data on a watershed basis. Approximately 30% of these data are in digital format.

GIS data from other sources for this District is considered limited. Most of the GIS data has been developed in-house by the District for their use. Attribute type data and map type data from other agencies is more plentiful but not in digital format.

While the District has developed a system to meet basic needs, there is a great need to develop and acquire sufficient data of high enough quality to meet ecosystem management needs. There is a need to develop a data acquisition plan and to adopt meta data standards. The District conforms to DLG III standards for line data when developing GIS files. Other agencies appear to follow similar standards for mapping purposes.

Data sharing within the District and between Districts and other Bureau offices is accomplished. Network and data sharing capabilities are generally confined to Bureau offices. The District has experienced problems bring data across from other agencies or offices (particularly imagery) because of poor transfer medium (QIC 150 tapes) and the software being used by the District (GRASS) does not easily import certain file formats.

Equipment/Software

The District's GIS capabilities are accomplished with a Data General workstation (UNIX) running GRASS, a PC (DOS) running IDRISI, and a

Apple/MAC running a CAD package for data capture. Image processing on-site are accomplished within the limitations of GRASS, a raster GIS. An equipment and software configuration that allows full image processing and GIS capabilities, digitizing, plotting (pen and electrostatic), and ortho correction is needed to meet the District needs. The configuration identified by the District includes the capability to support several workstation configured for image processing and GIS analysis by lead resource specialists.

Skills/Staffing Mix

The District does not have full time GIS and Remote Sensing coordinators or technicians. These roles are filled part time by two resource staff persons who have assumed these roles and acquired the skills necessary on their own. Some resource specialists are developing basic skills in use of the District's system without benefit of formal training. Most resource specialists have not developed skills necessary to effectively use the system for their resource management needs and must rely on the availability the part-time availability of the "volunteer" coordinators.

At least one person in each resource discipline needs to be well versed in the use of GIS and Remote Sensing, concepts and capabilities, and be adept at the use of the technology as appropriate for their specialty or field. At present this is not the case.

Support

The District staff feels that better support from management for use of modern technology is essential. The perception is that they are tolerated in their attempts but not really encouraged.

Currently, technical support is minimal from within the Bureau. The District will need to have the support of the State Office both from the technical and resource aspects, as well as from the Service Center, contractors, etc. A support network is viewed as essential to accomplishing the Bureau's mission on the ground.

Training, Continuing Education, and Information Needs

As indicated, the District is basically operating a GIS system with self taught resource specialists. There is a need to provide them with advanced training in spatial analysis, statistics and modeling, UNIX operation systems, ARCINFO and ERDAS Imagine. All resource specialists need training in basic GIS and Remote Sensing concepts, capabilities and limitations. Training in the use of the target system software for basic analysis and query capabilities is essential.

There is a sense of confusion about target system configuration, implementation, and lack of knowledge how the proposed configurations will fit into the need for advanced GIS and Remote Sensing applications for resource management. Additionally, there is the same sense of confusion about what ecosystem management means for the way the Bureau does business. Additional readings, memos, and policy may help to dispel this confusion.

California

Introduction

California is a traditional three tier BLM organization with well established support networks for resource management. Districts and Resource Areas are well integrated and are strongly committed to accomplishing the Bureau's mission on the ground. The State Office provides a strong support role as well as guidance, technical expertise, program administration, and coordination that facilitate the District and Resource Area missions.

Few places in the United States have the variety of ecosystems and the large human populations as does California. The growth of the human population, the need for recreation areas, fiber and mineral production needs, and a more environmentally aware public, create a challenge for public land managers who must try to maintain a balance between often conflicting demands and the conservation of natural resources. The BLM in California has entered into partnerships with the State and local governments to provide a balanced approach to managing resources and maintaining the natural diversity of the landscape as much as possible. The State, local governments and the BLM recognize that management at the landscape scale requires use of modern technology. PACFISH and FEMAT emphasize that need. All parties are moving forward to develop capabilities to use the best science and technology available for planning and management. The Bureau in California has been a leader and catalyst in this process.

State Office

The State Office has well developed capabilities to support field offices in the use of GIS and Remote Sensing software for resource management within the limitations of their existing hardware/software configurations and staffing levels. While there is a lot of support for the field to develop an integrated GIS/Remote Sensing and Resources approach, it appears that the resources staff at the State Office is not as well integrated as their field counterparts. This may present a problem when the State Office GIS and Remote Sensing staffs need to consult with a senior technical specialist that is knowledgeable of the principles of GIS and Remote Sensing for a specific resource application that may have statewide application.

Data

The amount of spatial data available in and to the State Office are considerable. Most of these data are digital or in a format that can be digitized. Additional data in ARCINFO files are available from various agencies and organizations.

A complete data inventory has not been accomplished and all existing data needs to have meta data developed. All new data will have meta data standards applied. The task of completing a data inventory and developing meta data for all existing data is formidable and will require a significant commitment of time.

Equipment/Software

ADS/MOSS/COS and the Prime computer are the mainstay for GIS. There was no mention of the use of image processing software in the State Office. Digitizing and plotting (both pen and electrostatic) and other devices and capabilities are available to produce products for offices. Additional digitizing tablets were identified as being needed. The compatibility of existing peripheral equipment with target system hardware is a concern.

Hardware and software capable of handling intensive spatial analysis and image processing are needed to support the field offices. The Ortho module for ERDAS Imagine is necessary to develop the products needed by the field.

Resource specialists will need to have capability to use the ARCVIEW module at their desk to help in developing reports and perform statewide evaluations.

Skills/Staffing Mix

Overall, the California State Office has a good mix of skills and staff. An area identified by the staff that could be improved is the enhancement of the knowledge of the resource staff concerning the principles and applications of GIS and Remote Sensing. This would assist in development of a statewide GIS and provide better guidance for field offices.

Skills need to be developed in data modeling and programming. It is believed that there is a high level of skill in the State Office for spatial analysis, remote sensing, cartography, and spatial statistics, although these skills can always be improved.

Support

The State Office is configured to handle a large part of support needs of the field offices but must rely on the Service Center and other sources for additional support and special needs. A support network is essential for development of regional GISs and ecosystem management such as is required by PACFISH.

Training, Continuing Education, and Information Needs

Information in the form of videos, newsletters, bulletins, and other publications, with wide distribution, was requested to stay current with new developments and uses of GIS, Remote Sensing, and related sciences. Videos were the most requested media. Additionally, information on texts, papers, and courses that may be available was felt to be beneficial. The general consensus was that resource personnel did not have the time to adequately search for current literature or courses and would find a periodic listing (with abstracts) of all literature and other material available quite valuable to accomplishing their jobs.

Training opportunities in principles and uses of remote sensing and GIS for ecosystem and resource management would enhance the skills of the staffs. Additionally, training in use of the various software packages will be necessary to attain the proficiency necessary to support the field offices.

Ukiah District

The Ukiah District is actively pursuing the use of GIS to help address management issues concerning FEMAT, PACFISH and a wide variety of other management needs. There is a knowledgeable staff of resource specialists working together with GIS specialists in all offices to develop an integrated approach to ecosystem and resource management.

Data

BLM data available to address PACFISH issues consists mostly of limited GIS coverage of the Sacramento River which includes stream data layers and BLM ownership. Other data resides in resource management plans and related documents, stream inventory data, and riparian inventory data that was entered in the RIPS system at the Service Center.

Other types of data available from other sources includes stream and specific fisheries data from State agencies and the Fish and Wildlife Service. The Teale data center can provide statewide data for DEMs, Vegetation, hardwoods, and hydrologic basins. These data are available in ARCINFO, hardcopy and other formats.

There are compatibility problems when sharing spatial data with other agencies or organizations (ARCINFO/MOSS conversions) that may affect accuracy.

A formalized data collection plan and implementation of meta data standards are not currently in place. Like most offices this is a planned action as part of the Bureau's modernization.

Remote sensing data is not currently available to the District although a they would like to acquire and use this type of data. There are not any capabilities to process these data at present due to lack of appropriate software and hardware.

Equipment/Software

The District is linked with the Prime in the State Office and there are terminals in each Resource Area for GIS (MOSS). Additionally, all

offices have digitizing tablets. Personal computers are used for text and numeric data files.

The District has one GPS unit that is shared between all offices. Capability exists to utilize the GPS data in data and spatial files for resource management.

The District is scheduled to receive 3 advanced workstations under the Oregon procurement for FEMAT. These workstations, if configured properly will meet the needs for PACFISH as well. A major limitation that could arise is insufficient storage space and lack of archive capabilities.

