

Chapter 1

Overview of Maps

In this chapter you will learn about:

- *Key points when working with maps*
 - *General types of maps*
 - *Incident specific maps*
 - *Map legend and symbols*
 - *Map sources*
-

A map is a navigational aid that represents a specific area, such as part of the earth's surface. Conventional symbols are used to identify objects and features on a map. Maps are critical communication tools for incident planning and operations, and are used for a variety of purposes, for example:

- To assist with navigation.
- To determine the location of a specific point or area (e.g., water sources, threatened resources).
- To calculate distance.
- To determine size of an area.
- To determine terrain and vegetative cover.
- To determine routes of travel.
- To determine names of streets, rivers, mountains, and other features.
- To visualize a specific area.

This chapter starts with some key points about maps. Then it discusses types of maps and incident specific maps. Additional information is provided on map legends and symbols. Finally, it describes different places to obtain maps.

Key Points When Working With Maps

When working with maps there are some key points to remember, especially when using the map in conjunction with a compass and GPS receiver.

Datum

Most maps are made based on a datum (horizontal and vertical), which is the origin or reference point from which all points on a map are measured. Several different datums have been used to develop maps; however, commonly used datum includes: North American Datum of 1927 (NAD27), North American Datum of 1983 (NAD83), and the World Geodetic System of 1984 (WGS84).

The datum is important for Geographic Information Systems (GIS) and GPS applications to ensure consistency of map data. When using a GPS receiver the datum must be set to match the horizontal datum on the map. If the datum does not match there will be errors when plotting data on a map.

Geographic North

Maps are usually based on the geographic North Pole (geographic north or true north). This is important to remember because a compass is based on magnetic north, which is different than geographic north. Magnetic north changes over time, while geographic north does not change over time. When using a compass and map together an adjustment has to be made to the compass to account for this difference. The difference is referred to as the magnetic declination, which is discussed in Chapter 4, Using a Compass and Clinometer.

Maps Are Not Perfect

For a map to be considered reliable and accurate, a point or symbol marked on a map must be in proper relation to known landmarks or positions located on the ground. In 1947, the “United States National Map Accuracy Standards” were established as the standards of accuracy for published maps and are currently in effect. The standards require a stringent percent of accuracy within centimeters of both location and elevation points tested. However, even with these standards, maps are not absolutely accurate because:

- Maps represent a curved and uneven surface that is drawn on a flat piece of paper, which results in a distorted picture.
- There is a margin of error (human error and inadequate survey procedures) in surveys that were used to create maps. Also, there are factual matters (errors such as names, symbols of features, and the classifications of roads or woodlands); sometimes the information is wrong and names and features change.
- On incidents, if a map has been photocopied, it most likely is not to scale. It is important to watch out for this and learn how to make adjustments.

Maps Can Be Outdated

Maps are outdated from the day they are made, including USGS topographic maps (for example, new roads may not be on a map). When working on an incident try to obtain the most up-to-date map. USGS topographic maps have the revision date in the margin.

General Types of Maps

This section discusses general types of maps: planimetric, topographic, and orthophoto.

Planimetric Maps

Planimetric maps show the positions of features without showing their relationship to the hills and valleys of the land. Examples of features on planimetric maps include rivers, lakes, roads, and boundaries. Planimetric maps include:

- Common road maps – road atlas and city maps (Figure 1-1).
- Specific area maps – preplan maps, floor plan maps, storm drain maps, sewer and water system maps.
- Schematic maps – agency maps and aviation maps.

