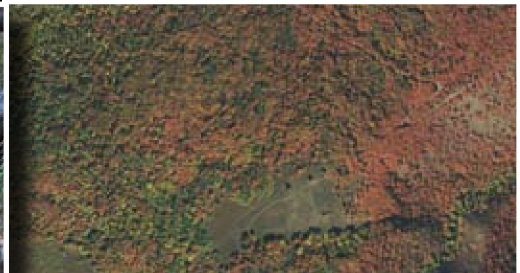
# Unauthorized Use Feature Inventory on the Logan Ranger District, Uinta-Wasatch-Cache National Forest

October 2009

RSAC0999-BRIEF4




United States Department of Agriculture

Forest Service

Geospatial Management Office

Remote Sensing Applications Center

# Abstract

Unauthorized use feature (UUF) are transportation features such as roads or trails that are not included in a forest's transportation database. UUF within the Logan Ranger District (RD), Uinta-Wasatch-Cache National Forest (NF) were identified and digitized from high resolution color aerial photography by the U.S. Department of Agriculture, Remote Sensing Applications Center (RSAC), on request from the Uinta-Wasatch-Cache NF and in cooperation with the Intermountain Regional Office (R4). This report summarizes the methods used to generate a comprehensive assessment of unauthorized use features and digitize those linear Features according to a geospatial data dictionary. It also describes the products prepared for the Uinta-Wasatch-Cache NF.

### *Key Words*

comprehensive assessment, geospatial data dictionary, unauthorized use feature, high resolution orthophotography, transportation feature, unauthorized trails, remote sensing, trails, off-highway vehicles (OHV) Uinta-Wasatch-Cache National Forest

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# Introduction

Unauthorized use features (UUF) are transportation features such as roads or trails that are not included in a forest's transportation database. UUF's within the Logan Ranger District (RD), Uinta-Wasatch-Cache National Forest (NF) were identified and digitized from high resolution ortho photography by the U.S. Department of Agriculture, Remote Sensing Applications Center (RSAC). For this project, a UUF was digitized if the interpreted feature was at least 48 inches wide and at least 100 feet long. This project was requested from and sponsored by the Uinta-Wasatch-Cache NF and in cooperation with the Intermountain Regional Office (R4) (figure 1). The objectives of this reimbursable project were to, 1) generate a comprehensive assessment of UUF's across the entire Logan RD and, 2) digitize line segments representing UUF's and label them according to the attributes defined in the data dictionary.