Skills/Staffing Mix

With the exception of the Redding RA, which does not have a full time GIS coordinator, the District has sufficient staff and skills mixes to accomplish the PACFISH Strategy and will be able to fully utilize equipment. Special skills in remote sensing and modeling will need to be developed within the existing staff.

Support

The District does not feel it is practical to request additional FTE to support GIS and Remote Sensing. The State Office will have to provide support for digitizing and other data gathering capabilities. Additionally, the State Office will need to provide support in processing remote sensing as the District does not have the time or personnel to incorporate remote sensing to the fullest extent needed. (It may be necessary to consider a full time remote sensing position in the future).

Training, Continuing Education, and Information Needs

Technical training on software applications that will be used on the target system is a must. The District will need immediate training from ESRI on ARCINFO and the associated modules. Additionally, training in ERDAS Imagine is necessary to accomplish the image processing that needs to be done in the District.

Intermediate to advanced spatial analysis techniques, modeling and basic statistical application would be very important. Principles of remote sensing and GPS training would be invaluable for all staff. Advanced GIS analysis as it relates to watershed analysis would be beneficial.

Areas the District would like to receive more information include Landscape Ecology and hierarchy theory, PACFISH Strategy updates, Remote Sensing Technology, and Spatial analysis and modeling.

Idaho

Introduction

Idaho, like California, is a traditional three tier BLM organization with well established support networks for resource management. Districts and Resource Areas are well integrated and are strongly committed to accomplishing the Bureau's mission on the ground. The State Office provides a strong support role as well as guidance, technical expertise, program administration, and coordination that facilitate the District and Resource Area missions.

Grazing, timber harvest, recreation and mineral extraction are major factors affecting anadromous fisheries. Additionally, water rights issues have an effect on the management of aquatic resources within the PACFISH area of the state.

Idaho, in preparation for use of GIS for ecosystem management performed an analysis of needs and capabilities. A copy of that report is attached (Appendix 2). This report is supplemental and complimentary to the findings of the Idaho GIS Team. In almost all cases, field offices favored implementing GIS and Remote Sensing at a level commensurate with at least option 2 or a combination of option 2 and 3 of the GIS Team report.

State Office

The State Office has the basic infrastructure to support and assist the Districts in development of GIS and Remote Sensing applications. While there is a lot of support and encouragement for the field to develop an integrated GIS/Remote Sensing and Resources approach, it appears that the resources staff at the State Office is not as well integrated as their field counterparts. This may present a problem when the State Office GIS and Remote Sensing staff needs to consult with a senior technical specialist that is knowledgeable of the principles of GIS and Remote Sensing for a specific resource application that may have statewide application.

Data

Idaho has only one central CPU (Prime 6650) in the State Office, to which all districts are connected via telecommunications, so GIS data are stored on this machine. Over the past five years, Idaho has acquired a considerable amount of base data through cooperative projects, mainly involving the US Geological Survey (for DLGs (Digital Line Graphs) and DEMs (Digital Elevation Models), and the US Forest Service (for DEMs). The State Office has played a major role in acquiring this data and converting it to ADS/MOSS, as well as developing the ownership layer in-house. The district data focus has been more on capture, edit, and analysis of resources data.

Data conversion from the MOSS family of software will likely be a joint effort of the State Office (mostly base data) and the districts (mostly resources data). The State Office has some recent satellite imagery in digital format, as well as project data from the early 1980's. The state has nearly completed its cyclical aerial photography (1: 24,000 scale natural color) and has flown low-level color infrared riparian photography for three out of the past four years. Through an MOU with the USGS, Idaho has acquired new orthophotos (OQs); digital versions of these OQs are now available.

For the most part, structured analysis, meta data standards, and a data inventory have not been accomplished at the State Office level. Development of meta data for existing data will be a time consuming but required effort as part of modernization.

Equipment/Software

The basic equipment in use is the Prime with the MOSS family of software for GIS. The State Office currently has limited image processing capabilities, running GRASS on a Sun workstation. At a minimum, equipment and software necessary to support option 2 of the GIS Team Report is required to accomplish the Bureau Mission as it relates to PACFISH and ecosystem management. Remote sensing/image analysis capabilities need to be given more emphasis, especially for PACFISH. The Ortho module for ERDAS Imagine will be necessary.

Skills/Staffing Mix

The GIS Team Report adequately covers this subject as it relates to GIS and Remote Sensing staff. However, skills need to be developed on the resources staff to help integrate their capabilities with the GIS staff to provide better support and guidance for the field.

Support

The State Office is positioned to provide adequate support for most of the field office needs. However, there will be a continuing need for integrated support from the Service Center and other support groups or offices. A support network will be critical to effecting ecosystem management and implementing the PACFISH Strategy.

Training, Continuing Education and Information Needs.

Information in the form of videos, newsletters, bulletins, and other publications, with wide distribution, was requested to stay current with new developments and uses of GIS, Remote Sensing, and related sciences. Videos were the most requested media. Additionally, information on texts, papers, and courses that may be available was felt to be beneficial. The general consensus was that resource personnel did not have the time to adequately search for current literature or courses and would find a periodic listing (with abstracts) of all literature and other material available quite valuable to accomplishing their jobs.

Training opportunities in principles and uses of remote sensing and GIS for ecosystem and resource management would enhance the skills of the

staffs. Additionally, training in use of the various software packages will be necessary to attain the proficiency necessary to support the field offices.

An additional need was identified for all Idaho offices; training in study and research design, especially as it relates to ecosystem management and GIS.

Salmon District

The Salmon District has a highly competent GIS/Remote Sensing coordinator that works well with the resources staff. The capability exists to begin development of a robust GIS/Remote Sensing/Resources approach to ecosystem management when sufficient equipment and training are made available.

Data

Numerous sources of data are available for use in PACFISH and ecosystem management. Included are historic aerial photos, stream inventory data, field notes and field data forms used by resource specialist, including field maps. The District has been active in converting some of this data into digital format.

The State and other agencies, organizations, and corporations have data that could be available for District use. Much of the GIS data is in ARCINFO format.

The District needs to complete a data inventory, record the meta data and get it formatted and digitized or entered into data bases.

There is not a formal plan for data collection except for those data required as part of the Biological Evaluation Plans for salmon.

Equipment/Software

Spatial data files are maintained and manipulated on the Prime system at the State Office, through a telecommunications link. Alphanumeric files are housed on personal computers.

The District has digitizing tablets for capturing vector data. There is no capability to process image files. Videography, a valuable tool for riparian and aquatic resource assessment and management is beyond the capabilities of the District until the hardware and software is made available to use the data. There will be a need to insure the District can prepare map products for field use, public meetings, and distribution. Additionally a need can be anticipated that display and simple query (ARCVIEW) capabilities will be needed for public use.

District and Area resource specialists will have a need to query and view data as part of their analysis of resource values without having to rely on the GIS specialist to prepare maps.

The District has identified the hardware necessary to provide for local GIS and Remote Sensing needs with support from other entities in a support network.

1. 2 advanced workstations in each resource area to do simple query and retrieves of data
2. 1 super power workstation for the District GIS Specialist to do the complex spatial and image analysis, also this workstation would be the main repository for the District spatial data.
3. 1 color output device capable of photo grade outputs
4. 1 large format document scanner.

Skills/Staffing Mix

The District has limited staff to provide adequate GIS and Remote Sensing support for field operations. A technician is needed in each of the Resource Areas to handle day-to-day input and maintenance tasks. One GIS Analyst is needed at the District for complex spatial and image analysis.

Resources staff skills in use of GIS and Remote Sensing need to be upgraded to be effective.

Support

The District is only able to provide some of the support necessary to Area Offices. This can not be remedied without equipment and staffing.

A support network consisting of the State Office (SWAT Team for big jobs), the Service Center (integrated support) and other support offices is needed to allow the District and Areas to accomplish the Bureau's mission on-the-ground.

Training, Continuing Education, and Information Needs

Resource specialists need to acquire the knowledge and familiarity of GIS and Remote sensing to be able to be conversant with GIS/RS specialists in order to get the best product available. Training in principles of GIS and Remote Sensing needs to be provided to Resource Specialists and Managers. Technical training on software application commensurate with types of analysis that will be performed needs to be offered to resource specialists. Spatial Analysis, modeling, and statistics is needed for at least the GIS technicians.

Coeur d' Alene District

The Coeur d' Alene District has a well functioning GIS shop and is able to produce quality products for the resources staff within the constraints of equipment and personnel limitations. The Cottonwood Resource Area, a very remote office, has greater constraints placed on it because of personnel, equipment and support limitations. Nevertheless these offices have a great interest in developing a working GIS/ Remote Sensing system to help in management of resources in a fragmented landscape.