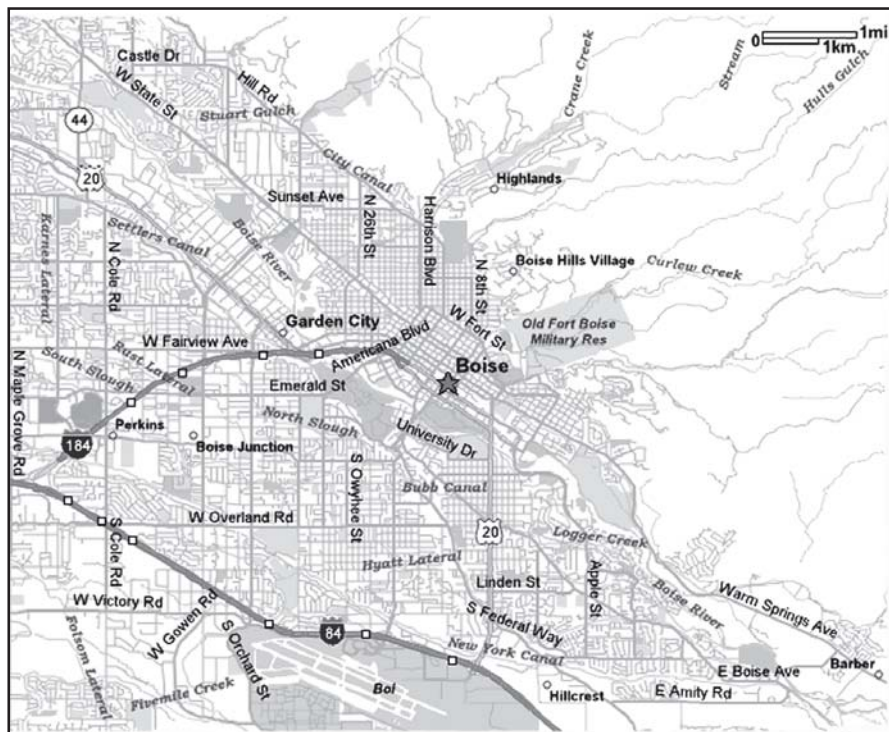


Figure 1-1. City map.

Topographic Maps

Topographic maps are different from planimetric maps because they show both the horizontal and vertical (relief) positions of features. The datum used for most currently available USGS 7.5 minute series topographical maps is the NAD27. A new datum, NAD83, is now being used and others are being developed. Most of the topographic maps used on incidents are produced by the USGS or USDA Forest Service. These maps are often used as the base map to develop incident specific maps, such as the Situation Unit map and Incident Action Plan map.

Two types of topographic maps include:

- Contour maps

Contour maps are the most common way to show the shape and elevation of the land (Figure 1-2). A contour is an imaginary line, where all points on the line are at the same elevation (above or below a specific reference elevation, usually sea level). Contour lines reveal the location of slopes, depressions, ridges, cliffs, and other topographical features.

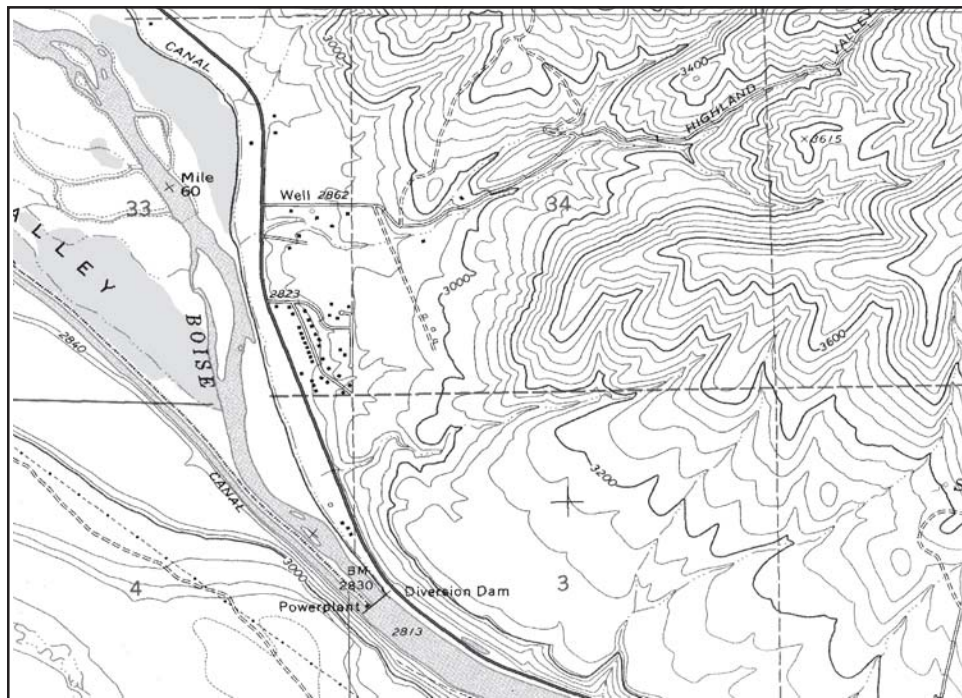


Figure 1-2. Topographic map showing contours.

- Shaded-relief maps

Shaded-relief maps use a shadow effect color to simulate the terrain (Figure 1-3). Different color shades are used to accentuate the shape of the physical features. The darker the shading the steeper the slope.