**Logan Ranger District**
**Uinta Wasatch Cache National Forest**

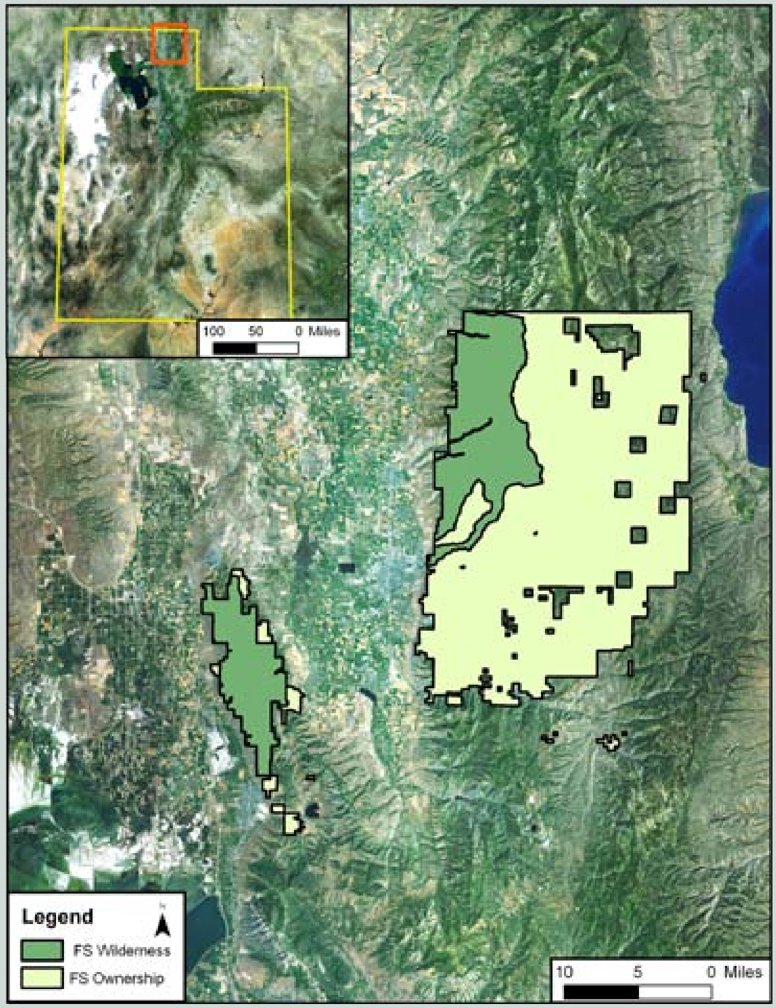


**Figure 1—The study area for the project includes the Bear River Range and the Wellsville Mountains in Logan Ranger District, Uinta-Wasatch-Cache National Forest.**

# Methods

## Geodatabase Design

A Geographic Information Systems (GIS) data dictionary containing the names of the datasets and the attribute definitions for those datasets was created for the inventory (appendix A). These descriptive attributes were used to design and build a personal geodatabase to store and organize the geographic datasets for the project. To ensure compatibility with field data collection, the personal geodatabase schema was ported to Global Positioning Systems (GPS) units for field verification, inventory, and attribution.

## Imagery

Natural color, high resolution orthophotography (HRO) with a nominal spatial resolution of approximately one foot and acquired in 2006 (UTM NAD83 Zone 12 North) was obtained from the Utah Automated Geographic Reference Center (AGRC). The imagery was mosaicked into 11 different image tiles covering two non-contiguous areas of the Logan RD—the Wellsville Mountains and the Bear River Range.

## Comprehensive Assessment

To help organize and prioritize the inventory, a fishnet of rectangular digital grid cells (DGC) having a five acre cell size was generated across the entire Uinta-Wasatch-Cache NF. The five acre DGC layer was overlaid on the HRO imagery and systematically interpreted to produce the comprehensive assessment. As shown in figure 2, DGCs that contained a UUF were coded with a value of "1" (presence) while DGCs that did not contain a UUF were coded with a value of "0" (absence). The DGC was converted to a point layer (using the polygon centroid) and a 3x3 kernel focal summary of the coded values was applied to create a thematic representation of relative presence and absence. Cooperators from the Logan RD used the information from the comprehensive assessment and their local expert knowledge of the extent of UUFs on the district to delineate nine