Data

The District Office has the responsibility for digitizing all data used in the offices. As indicated previously, most base data is prepared and maintained through the State Office. Almost all digital data of spatial nature is processed by the District. GIS base data (1:24000 scale) that is available for the PACFISH strategy include PLS, Hydrology, Transportation, ownership, and elevation for portions of the Salmon River, and all of the Coeur d' Alene River. A fairly large amount of data are available that deal with forest productivity, timber sales and cuts, and classification.

Other data is available from other agencies and corporations. While some of the corporation data is desirable, the cost has precluded acquisition of large amounts of it.

District wide a data inventory needs to be conducted, and meta data developed. New data going on to the system is receiving meta data. A lot of data that is in hardcopy format needs to be prepared for input into a GIS for future analysis.

Equipment/Software

The equipment configuration in the District is very similar to that found in the Salmon District. Similar needs for equipment and software exist. The Cottonwood Resource area seems to be in great need of equipment and software to allow it to get rapid turn around on processing and analysis. This would require a GIS/RS specialist position at the Area.

Skills and Staffing Mix

The District is concerned that the current GIS staff will not be large enough to handle the huge PACFISH workload. Without GIS staff, resource specialists are asked to fulfill their function. This is of course very difficult because of the existing workload on each specialist not to mention that most do not have the training to fully utilize GIS and Remote Sensing for resource management.

Support

The District and especially the remote Cottonwood RA need a well integrated support network to perform analysis leading to resource management options. Scanned Aerial Photography, videography, and satellite imagery are sources of data the District will need assistance in preparing for use.

Training, Continuing Education, and Information Needs

Resource specialists need to acquire the knowledge and familiarity of GIS and Remote sensing to be able to be conversant with GIS/RS specialists in order to get the best product available. Training in principles of GIS and Remote Sensing needs to be provided to Resource Specialists and Managers. Technical training on software application commensurate with types of analysis that will be performed needs to be offered to resource specialists. Spatial Analysis, modeling, and statistics is needed for at least the GIS technicians.

Information in the form of videos, newsletters, bulletins, and other publications, with wide distribution, was requested to stay current with new developments and uses of GIS, Remote Sensing, and related sciences. Videos were the most requested media. Additionally, information on texts, papers, and courses that may be available was felt to be beneficial.

CONCLUSIONS

With the exception of Alaska, all states have a functioning GIS shop that is able to provide support for field offices within the limitations of existing equipment, software, and staffing.

Resources staff in the State Offices, except Alaska, generally were not heavily integrated with the GIS staffs, and generally seemed to have less understanding of the principles and uses of GIS and Remote sensing tools than many of their field level counterparts. It is a recommendation that resources staffs be afforded the opportunity to develop the knowledge necessary to help integrate GIS and remote sensing tools with the traditional sciences at all levels of the organization. This knowledge will be necessary when coordinating ecosystem management efforts across administrative boundaries.

During the interviews and included in the answers on the questionnaires, it was almost universal at the field level that the next higher level have an integrated approach to providing support. It appears that integration of GIS and Remote sensing (and associated analytical methods) with resource management is working well at the field to solve problems and manage resources. The field would like to gain support from upper levels in the manner they conduct business.

GIS and Remote Sensing is not the answer to resource, ecosystem, or landscape management. Rather it is a tool, that used wisely will allow us to be more effective in the long run. How we use those tools is very important. Even more important is how well we support the field in their use of the tools.

The general conclusions that can be made from this assessment are:

1. A wide variety of training, continuing education and information must be made available to resource specialists and GIS/Remote Sensing specialists Bureauwide if we are to be effective in using these tools.
2. Districts and Resource Areas must be given the capability to perform as much GIS and Remote Sensing processing and analysis as they need to be responsive to changing conditions.

3. GIS and Remote Sensing cannot be done totally in the field but requires a hierarchy and network of integrated support consisting of resource specialists and GIS/RS specialists.
4. Resource personnel do not have sufficient knowledge to fully articulate their needs for remote sensing and GIS tools at this time. However, this will change once they have the opportunity to experience the capabilities of the technology and have sufficient and knowledgeable support from higher in the organization.
5. Data inventories, structured analysis, meta data standards, and data acquisition plans are a must if a logical and cost effective approach to populating GIS data bases is to occur.
6. Equipment needs for resource management, including data storage and transport will be far greater than the "standard" target system configuration provides at present.
7. Data acquisition from sources other than BLM will need to be facilitated so the field can function in a timely manner. This may require master agreements at high levels of the Bureau that facilitate this.
8. Advanced work stations will most likely be the minimum equipment configuration for simple analysis and manipulation by resource specialists.
9. Fully equipped advanced workstations or an engineering upgrade to the next level of CPU for advanced workstation capabilities will be necessary for GIS and Remote Sensing specialists to perform analysis and processing for resource applications.
10. An increase in skilled GIS and Remote Sensing specialists will be necessary to support the field. This may mean retraining some staff already on board.
11. With the advent of more use of GIS and Remote Sensing for ecosystem management, a means to prototype new methodology to answer complex questions will be

necessary to save the field time and avoid litigation.
Technology transfer will become increasingly important in
day to day operations of the Bureau.

Tables

CAPABILITIES NEEDED BY OFFICE †

OFFICE	IMAGE PROCESSING	GIS ANALYSIS	DIGITIZING	PHOTO SCANNING	VIDEO CAPTURE PROCESSING	GPS	MODELING	PROGRAMMING AMLS & TOOLBOX	ORTHO RECTIFICATION	SPATIAL STATISTICS	ARCHIVE CAPABILITIES	CD ROM MASTERING	CD ROM READ
ALASKA SO	■▲	●▲	■▲	■	■	■●▲	■●▲	■	■●	■●▲	■	■	■▲
ANCHORAGE DO	●▲	▲●	●▲	▲	▲	●▲	●▲	●▲	▲●	●▲	●		▲
ARCTIC DO	●▲	▲●	●▲	▲	▲	●▲	●▲	●▲	▲●	●▲	●		▲
GLENNALLEN DO	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		▲
KOBUK DO	●▲	▲●	●▲	▲	▲	●▲	●▲	●▲	▲●	●▲	●		▲
STEESE-WHITE DO	●▲	▲●	●▲	▲	▲	●▲	●▲	●▲	▲●	●▲	●		▲
CALIFORNIA SO	■▲	●▲	■▲	■	●	■●▲	■●▲	■	■	■●▲	■	■	■▲
UKIAH DO	●▲	●▲	●▲	▲	▲	●▲	●▲	●	●	●▲	●		▲
RESOURCE AREAS	▲●	▲●	▲●	▲	▲	▲	▲●	▲●	▲	▲	▲		▲
IDAHO SO	■▲	●▲	■▲	■	■	■●▲	■●▲	■	■	■●▲	■	■	■▲
SALMON DO	●▲	●▲	●▲	▲	▲	●▲	●▲	●	●	●▲	●		▲
RESOURCE AREAS	▲●	▲●	▲●	▲	▲	▲	▲●	▲●	▲	▲	▲		▲
COEUR D'ALENE DO	●▲	●▲	●▲	▲	▲	●▲	●▲	●	●	●▲	●		▲
RESOURCE AREAS	▲●	▲●	▲●	▲	▲	▲	▲●	▲●	▲	▲	▲		▲

■ Major support role, tool development/programming, large production assist other offices in major projects.

● Support role, special technical needs, processing and analysis, develop tools, moderate to large projects.

▲ End use, query/view, basic analysis and manipulation, small projects.

† Capabilities presented in each block in order of need.