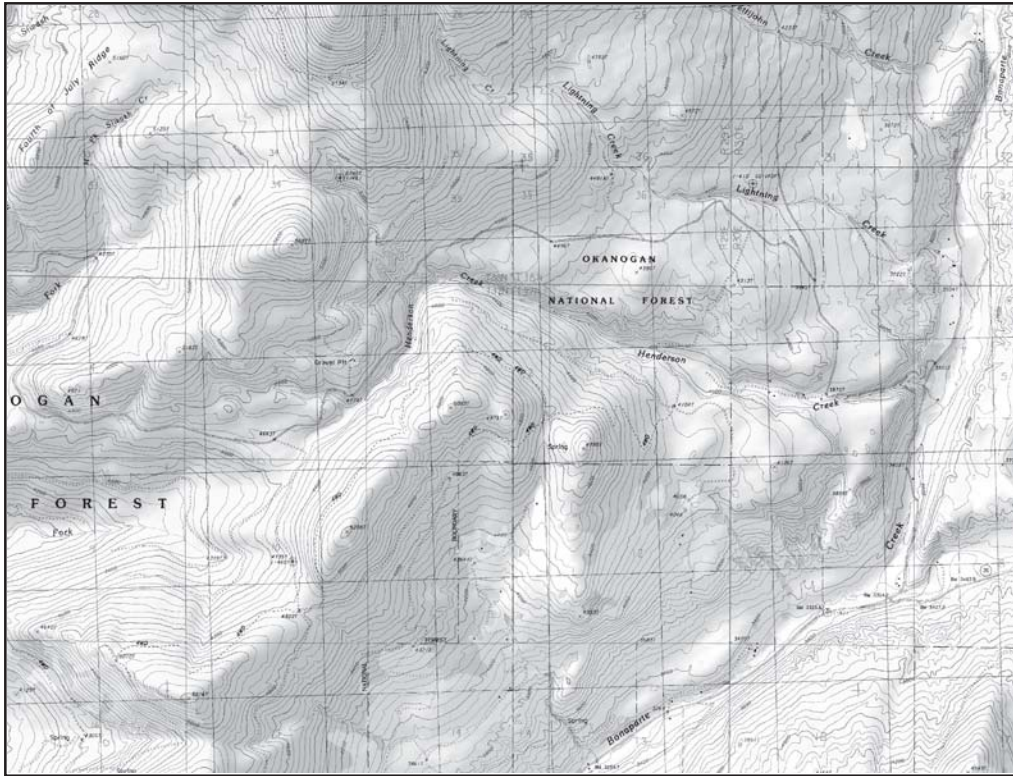


Figure 1-3. Shaded-relief map.

Orthophoto Maps

An orthophoto map is an aerial color-enhanced photograph of the land depicting terrain and other features (Figure 1-4).

Some orthophoto maps are overlain with contour lines and other features commonly associated with topographic maps. These maps are corrected for scale and are the same size as USGS topographic quadrangle maps.



Figure 1-4. Orthophoto map.

Incident Specific Maps

There are several different types of maps used on an incident and they each have their own specific purpose.

Situation Unit Map

The Situation Unit map is the most current map of the incident because it is continuously updated (Figure 1-5).

It is the master map and other incident maps are often derived from this map. The Situation Unit map is a large topographic map that is computer generated or hand drawn.

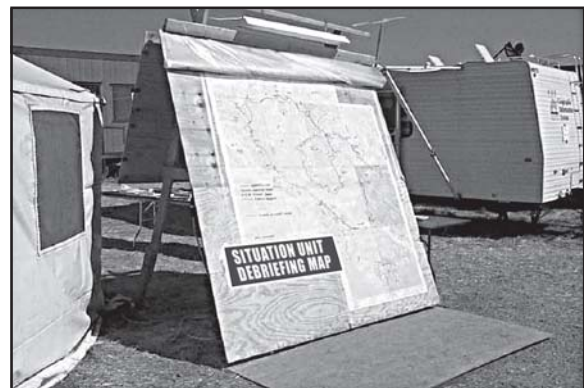


Figure 1-5. Situation Unit map.

Incident Action Plan (IAP) Map

The Incident Action Plan map is the primary map that operations personnel use to accomplish the incident mission. It represents a snapshot in time and is published daily in the IAP. It is a small, black and white topographic map (typically 8½" x 11" or 11" x 17") that is hand-drawn or computer generated (Figures 1-6a and 1-6b). It contains the same information that is on the Situation Unit map.