Training and Continuing Education Needs by Office †

OFFICE	GPS	LANDSCAPE/ ECOSYSTEM MGMT PRINCIPLES	SPATIAL ANALYSIS AND MODELING	ERDAS IMAGINE	ARC/INFO AND SUPPLEMENTS	PROGRAMMING (C, AMLs etc.)	PRINCIPLES OF GIS AND REMOTE SENSING	STRUCTURED ANALYSIS	GIS AND RESOURCE MANAGEMENT (PRINCIPLES AND THEORY)	MODELING (RESOURCE ETC)	STUDY AND RESEARCH DESIGN	STATISTICS (STANDARD)	SPATIAL STATISTICS	HIERARCHY THEORY, ECOLOGICAL METHODOLOGY etc.
AK SO	▲■	▲■	▲■	▲■	▲■	■	▲■	▲■	▲●■	▲■	opt	▲■	▲■	▲■
AK ANCHORAGE	▲●	▲●	▲●	▲●■	▲●■	▲●	▲	▲	▲●	●	opt	●	▲	▲
AK GLENNALLEN	▲●	▲●	▲	▲	▲	▲	▲	▲	▲●	●	opt	●	▲	▲
AK KOBUK	▲●	▲●	▲●	▲●■	▲●■	▲●	▲	▲	▲●	●	opt	●	▲	▲
AK ARCTIC	▲●	▲●	▲●	▲●■	▲●■	▲●	▲	▲	▲●	●	opt	●	▲	▲
AK STEESE-WHITE	▲●	▲●	▲●	▲●■	▲●■	▲●	▲	▲	▲●	●	opt	●	▲	▲
CA SO	▲■	▲■	▲■	▲■	▲■	■	▲■	▲■	▲●■	▲■	opt	▲■	▲■	▲■
CA UKIAH DO	▲●	▲●	▲●	▲●■	▲●■	▲●	▲●	▲	▲●	●	opt	●	▲●	▲
UKIAH RAs	▲●	▲●	▲	▲	▲	▲	▲	▲	▲●	●	opt	●	▲	▲
ID SO	▲■	▲■	▲■	▲■	▲■	■	▲■	▲■	▲●■	▲■	▲●■	▲■	▲■	▲■
ID SALMON DO	▲●	▲●	▲●	▲●■	▲●■	▲●	▲●	▲	▲●	●	▲●■	●	▲●	▲
SALMON RAs	▲●	▲●	▲	▲	▲	▲	▲	▲	▲●	●	▲●■	●	▲	▲
ID COEUR D' ALENE DO	▲●	▲●	▲●	▲●■	▲●■	▲●	▲●	▲	▲●	●	▲●■	●	▲●	▲
CDA RAs	▲●	▲●	▲	▲	▲	▲	▲	▲	▲●	●	▲●■	●	▲	▲

- ▲ Basic skills and principles training, seminars, and workshops
- Intermediate skills and principles training, seminars, and workshops
- Advanced skills and principles training, seminars, and workshops

†The level of training is dependent on specialty and role in support or analysis. Generally, resource specialists will not require advanced training in software use but will need more training in principles of GIS and Remote Sensing and the sciences that use these tools to accomplish ecosystem and landscape management. GIS and Remote Sensing analysts and technicians will generally require higher levels of training in use of the software and analysis techniques, including spatial statistics. Each office usually has a mix of resource specialists and analyst/technician types which accounts for the mix of training identified for each office.

BASIC EQUIPMENT NEEDED BY OFFICE for GIS/RS †

OFFICE	Max configure advanced workstation	*Normal* config Advanced stations	Digitizing tablets	Photogram- metric scanner	Video Capture Equip	GPS field equip.	GPS Base	Ink Jet plotter	Electrostat ic plotter	Film Recorder	Projector for display workstation screen	CD ROM MASTERING	CD ROM READ
ALASKA SO	2	3	2	1	1	yes	yes	2	1	1	1	1	5
ANCHORAGE DO	1	3	1		1	yes		1		1	1		4
ARCTIC DO	1	2	1			yes		1		1			4
GLENNALLEN DO	1	3	1			yes		1		1			2
KOBUK DO	1	3	1			yes		1		1			4
STEESE-WHITE DO	1	3	1			yes		1		1			4
CALIFORNIA SO	3	3	4	1	1	yes	yes	2	1	1	1	1	6
UKIAH DO	1	2	2			yes		1		1	1		4
RESOURCE AREAS		3 ea	3			yes		3		1 ea			4
IDAHO SO	3	4	3	1	1	yes	yes	2	1	1	1	1	7
SALMON DO	2	4	2		1	yes		1		1	1		6
RESOURCE AREAS		3 ea	2			yes		2		1 ea			6
COEUR D' ALENE DO	2	3	2		1	yes		1		1	1		6
RESOURCE AREAS		3 ea	3			yes		2		1 ea			6

† Equipment identified to allow offices to develop capabilities for PACFISH and Ecosystem Management, other equipment may be required depending on workload and additional capability offices need to develop for management purposes.

ALASKA STATE OFFICE

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	Yes	Automated Resources Data Coordinator provides this service. Recognized expert for GIS and Remote Sensing applications.
GIS/Remote Sensing Analyst(s) or Technician(s)	NO	Needed
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	Some Knowledge	Need training in theory and hands on use of tools. Wildlife and Fisheries personnel most knowledgeable and proficient.
Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.	NO	Need training commensurate with level of analysis desired (novice to intermediate level)

Hardware and Software to support field offices and perform statewide analysis available (resources).	No capability for resources even with Prime system.	Needed. Resources do not have access to even the "old" MOSS systems. Have to contract with vendors or other agencies for "maps", no real analysis capability. Prime mostly used for land records functions.
Data inventory completed	No	Need to initiate inventory of all data that can be used with GIS analysis for PACFISH and Ecosystem Management.
Use Meta Data Standards in office.	No	Meta Data standards have not been implemented because of lack of equipment and data inventory. Planned for future.
Other agency Meta Data	No	Meetings to discuss meta data standards and use as well as common data have been conducted.

Other Agency Data Available	Yes	Some problems in sharing data because of policy and legal issues, conversion between different hardware and software platforms is impediment, inconsistent data conventions. Meta Data standards need to be in place and used before data sharing becomes common practice.
Data Collection Plan	No	Data collection plan for PACFISH has not been developed. Standards for implementing PACFISH not finalized for Alaska which precludes design of data collection plan. Similar constraints apply to general ecosystem management.
Network capabilities	Limited	email only none with other agencies or organizations.
GIS or Remote Sensing software used by resources specialists	No	Not available to use. Have identified need to have access.

<p>Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.</p>	<p>No</p>	<p>Need training, skilled personnel assigned to support use of GIS/RS applications for PACFISH and Ecosystem Management.</p>
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ALASKA ANCHORAGE DISTRICT

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	Yes	same as analyst
GIS/Remote Sensing Analyst(s) or Technician(s)	Yes	Coordinator and analyst combined. Use temporary employees when available. Workload greater than staff can accomplish, unable to meet many important needs.
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	Limited	Need training in principles and uses of GIS, Remote Sensing and landscape analysis.
Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.	Very limited	Needed. Some hands on experience, but mostly no experience or training at level necessary for accomplishing mission.
Hardware and Software to support field work and perform analysis available (resources).	Yes	Data General/Unix with ArcInfo, PCs

Data inventory completed	No	Needed. Need assistance (temporary employees etc) to accomplish to meet timelines for PACFISH and other initiatives.
Use Meta Data Standards in office.	No	
Other agency Meta Data	No	
Other Agency Data Available	Yes, not in common use.	Some data is available via modem (file transfer) but is uncommon means of transfer. Most data is via hardcopy some by disk/tape exchange. Media incompatibilities are a problem.
Data Collection Plan	No	Need
Network capabilities	Very limited	Mostly email (not in common use by most resource specialists)
GIS or Remote Sensing software used by resources specialists	No - uncommon	Most resource personnel do not use, some use of file retrieval for viewing.

<p>Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.</p>	<p>No</p>	<p>Limited workforce available or assigned to accomplish basic mission. Resource specialists lack basic skills for novice and intermediate use of software/hardware that exists (which would allow analyst to deal with complex problems).</p>
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ALASKA ARCTIC DISTRICT

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	No	Need
GIS/Remote Sensing Analyst(s) or Technician(s)	No	Need. Functions that are provided by this role are viewed as being necessary to accomplish mission.
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	Limited	Some basic knowledge by few resource specialists. Need at least basic training for all resource specialists.
Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.	Limited	Some staff have had training in use of MOSS and CAD programs. Need training in target system GIS and Remote Sensing Software.
Hardware and Software to support field work and perform analysis available (resources).	Limited	Mostly PC equipment identified. Some access to other District equipment.
Data inventory completed	No	Need
Use Meta Data Standards in office.	No	Need

Other agency Meta Data	Unknown	
Other Agency Data Available	Yes	Hardcopy, digital data base files, spatial data primarily hardcopy (limited capability to use digital spatial)
Data Collection Plan	No	Use BLM manual 6720 but no formal plan in place at present.
Network capabilities	Yes	data file share within building (houses 3 Districts). No capability identified between agencies.
GIS or Remote Sensing software used by resources specialists	Yes, limited	One resource specialist identified as working with MOSS, CAD, image processing (unknown)
Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.	No	Need coordinator, technician/analyst, training for resource specialists.

ALASKA GLENNALLEN DISTRICT

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	No	Depend on State Office
GIS/Remote Sensing Analyst(s) or Technician(s)	No	
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	No	Need
Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.	No	Need. No equipment to utilize skills if had.
Hardware and Software to support field work and perform analysis available (resources).	Limited	PCs only. Mostly office automation capabilities.
Data inventory completed	No	Need.
Use Meta Data Standards in office.	No	Need

Other agency Meta Data	No		
Other Agency Data Available	Yes		Reports and hardcopy of field data. Maps
Data Collection Plan	No		Need
Network capabilities	Very limited		Email capabilities, little or no use by resource specialists.
GIS or Remote Sensing software used by resources specialists	No		None available. Have relied on other offices for support in past.
Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.	No		Skill mix can be enhanced by training in principles and use of software/equip. Little opportunity to assign personnel to analyst role.

ALASKA KOBUK DISTRICT

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	Yes	In training
GIS/Remote Sensing Analyst(s) or Technician(s)	Yes	In training
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	Limited	Beginning to provide basic training for analyst who will provide introduction and assistance to other resource staff.
Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.	Limited	See above
Hardware and Software to support field work and perform analysis available (resources).	No	Must rely on borrowed time on another office's system.
Data inventory completed	No	Very good idea of sources of data and potential quality.

Use Meta Data Standards in office.	No	Need to implement so data exchange with others can be accomplished.
Other agency Meta Data	No	Not always necessary for what District is working with but needs to be considered with increase of digital data exchange
Other Agency Data Available	Yes	Significant amounts identified, however, District does not have the hardware/software to make use of. Generally limited to hardcopy or reports.
Data Collection Plan	Yes	Several HMPs and activity plans have detailed data acquisition plans or strategies that focus on anadromous fish issues.
Network capabilities	Yes	District uses file sharing capabilities of internal network and email.
GIS or Remote Sensing software used by resources specialists	No	

<p>Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.</p>	<p>No</p>	<p>District is starting to remedy this problem. Much training is necessary to accomplish mission. Analyst and technician functions need to be build into staff.</p>
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ALASKA STEESE-WHITE MTN DIST.

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	No	Two resource specialists fill this role part time by own initiative.
GIS/Remote Sensing Analyst(s) or Technician(s)	No	Two resource specialists fill this role part time by own initiative. Can only provide limited support for others.
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	Limited	A couple of resource specialists have self taught themselves the basics of GIS and remote sensing.
Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.	Limited	A couple of resource specialists have self taught themselves the basics of GIS and remote sensing.
Hardware and Software to support field work and perform analysis available (resources).	Yes	UNIX (DG) GRASS DOS (PC) IDRISI APPLE/MAC CAD Software/hardware limits capability of District significantly.

Data inventory completed	No	Needed.
Use Meta Data Standards in office.	Partial	DLG III standards, other not mentioned but needed.
Other agency Meta Data	Yes ?	Other agencies seem to have some meta data standards they use.
Other Agency Data Available	Yes	Mostly hardcopy maps, reports etc. Possible that much data in digital format may not be amenable to a GIS.
Data Collection Plan	No	
Network capabilities	Yes	On site capabilities good for file transfer (3 Districts at same site), some capabilities with other BLM offices via email. No capability with other agencies.
GIS or Remote Sensing software used by resources specialists	limited	Relatively little time is expended by resource personnel, need analyst to assist in workload.

<p>Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.</p>	<p>No</p>	<p>Need to provide training in use of software/equipment and in principles of GIS/RS. Analyst and Coordinator functions need to be made part of staff mix to be functional.</p>
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CALIFORNIA STATE OFFICE

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	Yes	In cartography
GIS/Remote Sensing Analyst(s) or Technician(s)	Yes	In cartography
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	Limited	A higher level of knowledge of the principles and uses of remote sensing and GIS as tools to accomplish ecosystem management is necessary to provide guidance and quality assurance for field. Additionally, a higher level of knowledge will help field coordinate their support needs, including agreements with other agencies using the technology. This will help round out the technical proficiency provided by the current staff in Operations.

<p>Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.</p>	<p>No</p>	<p>The CA State Office Resources staff does not have the requirement, given their functions to, be trained in the use of GIS or Remote Sensing software or hardware. A basic to intermediate knowledge and a basic level of proficiency would be sufficient.</p>
<p>Hardware and Software to support field offices and perform statewide analysis available (resources).</p>	<p>Yes</p>	<p>Older technology (Prime/MOSS), limits capability. New systems associated with FEMAT will help alleviate problem (when delivered). Need to increase capabilities to include video capture, scanning aerial photography etc. to be able to assist field in their mission. Storage and archival considerations important.</p>

Data inventory completed	No	<p>A lot of data is known to exist but needs to be identified and meta data developed.</p> <p>Cartographic products in the SO are fairly well documented, as are MOSS files. Meta data has yet to be associated with much of the data.</p>
Use Meta Data Standards in office.	No	<p>Not at this time but will be using them in the new BLM system and for all newly acquired data. Data quality of meta data standards may not be adequate for spatial data.</p>
Other agency Meta Data	Yes	<p>Assume that other agencies are or will use FDGC proposed standards.</p>
Other Agency Data Available	Yes	<p>Large amounts of digital and hardcopy data are available from other agencies and organizations. These data are in spatial and alphanumeric format. It appears that the most common software used for spatial data is ARC and Erdas.</p>

Data Collection Plan	Yes/No	A formal data collection plan is not in place other than the guidelines given associated with PACFISH and FEMAT initiatives. This function probably will be critical at the field level, with the SO providing guidance.
Network capabilities	Yes	Prime for GIS and email for other. Modem to other agencies for file transfer and attach to systems (USFS)
GIS or Remote Sensing software used by resources specialists	No	State Office resource personnel's duties do not include time to devote to manipulation or analysis of GIS or Remote Sensing Data. This is viewed to be a District and Resource Area function. However, the capability to query and view data prepared by field offices may be desirable (ARCVIEW)

<p>Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.</p>	<p>Mostly</p>	<p>Need to develop skills in programming and data modeling. Training to increase knowledge and skills would be beneficial.</p>
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CALIFORNIA UKIAH DIST.

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	Yes	All offices have full time except Redding which has part time capability.
GIS/Remote Sensing Analyst(s) or Technician(s)	Yes	All offices have full time except Redding which has part time capability.
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	Yes, limited basic	Resources staff has received training in ADS/MOSS and are involved with GIS coordinator in development of products. Need training in principles of GIS and Remote Sensing for ecosystem management, landscape ecology and hierarchy theory, spatial analysis and modeling (principles).
Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.	Yes, basic	ADS/MOSS training has been provided. Image processing training is lacking as is training in ARCINFO.

Hardware and Software to support field offices and perform districtwide analysis available (resources).	Yes	Prime system and PCs provide capability using ADS/MOSS and dBase on PCs. Slated to receive 3 advanced workstations as part of FEMAT.
Data inventory completed	No	This has been identified as necessary. Need assistance and support from SO to accomplish this.
Use Meta Data Standards in office.	Generally not	Need
Other agency Meta Data	Not currently	Being reviewed
Other Agency Data Available	Yes	PC data base files, maps, photos, ARC files, image files, etc. from many sources (Teale Data Center, CA Dept Fish and Game, US Forest Service, CA Dept Water Resources etc.)
Data Collection Plan	No	Not at present.
Network capabilities	Yes	Prime for GIS between offices, none in office, modem for FS other.
GIS or Remote Sensing software used by resources specialists	No	Almost all GIS input/manipulation done by GIS specialists.

Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.	Not presently	Need to have full time GIS coordination/analyst capabilities in Redding. Resource personnel need to increase knowledge levels.
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IDAHO STATE OFFICE

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	Yes	
GIS/Remote Sensing Analyst(s) or Technician(s)	Yes	
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	No	Needed. Resources staff needs to develop a level of knowledge and proficiency necessary to support and guide field offices in ecosystem management. Need better integration with GIS staff to assist efforts by field offices.
Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.	No	Basic level of training necessary to view and query statewide data. (ARCVIEW)

Hardware and Software to support field offices and perform statewide analysis available (resources).	Yes, limited.	Prime - ADS/MOSS, networked. Do not have the capabilities to perform the analysis necessary to support field because of limitations of software and hardware. Properly configured target system hardware/software should meet needs.
Data inventory completed	No	Need to accomplish.
Use Meta Data Standards in office.	No	ADS/MOSS does not have the capability to accommodate. Will be using when get a system that can accommodate.
Other agency Meta Data	No	
Other Agency Data Available	Yes	Idaho Department of Water Resources has statewide ARC/INFO GIS coverages at various scales. Other sources of digital data available.
Data Collection Plan	No	Not at this time.
Network capabilities	Yes	Prime, email, modem
GIS or Remote Sensing software used by resources specialists	No	All processing and manipulation accomplished by GIS specialists.

Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.	No	Insufficient staffing and integration of GIS and traditional resource personnel to provide multi-resource ecosystem management. (Idaho GIS Team Report attached)
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IDAHO SALMON DIST.

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	Yes	District Office, none in Areas.
GIS/Remote Sensing Analyst(s) or Technician(s)	Yes	District Office, none in Areas.
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	Limited	Need more training in principles and applications of these tools to better to the job and communicate with the GIS/RS specialist. Unable to effectively use the tools for ecosystem management lack knowledge of capabilities and uses.
Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.	No	Need basic training along with theory and principles.

Hardware and Software to support field offices and perform districtwide analysis available (resources).	Yes, limited.	Limited to existing Prime connections with SO. Not enough workstation capability to meet all office needs. No capability to manipulate image files etc.
Data inventory completed	No	Need to accomplish. Lack personnel to do inventory. Could use student interns, temporary employees, volunteers etc. if available and had system to put data on.
Use Meta Data Standards in office.	No	No standards accepted yet, ADS/MOSS does not have capability to store meta data.
Other agency Meta Data	No	
Other Agency Data Available	Yes	See State Office.
Data Collection Plan	No formal.	Data collection is part of the salmon recovery requirements but not a formal data collection plan for ecosystem for PACFISH needs.
Network capabilities	Yes	Prime in SO email modem communications

GIS or Remote Sensing software used by resources specialists	No	Need basic training. ARCVIEW and simple analysis training appropriate.
Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.	No.	Need GIS/RS technician types in each RA, Analyst and technicians in District to meet even the existing workload. Resource specialists need to receive training to make more effective.

ID COEUR D' ALENE DIST.

Assessment factors	Status	Remarks
GIS/Remote Sensing Coordinator	Yes	
GIS/Remote Sensing Analyst(s) or Technician(s)	Yes	
Resources Staff Trained/Knowledgeable in principles of GIS and Remote Sensing.	Limited	Some knowledge, mostly gained by exposure. Need to have training and information provided.
Resources Staff Trained/Knowledgeable in use of GIS and Image processing software/hardware.	No	Need basic training to perform queries and do simple analysis.
Hardware and Software to support field offices and perform districtwide analysis available (resources).	yes, limited	Prime and PC based. Limitations of software and hardware limiting.
Data inventory completed	No	Some work along this line but not universal in District.
Use Meta Data Standards in office.	Just starting.	Beginning to use meta data standards (draft) to document data.

Other agency Meta Data	No	
Other Agency Data Available	Yes	Numerous sources. Spatial data in ARC files. Alphanumeric digital files from many agencies and organizations. Hardcopy maps, reports etc available.
Data Collection Plan	No	Informal plans developed by individuals for some offices.
Network capabilities	Yes, some limitations	Prime email modem Remote offices lacking capabilities except email/modem.
GIS or Remote Sensing software used by resources specialists	No	Need basic training in simple analysis, query.
Skill mix/workforce sufficient to effectively utilize GIS/Remote Sensing tools and equipment.	No	Lack sufficient technicians in field offices, resource specialist lack knowledge to assist in analysis and do basis analysis. Workload at present greater than present analyst and technician can accomplish in district office.

QUESTIONS

OFFICE

POSITION

NAME

1

2

APPENDIX 1

Questionnaire - PACFISH Needs Assessment

The following questionnaire was developed to help us to assess equipment, data, training, and networking capabilities needs for those offices responsible for managing anadromous fish habitats in the area covered by the PACFISH Strategy. The purpose of this needs assessment is to help develop a strategy to bring your office(s) on line as quick as possible with software, hardware, training, and support to address the issues and management needs identified in the PACFISH Strategy. Please be as concise and complete as possible when answering these questions. Use additional sheets of paper if necessary. You are encouraged to provide scenarios of ideal equipment, data, training, and support needs or desires. If you do, please take the time to describe what you would consider would be the minimum needs to support your programs given existing FTE limitations, staff workloads etc. so that we can identify a bottom line that is necessary to accomplish your mission. Representatives will be visiting offices to conduct information gathering meetings as a supplement to this questionnaire.

The target audience for this questionnaire and the meetings are GIS/Remote sensing personnel, ADP representatives, Management, and those personnel involved with data acquisition and analysis for PACFISH (fisheries, watershed, etc.)

We will collect the questionnaires when we meet with the offices.

Meeting Schedule:

- December 6 - Alaska State Office (a.m.)
 - Anchorage District Office (p.m.)
- December 7 - Fairbanks Districts
- December 8 - California State Office
- December 9 - Ukiah District Office
- December 13 - Idaho State Office
- December 14 - Salmon District Office (late p.m.)
- December 15 - Salmon District Office
- December 16 - Coeur d' Alene District Office

QUESTIONNAIRE

OFFICE _____ (REQUIRED)

POSITION OR JOB _____ (REQUIRED)

NAME _____ (OPTIONAL)

1. What types of data are currently available to address PACFISH issues?
2. What formats is the data in?
 - a. What percentage is digital? _____
 - b. What percentage is hardcopy? _____
 - c. What percentage is spatial? _____
 - d. What percentage is text or numeric? _____
 - e. Are there any other formats or systems used to store and manipulate data? Y N (circle) What are they?
3. What data or types of data are available from other agencies or organizations?
 - a. What formats are the data in?
 - b. Do you have free access to the data?
 - c. Is this access available through a network or file sharing?
 - d. What software is in use by other agencies you share or need to share data with?
 - e. What data themes are included in other agency files that are needed for PACFISH analysis?

4. What hardware/software platforms are you currently using to store text and spatial data that can be used for PACFISH analysis?
5. Are there compatibility problems or issues that prevent data sharing with other agencies?
6. Have you used structured analysis and data modeling to develop your digital data files?
7. Do you utilize meta data standards for your data?
8. Do agencies or organizations have compatible or comparable meta data standards?
9. Is there a formalized written plan to collect data for anadromous fish habitat and watershed management in your office?
10. Is this plan (if available) adequate to meet all data acquisition and evaluation needs for PACFISH issues and management?
11. What computer platforms do you use for:
 - a. spatial data files
 - b. text and numeric data files
12. Can you or do you share data files over a network
 - a. within your office
 - b. between offices
 - c. between agencies
13. Do you have any capabilities to capture spatial data digitally
 - a. digitizing tablets
 - b. scanners

14. Do you have capability to utilize GPS data
 - a. in your text and numeric data bases files
 - b. in your spatial data files
15. Do you have the capability to process image files
16. Do you have the capability to capture/utilize digital image files such as videography
 - a. inhouse?
 - b. contract?
 - c. other sources?
17. Is there a dedicated GIS/Remote sensing technician available in your office?
 - a. If yes, is this person able to provide support as needed for your program?
18. Is there a GIS/Remote sensing coordinator available in your office.
19. Have resource personnel been provided training in any GIS or image processing software?
 - a. If so, what software packages?
20. If GIS or image processing software is used in your office by resource specialists, how much time is devoted to manipulating data or processing image files for analysis?
21. What types of analysis and processing do you feel are needed or appropriate in your office?
 - a. By resource specialists as an added function of their job.
 - b. By single purpose GIS/Remote Sensing specialists (if available)

22. What types of analysis and processing do you feel are needed or appropriate at the next higher level of the organization to support your operations?
23. In your office, what would be your concept of the **ideal** mix of skills and personnel necessary to support a functional GIS/Remote Sensing capability for PACFISH issues and management needs.
24. In your office, what would be your concept of the **minimum** mix of skills and personnel necessary to support a functional GIS/Remote Sensing capability for PACFISH issues and management needs.
25. Are statewide or regional data available (GIS and alphanumeric) that are necessary for analysis associated with PACFISH?
- a. Can you access these data as part of a network?
 - b. If not, how do you acquire these data?
 - i. How do you input these data into your system?
26. Are you able to stay current with the advances in GIS and Remote Sensing?
- a. Do you feel you have an adequate background in the principles and capabilities of GIS analysis and remote sensing to accomplish your mission?
27. Would you like to see a support structure place that is responsive to your specific needs for GIS analysis and remote sensing?
28. What types of training or continuing education opportunities do you need to develop a working knowledge or become proficient in GIS and Remote Sensing (as appropriate for your position):
- a. Principles of GIS and Remote Sensing
 - b. Technical training on software applications
 - c. Spatial analysis, modeling, and statistics
 - d. Other