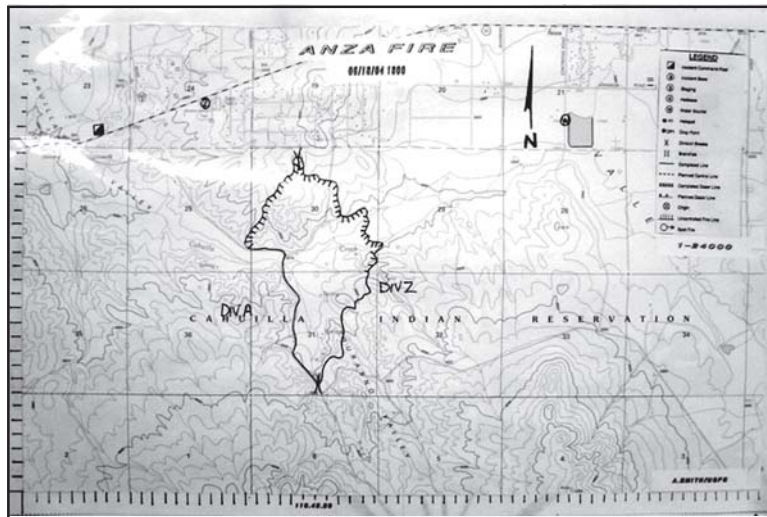


Figure 1-6a. Incident Action Plan map (hand-drawn).

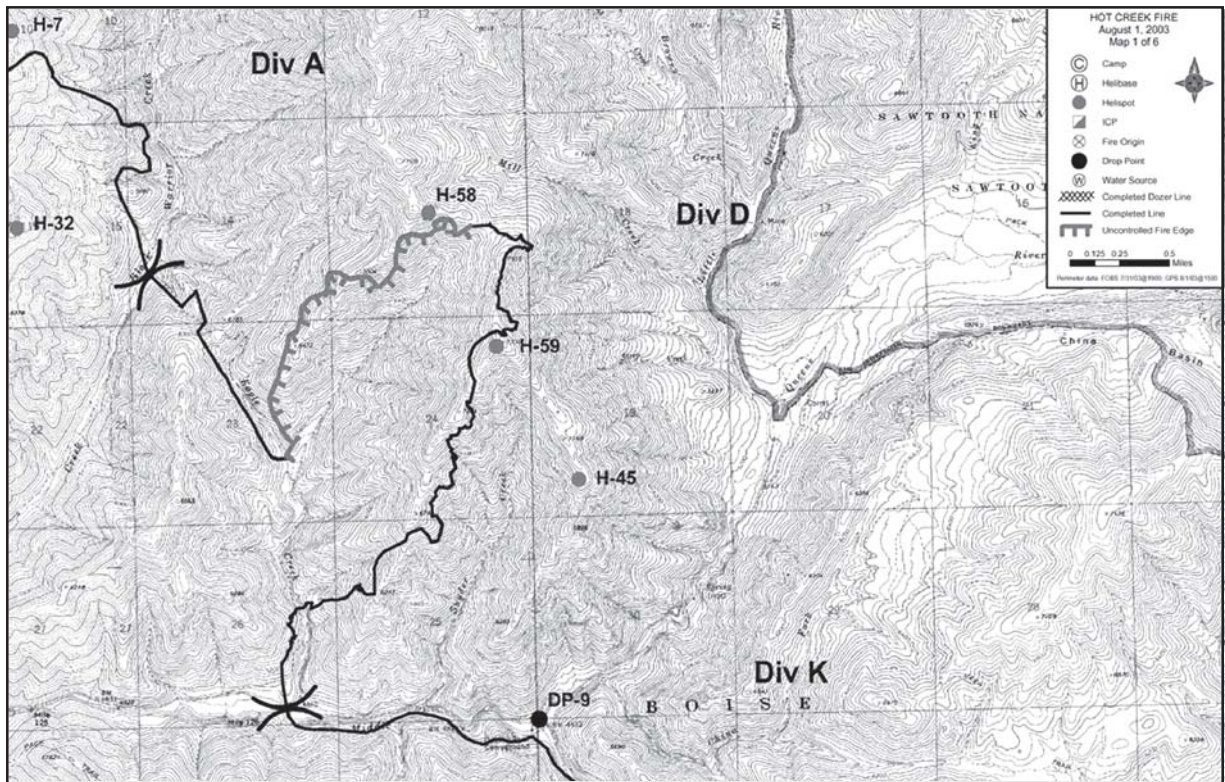


Figure 1-6b. Incident Action Plan map (computer generated).

Operational Briefing Map

The Operational Briefing map is used during briefings to discuss work assignments and other details for the upcoming operational period (Figure 1-7).



Figure 1-7. Operational Briefing map.

Progression Map

The Progression map shows how the incident has grown over the landscape according to a time scale and is used to track the incident's progression (Figure 1-8). It is a topographic or shaded-relief map that illustrates the changing perimeter, which is distinguishable by color or text. The size of the Progression map varies.