29. What hardware (including peripherals) from the modernization contract do you feel would give your office the capabilities to perform your mission as it relates to analysis of watersheds and anadromous fish habitats for PACFISH (list)?
- a. Does this equipment configuration provide total standalone capability for all GIS and Remote Sensing needs?
 - b. Does this equipment configuration provide for your local analysis needs, depending on other offices or contractors for major processing or digitizing jobs?
 - c. Do you feel you have the workforce to effectively utilize this equipment for the purposes intended?
 - d. Is this equipment identified in your IRM 5 year plan?
 - i. If not, do you plan to update your plan to reflect these needs?
30. Were there any specific questions you could not answer adequately because of lack of information or knowledge?
- a. If so, please identify which ones.
31. Are there any areas you would like to see more information (e.g. target system configurations, GIS applications, Remote Sensing technology, Spatial analysis and modeling, Landscape Ecology and hierarchy theory, Ecosystem Management concepts, PACFISH Strategy, etc.)
32. Other comments, suggestions or areas not covered by questions (narrative):

APPENDIX 2:

IDAHO BUDGET/RESOURCES PROJECT GIS TEAM REPORT

Problem Statement

GIS is an under-staffed and under-utilized tool in Idaho BLM, yet use of this tool is imperative to cope with the planning, implementation, and monitoring of major Bureau initiatives, such as ecosystem management.

Specific concerns involve:

- *the perception that GIS is a stand-alone program separate from resource programs (versus being a support tool that can greatly facilitate resource analysis)*
- *the inadequate level of current funding, which hinders GIS staffs' ability to produce timely products and keep up with the vastly increasing workload in the state (versus the support needed to "do the job right," especially at the local level)*
- *the lack of a user-oriented, fully functional GIS system with sound data, readily used by specialists and managers at all levels (versus the present "guru" system with its inferior software and non-standard data)*
- *the lack of understanding and appreciation by managers of the capabilities of GIS.*
- *the possible relocation of the SO GIS staff functions to other locations within the organization*

Simply stated, the problem is finding how best to utilize GIS as a tool in facilitating interdisciplinary resource management within Idaho BLM.

Analysis

Scope of effort: The group felt that it was more productive to look at the "big picture" of GIS in the state, and not just address the issue of SO organization and functions. We anticipated that other teams were likely to recommend major changes in BLM's resource management in Idaho (including adoption of ecosystem management), so we looked into the future and developed three specific short-term (1-3 yrs.) alternatives for different levels of GIS technical support for these efforts. We also looked in detail at how Modernization will provide us more capabilities (and raise more issues.)

Long-term scenario: Since our concern was for the formulation of short-term recommendations, the discussion on the long term (3+ years) was limited to a vision of where we were headed -- fully functional GIS capabilities at all levels, movement toward an integration of alphanumeric and spatial data, development of true LIS-type (Land Information System) capabilities, active data sharing with other agencies, and the use by managers and specialists of a system that meets their requirements. We ensured that the two short-term "action" alternatives identified led toward this scenario.

Alternatives considered

Alternative #1: "no action": This involves maintaining the current level of funding at the State Office and district offices. The number of current GIS positions would be maintained. Specific GIS functions affected and the level of GIS activity are described in Table 1 in the appendix.

Pro's:

- No new funding or FTE required

Con's:

- Will not meet demands of multiple-use resource management
- Cannot support ecosystem management, which is data-intensive
- Resource specialists will have to input much of the GIS data themselves (not enough GIS techs)
- Forces us to use manual or outdated procedures, which are costly and inefficient
- Limited GIS staffs with inferior software will continue to meet only a fraction of district/SO requirements, perpetuating the "black hole" syndrome ("We've put lots of bucks into GIS and have 'nothing' to show for it.")

Alternative #2: "base level": Provides additional WMs and dollars to provide for basic (minimal) GIS operations within each district and the SO. Anticipates the significant training and huge data transition workload as we move more quickly toward better GIS software and the Modernization platform. See Table 2 in the Appendix for more information.

Pro's:

- More effective use of GIS in multi-resource ecosystem management
- Greater opportunity to effectively analyze alternatives (resource programs / plans)
- More hands-on opportunities, user interfaces for resource specialists and managers; easier to access system, feeling of ownership
- Data conversion can be done sooner; new data can be placed into new system (without conversion)
- More immediate response to GIS needs at field level
- Resource specialists have more time for work on their specialty because of increased efficiency of GIS and larger GIS support staff

Con's:

- More FTE, dollars required for GIS to properly support resource activities
- Purchase of some new equipment will need to be completed before scheduled in the Modernization timelines

Alternative #3: "full implementation": Provides GIS technician staffing to the resource area. Provides for funding to adequately meet most district requirements. Establishes a "GIS SWAT Team" consisting of experienced GIS analysts and others to be at field locations for extended periods for major projects, such as RMPs. See Table 3 in the Appendix for more information.

Pro's:

- (All of the above "Pro's" from Alternative 2), plus:
- More time and people devoted to interagency data sharing, coordination;

better professional image for BLM

- Better integration of remote sensing with GIS for improved data, maintenance efficiency

Con's:

- Even more FTE and funding than in Alternative #2

Key Definitions and Acronyms (as used in this discussion)

ARD Automated Resources Data: Information about various natural resources (i.e. archaeological sites, mineral deposits, riparian areas, vegetation species, soil types, wildlife habitats, etc.) that are in an automated system.

GIS Geographic Information Systems: Used inclusively here to represent the computer tools (including the associated training, budget, personnel, etc.), that are used to analyze data associated with BLM resource programs. GIS normally includes the hardware and software needed to input and export data used in this analysis.

RBD Resource Base Data: Those geographic features usually associated with base maps. These include topography (terrain and elevation), hydrography (lakes, rivers, wetlands, etc.), transportation (roads, trails, pipelines, etc.) and cultural features, including political boundaries. In the context of this paper, RBD also includes digital landlines and ownership information.

Recommended Approach

Level of needed GIS support: In attempting to be both realistic, and at the same time, very cognitive of the current "poor health" of GIS within the Bureau, Alternative #2 is the recommended approach. This is the short-term, base level minimum needed to get GIS utilized efficiently. To do nothing, as is outlined in the no action alternative, would merely exacerbate the current state of affairs--i.e. the continued use of inefficient and therefore costly analysis tools, inability to keep pace with current multiple-use resource management activities, the continued dissatisfaction from both field personnel and GIS specialists, etc.

GIS staffing has to increase, and GIS professionals need to play a major support role in the teams that will deal with on-the-ground resource management. Continuing input and analysis of data, transition from our existing software to the new Modernization software and hardware, greater team participation in helping develop GIS data standards in order to cross ecosystem boundaries -- these are but some of the tasks in which GIS personnel will be asked to participate. To accomplish this, each district will need at least one full-time GIS analyst and one full-time technician on site, with each resource area having a collateral duty position to coordinate GIS needs with the district.

Under this alternative, the State Office will need to be responsible for collecting some RBD, providing field production support, converting a huge volume of data, quality control, technical assistance, training in the new software, and applications development (including remote sensing). In the short term, this will require a total of at least two to three positions. Once BLM begins managing its resources using the principles of ecosystem management, the need for widespread sharing and exchange of data with various agencies and groups will increase dramatically. The SO staff will be in a far better position for support when this occurs.

Implementation of the recommended alternative will help alleviate many of the concerns described in the problem statement. Benefits include an accelerated replacement of the current inferior "guru" system with new GIS software and hardware, as well as a user-friendly interface for resource specialists and managers to access the system directly for queries on their data (thus gaining a sense of "ownership" in the system). Other benefits include increased output capabilities (better software and more GIS staff ("I'm seeing something out of the system now")), and increased time for GIS personnel from the RA, district, or SO to work more effectively in a team environment along with resource specialists (GIS is not a stand-alone program) to solve many of the pressing data standards issues.

Organizational considerations: In general, the group concluded that the current functions being carried out at the different organizational levels were working well and needed no major changes. Particularly, the functions performed at the SO were felt to be best placed at that location. The recommended alternative (#2) saw an increased workload at all levels, but with little change in the actual functions.

The organizational location of the SO GIS staff was also discussed, with varying opinions. Several members of the team highlighted the fact that the operational components of the Bureau's Land Information System (LIS) (ALMRS, GCDB, GIS, and Mapping Sciences) are currently located within the same division (Operations), which has facilitated communication and resulted in a synergy and innovation. Others were concerned that GIS might thus be incorrectly viewed as independent of Modernization; however, GIS recognizes that it must be part of an overall implementation approach ("umbrella") guided by IRM. The group also thought that the overall guidance for GIS (and priority setting) should be accomplished through a more active IRM Field Project Board, composed primarily of managers. As a result, the recommendation was to retain the GIS staff at ISO within the Division of Operations. This placement, however, should have no impact on the placement of GIS personnel at the districts or resource areas, as these groups will be organized around an interdisciplinary team concept.