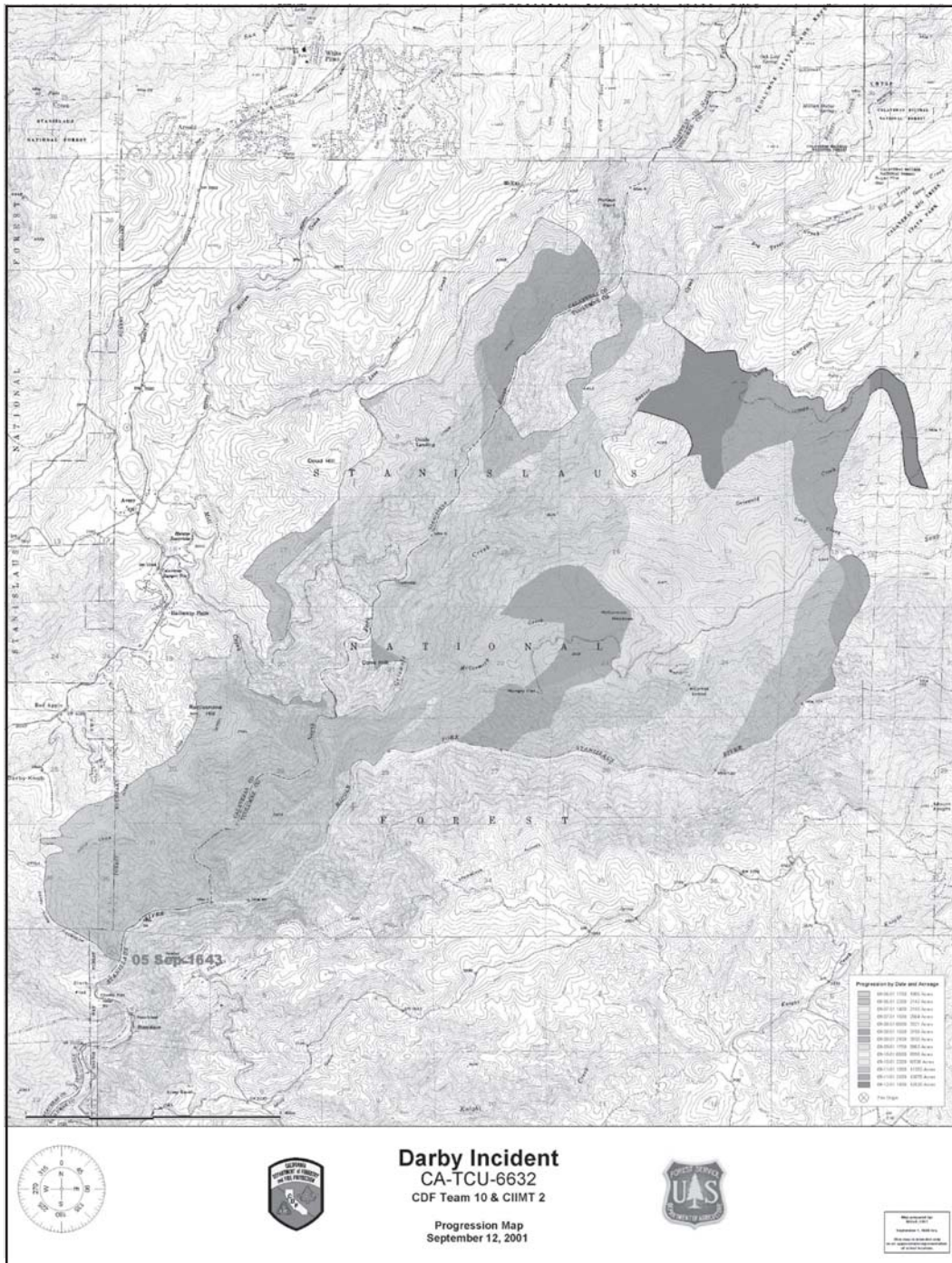


Figure 1-8. Progression map.

Facilities Map

The Facilities map is used to orient incident staff to the layout of the incident command post and camp (Figure 1-9). It is typically on one page, 8½" x 11", and included in the IAP.

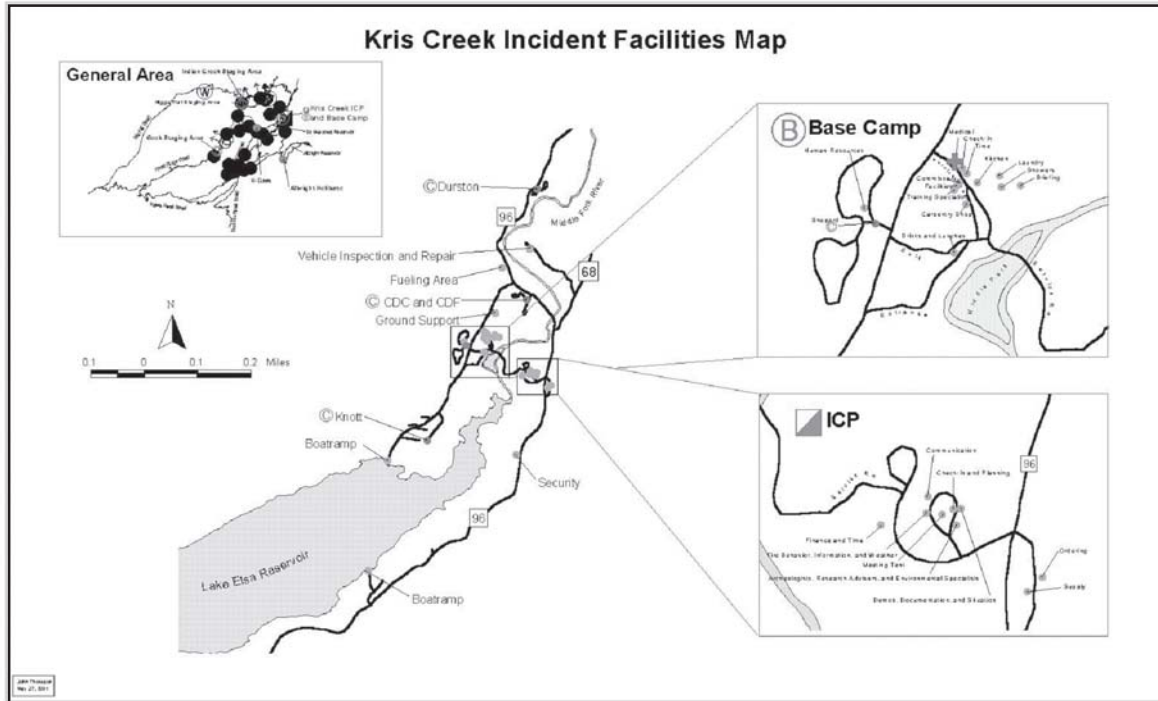


Figure 1-9. Facilities map.

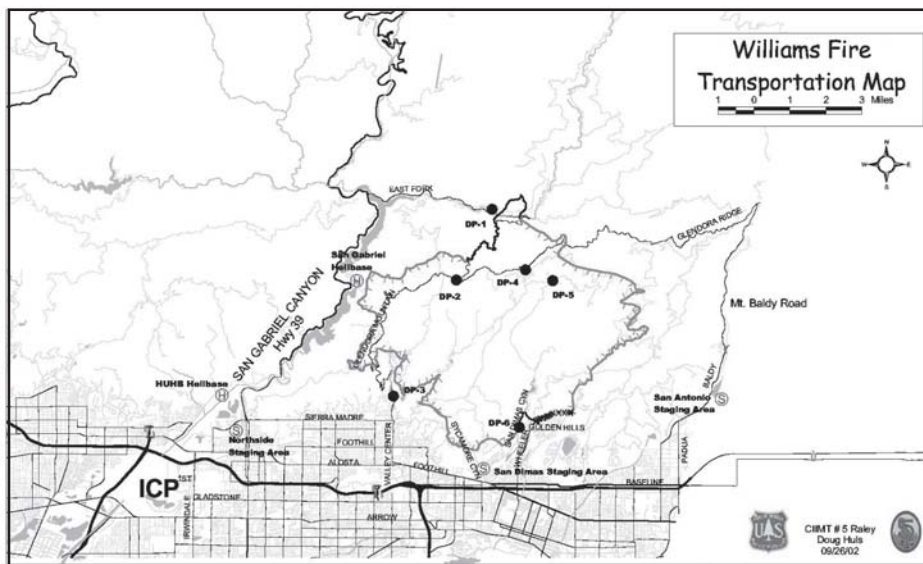


Figure 1-10. Transportation map.

Transportation Map

This map shows travel routes and overall access to the incident (Figure 1-10).

It is used to facilitate the safe delivery of equipment, supplies, and personnel to and from the incident location. It is typically 8½" x 11" and included in the IAP.

Infrared Map

Infrared maps display heat sources and hot spots on a fire incident (Figure 1-11).

Infrared Interpreters (IRIN) translate information from infrared imagery to the topographic maps. Several shades of black and white are used to depict heat sources. Black represents the hottest spots while white shows the cooler areas.



Figure 1-11. Infrared map.

Structure Protection Map

This map displays locations of improvements (e.g., structures) in relationship to the incident.