Appendix 1

~~Alternative 1~~: "No action" (Retains current funding levels for GIS operations at SO and districts; no new positions)

(Functions shown in regular print; *level of work expected under this alternative is shown in italics*)

Table 1

State Office	District	Resource Area
RBD collection, Quality Control (QC), maintenance (<i>limited areas only</i>); some small ARD projects for SO Divisions (e.g., fire) (<i>as time permits, which is rarely</i>); data conversion (<i>very limited</i>)	ARD input (incl. digitizing); data import/conversion (<i>very limited; even districts with dig. position can meet only a fraction of local users' needs</i>)	ARD digitizing (<i>except for Cottonwood, RAs basically remain "out of the loop."</i>)
Contract support (RBD and aerial photos) (<i>cannot adequately support riparian photo contracting, other digital data collection</i>)	GIS analysis on district projects; assist others with analysis (<i>limited; one project may be worked on; other work (even running off a plot) is delayed or simply not done.</i>)	ARD analysis (<i>except for some work done at Cottonwood RA, no other RA capabilities available</i>)
Tech. assistance/ training/ application develop. (<i>limited; can't adequately assist District users; minimal training for non-GIS staff; many unmet training needs</i>)	Tech. support/training for specialists/managers; some applic. development (<i>extremely limited; no time available to train GIS staff or brief specialists/managers</i>)	
Product generation support -- electrostatic plotter, RMP-type products involving Cartographics staff (<i>limited support</i>)	Preparation of hardcopy output -- design, production (<i>meets only a fraction of the local needs; need GIS person to create, run off the plots</i>)	Hardcopy output (<i>no capabilities, except for Cottonwood</i>)
Overall program coordination, direction ("program lead" role), interagency contacts (<i>little time available to coordinate with program leads/other agencies re: data exchange</i>)	District project design/ project management/ project prioritization (<i>very little time to coordinate incoming materials, correct compilation errors, etc.; continued "brush fire" requirements.</i>)	
Data standards -- user requirements, establishment of standards for GIS data (<i>very little work done; huge need</i>)	Dev. of proposed standards for subsequent review by other Dists. and SO) (<i>little time to review; rare opportunity to meet, discuss, and resolve</i>)	

~~Alternative #2~~: "Base level": (Minimum to get GIS on-line and utilized efficiently)

(Functions shown in regular print; level of work expected under this alternative is shown in italics)

Table 2

State Office	District	Resource Area
RBD collection, QC, maintenance (<i>statewide coverage obtained in shorter timeframe</i>); some small ARD projects for SO Divisions (<i>continuation of current efforts</i>); data conversion (<i>more timely</i>)	ARD input (incl. digitizing); data import/conversion (<i>GIS tech 5/6/7 will meet more of pressing district needs; will be available to handle some of conversion to new software</i>)	ARD digitizing (<i>no on-site digitizing (except Cottonwood), but greater capacity at DO for digitizing.</i>)
Contract support (RBD and aerial photos) (<i>cannot adequately support riparian photo contracting; some support for other digital data collection activities</i>)	GIS analysis on district projects; assist others with analysis (<i>Having at least 1 GIS analyst (9/11) position will help greatly in district projects; improved software will enhance production.</i>)	ARD analysis (<i>as above, depends on District capabilities, except Cottonwood RA</i>)
Tech. assistance/ training/ application develop. (<i>much improved assistance and training for users; total of 2-3 GIS analysts necessary to do training/ conversion to new software; adequate remote sensing services also provided.</i>)	Tech. support/training for specialists/ managers; some applic. development (<i>improved software will allow specialists and managers to access system, make simple plots unassisted; more time for GIS analyst to provide training, do application dev.</i>)#	
Product generation support -- electrostatic plotter, RMP-type products involving Cartographics staff (<i>better support, more timely turnaround</i>)	Preparation of hardcopy output -- design, production (<i>more local needs can be met than currently</i>)	Hardcopy output (<i>as above, need to use district plotter, except Cottonwood.</i>)
Overall program coordination, direction ("program lead" role), interagency contacts (<i>more time available to coordinate with program leads/other agencies; can save us time and dollars through shared data</i>)	District project design/ project management/ project prioritization (<i>more time to properly coordinate GIS work; to plan ahead and anticipate some future requirements; increased data exchange.</i>)	
Data standards -- user requirements, establishment of standards for GIS data (<i>critical resource themes can be addressed; some standards can be developed</i>)	Dev. of proposed standards for subsequent review by other Dists and SO (<i>more time to participate as a team to propose/review/ adopt standards.</i>)	

[# Note: also need an automation system manager/IR expert for new hardware, software, communications -- not a GIS position, but essential for GIS success]

~~Alternative #3~~: "Full implementation": (Additional FTE and dollars)

(Functions shown in regular print; level of work expected under this alternative is shown in italics)

Table 3

State Office	District	Resource Area
RBD collection, QC, maintenance (<i>accelerated statewide coverage</i>); some small ISO ARD projects (<i>continuation of current efforts</i>)	ARD input (incl. digitizing); data import/conversion (<i>GIS tech 5/6/7 will meet more of pressing district needs</i>)	ARD digitizing (<i>RA data input, depending on local needs.</i>)
Contract support (RBD and aerial photos) (<i>more support for remote sensing /image processing contracts; continued digital data collection activities.</i>)	GIS analysis on district projects; assist others with analysis (<i>Having at least 1 GIS analyst (9/11) position will help greatly in district projects; improved software will enhance production.</i>)	ARD analysis for local projects (<i>GIS analyst at RA level; greater access to user-friendly system for resource specialists, managers</i>)
Tech. assistance/ training/ application develop. (<i>much more time for developing resource-specific applications</i>); roving GIS "SWAT" team for major projects or special applications (<i>takes huge workload off the district staff and provides specialized expertise.</i>)	Tech. support/training for specialists/ managers; some applic. development (<i>more time for GIS analyst to provide local training, do applications development; increased use of data from Global Positioning System (GPS) and remote sensing.</i>)#	Technical advice and support to local resource specialists and managers (<i>GIS analyst/ collateral duty GIS technician</i>)#
Product generation support -- electrostatic plotter, RMP-type products involving Cartographics staff (<i>better support, more timely turnaround</i>)	Preparation of hardcopy output -- design, production (<i>more local needs can be met than currently; improved software will allow specialists and managers to access system and make simple plots unassisted</i>)	Hardcopy output (<i>local plotter; staff to design and run plots.</i>)
Overall program coordination, direction ("program lead" role), interagency contacts (<i>pro-active role in coordinating with program leads/other agencies; increased data sharing.</i>)	District project design/ project management/ project prioritization (<i>more time to properly coordinate GIS work, esp. with resource specialists/mgrs.; to plan ahead and anticipate some "brush fires".</i>)	RA project design/management; data exchange with other agencies (<i>active program</i>)
Data standards -- user requirements, establishment of standards for GIS data (<i>a much more organized and consistent approach can be done.</i>)	Dev. of proposed standards for subsequent review by other Dists and SO (<i>more time to participate as a team to propose/review/ adopt standards.</i>)	Data standards (<i>more time for on-the-ground staff with GIS experience to help develop standards.</i>)

[# Need an Automation system manager/IR person to take care of new hardware, software, communications. Not a GIS position, but essential for GIS support]

Appendix 2

Team Summary

Team members

Katy Madrid	Computer Systems Analyst (GIS)	1-1
Pete VanWyhe	Planning and Envir.Coord./GIS	1-2
Dennis Hoyem	Planning and Envir. Coordinator	1-3
Dennis Schulze	Administrative Office	1-5
Dave Crabtree	Computer System Analyst (IRM,GIS)	1-6
Troy Bunch	Sup. Cartographer (Cartographics)	941
Bill Yeager	Nat. Res. Spec. (GIS/RS Coordin.)	941

Length and format of meetings

Initial meeting in Burley, April 15.

Summary notes sent out April 26, interim plan notes due back to Bill on April 29.

Conference call May 6 with all members (1-hour).

Meeting in Boise May 11 (9:30 - 4:30) with 5 team members (Katy, Pete, Dennis S., Bill, Troy); phone contact during meeting with other 2 (Dennis H. and Dave).

Draft sent out to team members 5/14/93; revised draft 5/18/93.

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