Air Operations Map

This is a topographic or shaded-relief map with symbology that pertains to air operations. It may include temporary flight restrictions and flight hazards.

Public Information Map

This map is used to keep the public informed and does not show tactical details. It shows incident location in relationship to communities and other points of interest.

Fire History Map

The fire history map displays fire perimeter in relationship to previously burned areas.

Ownership Map

This map displays land ownership within and adjacent to the incident perimeter.

Rehabilitation Map

The rehabilitation map displays incident activities that may cause environmental impacts. This map also charts progress of rehabilitation activities.

Fuels/Vegetation Map

This map displays fuels and/or vegetation within and adjacent to the incident perimeter.

Map Legend and Symbols

Most maps have a legend that is used to interpret symbols on the map such as what color line delineates a road or land ownership boundary, or what symbol represents a building, stream, or heliport (Figure 1-12). The symbols used vary with every map, depending upon the purpose of the map. The legend may also include the map scale and other important information.

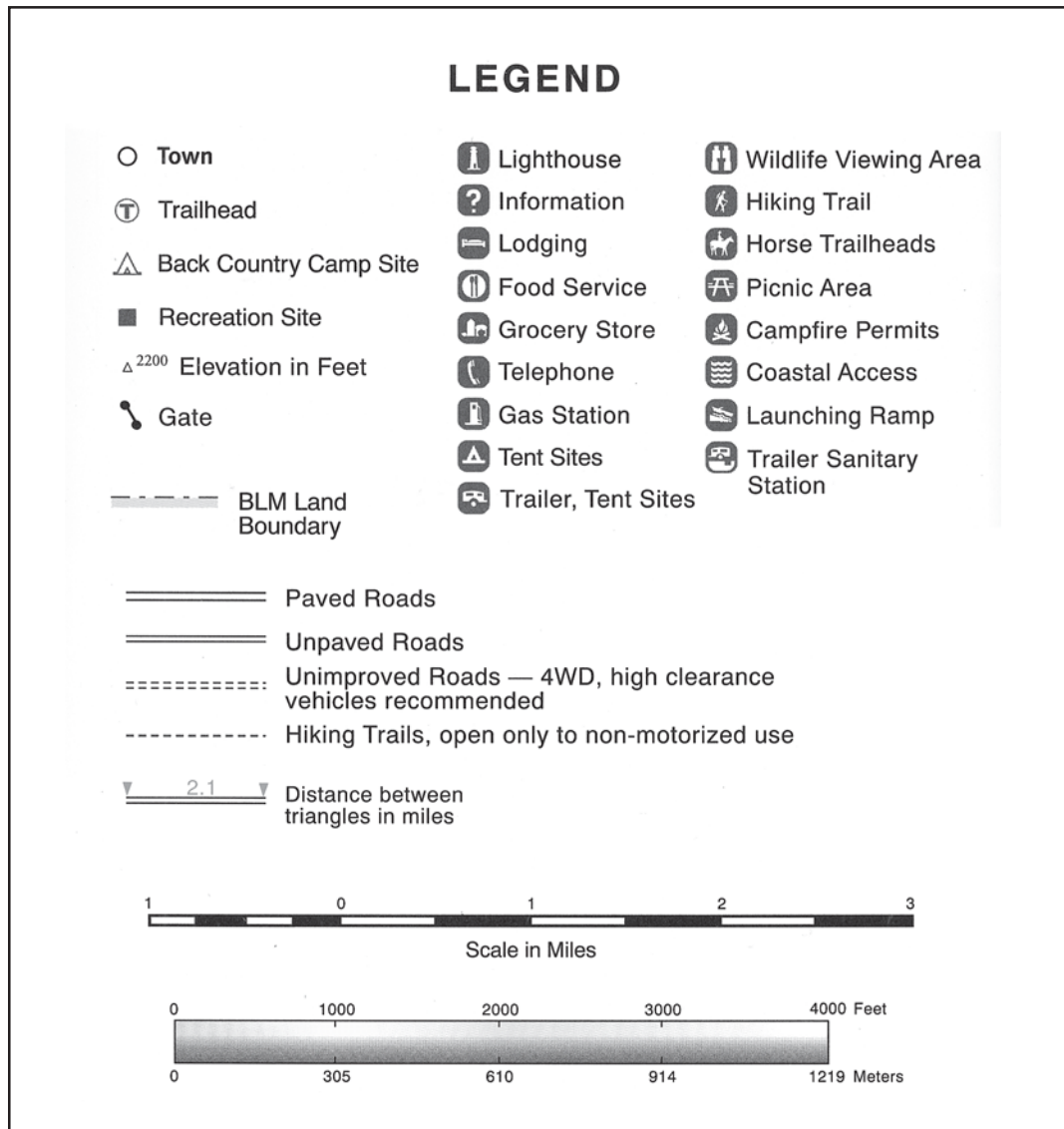


Figure 1-12. Example of a map legend.

Symbol Colors

Map symbols are usually printed in colors with each color representing a class of features. The colors and features used on incident maps include:

- Blue – facilities, water
- Red – fire features, origin, roads
- Black – roads, control lines, drop points
- Orange – fire spread prediction
- Green – vegetation
- Brown – contours, cuts and fills, other relief features
- Purple – revised information
- Grey – developed areas
- Other colors may be used for special purposes.

Types of Symbols

Incident Command System (ICS) has a standardized, color-coded symbol set that was developed specifically for the Incident Command System (Figure 1-13). The ICS symbols are also in the Fireline Handbook. Additional symbols can be created for incident maps, but they must be defined in the legend.

| SUGGESTED FOR PLACEMENT ON BASE MAP | | SUGGESTED FOR PLACEMENT ON OVERLAYS | |
|-------------------------------------|---|-------------------------------------|--|
| MINIMUM RECOMMENDED | | | |
| BLACK | RIDGE HIGHLIGHTED GEOGRAPHIC OR MANMADE FEATURES | RED | 10 AUG 1730 UNCONTROLLED FIRE EDGE |
| BLACK | COMPLETED DOZER LINE COMPLETED LINE LINE BREAK COMPLETED | RED | 10 AUG 1730 SPOT FIRE 10 AUG 1700 HOT SPOT |
| RED | 10 AUG 1430 FIRE ORIGIN HAZARD (IDENTIFY TYPE OF HAZARD, E.G., POWER LINES) | ORANGE | 10 AUG 2000 FIRE SPREAD PREDICTION |
| BLUE | INCIDENT COMMAND POST INCIDENT BASE HOLT CAMP (IDENTIFY BY NAME) | BLACK | PLANNED FIRE LINE PLANNED SECONDARY LINE [I] [II] BRANCHES INITIALLY NUMBERED CLOCKWISE FROM FIRE ORIGIN (A) (B) DIVISION INITIALLY LETTERED CLOCKWISE FROM FIRE ORIGIN >A-2< SEGMENTS COMBINE DIVISION LETTER WITH CLOCKWISE NUMBERING WITHIN THE DIVISION |
| BLUE | H-3 HELISPOT (LOCATION AND NUMBER) HELIBASE REPEATER/MOBILE RELAY | BLACK | W/10 1600 9/7 WIND SPEED DIRECTION PROPOSED DOZER LINE FIRE BREAK (PLANNING OR INCOMPLETE) STAGING AREA (IDENTIFY BY NAME) |
| OPTIONAL | TELEPHONE FIRE STATION WATER SOURCE (IDENTIFY, E.G., POND CISTERN, HYDRANT) MOBILE WEATHER UNIT IR DOWN LINK FIRST AID STATION | BLUE | ALL OVERLAYS MUST CONTAIN REGISTRATION MARKS. THESE MAY CONSIST OF IDENTIFIED ROAD INTERSECTIONS, TOWNSHIP/RANGE COORDINATES, MAP CORNERS, ETC. |

Figure 1-13. Incident Command System symbology.

Map Sources

There are several different places to obtain maps.

Federal Agencies – Local, Regional, and National Offices

The local, regional, and national offices for federal agencies often have maps for their specific jurisdiction.

Local/State Agency Offices

Local and state agency offices (forestry, fire, police, emergency management) will have maps of the local area.

Local Business Offices

Local business offices (real estate, contractors, utility companies, Chamber of Commerce) may also have maps of the local area.

Internet

Several agencies have statewide data sets available online.

Mapping Software

Mapping software is now available that offers a variety of features, such as printing maps, plotting points, determining acreage, and downloading GPS information (tracks, waypoints, routes). Geographic Information System is the major software system that is used for mapping data; however, there are other software products available.

Checking Your Understanding

Answers to “Checking Your Understanding” can be found in Appendix B.

1. List three examples of how you may use a map on an incident.

2. Describe two key points to remember when using a map with a compass or GPS receiver.

3. Indicate the type of map that would be most appropriate for these activities:
 - A. Locate hot spots on an incident – _____
 - B. Determine slope of a specific area – _____
 - C. Identify travel route – _____
 - D. Determine current perimeter location – _____
 - E. Identify perimeter location when the incident started – _____

4. What publication can you use to learn the ICS symbols?

5. List three sources of where you can obtain maps.