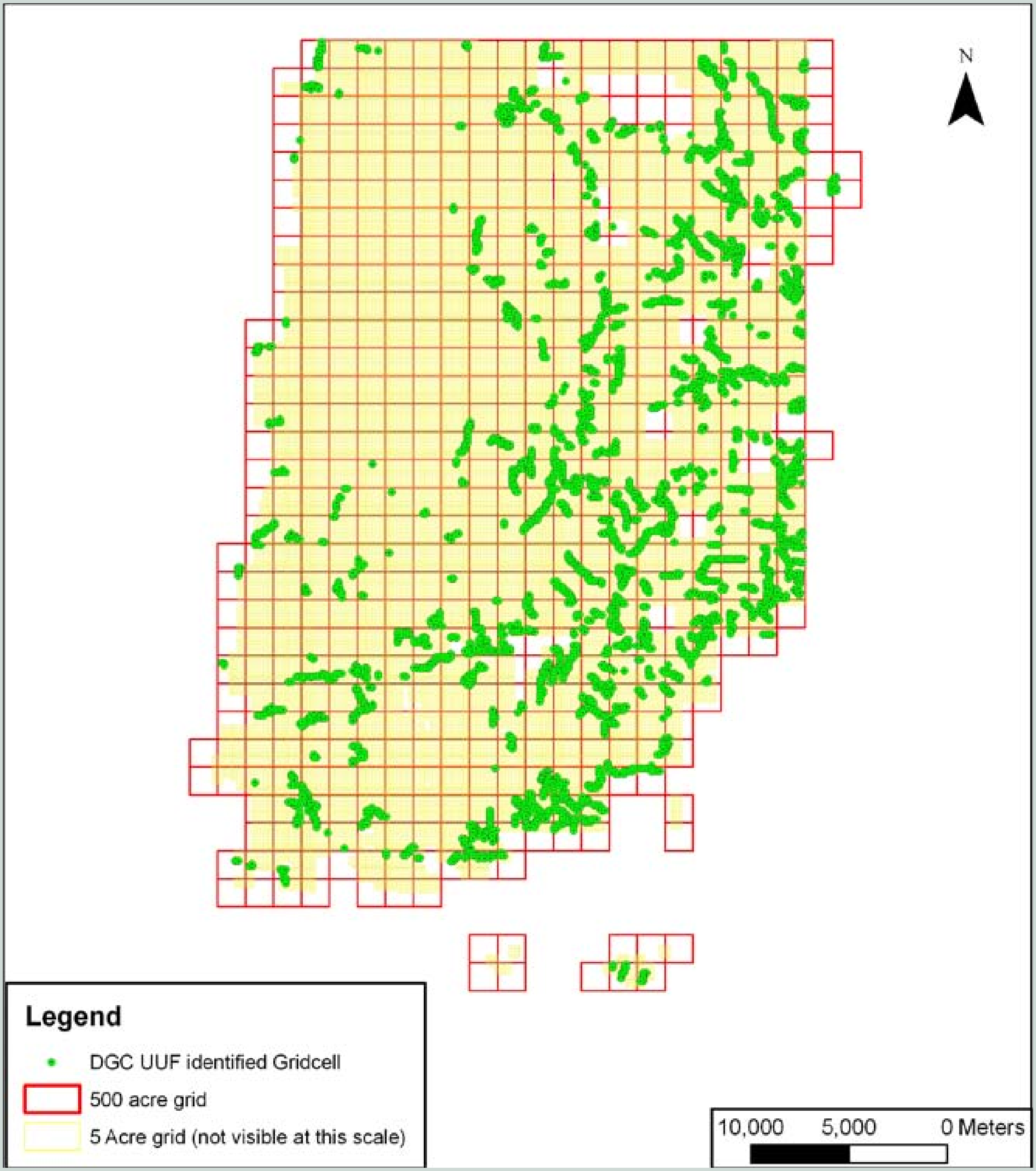


**Figure 2—The 500 acre grid cell layer overlaid on the five acre DGC layer *(not visible at this scale)*. The 500 acre grid cell layer was used to organize the five acre DGC layer. The green dots denote five acre DGCs where UUFs were present.**

geographic areas to prioritize the order in which the areas would be digitized and field verified. These areas were referred to as field assessment zones (FAZ).

## Unauthorized Use Feature Inventory

A digitizing protocol was established to resolve different UUF scenarios encountered during the project. The following is a summary of that protocol.

- **UUF Attribution**—Four attributes were added to each UUF and coded as the inventory was conducted.
  - [Survey_Status]—Has the feature been field surveyed?
    1 = Not Surveyed
    2 = Partial Survey
    3 = Full Survey
  - [Confidence_Measure]—Estimated confidence of feature description from digitized line work.
    1 = Low
    2 = High
  - [OR_Date]—Date of the original record indicating when the digitized line work was created.
    Date
  - [Source_Code]—How the data were collected and/or derived?
    1 = Digitized from digital resource photography.

- **Obstructed View Areas**—Line segments where UUFs were not clearly visible from the imagery due to vegetation canopy, landform features, shadows, and other obstructions.
  - Digitized the most logical pathway of the UUF through the obstruction.
  - If no logical pathway existed but there was an entrance/exit path, digitized a line feature through the obstruction to the entrance/exit and attribute the line feature with a low confidence interval.
  - If a UUF entered an obstructed view area and was not visible and no logical pathway could be determined, stopped digitizing the UUF and attributed the line feature with a "Low" [Confidence_ Measure].

- **Braided Networks**—Geographic areas where braided networks of UUFs were identified on the imagery and needed field verification.
  - Digitized all UUFs that met the minimum width and length criteria.
  - Digitized a polygon around the braided network area for field verification.
  - [Survey_Status]—Indicated if the feature had been field surveyed.
    1 = Not Surveyed
    2 = Partial Survey
    3 = Full Survey
  - [Source_Code]—Indicated how the data were collected and/or derived.
    1 = Digitized from digital resource photography.
    2 = GPS field acquired
    3 = Other

- **Node placement**—Nodes were placed at intersections of UUF digitized line features.
  - QAQC verified and added a node when necessary to selected line features at intersections.

- **Merge Features**—Line features were merged into a single line feature where necessary.
  - Performed on selected line features that were interpreted as being the same continuous line feature and having the same [Confidence Measure] attribute.

The following is a summary of the ArcGIS environment parameters used for the UUF inventory.

- **View Scales**
  - 1:3500-1:4500 (feature identification)
  - 1:1200 (feature digitization)

- **Cluster Tolerance**
  - .001

- **Snapping Tolerance**
  - 5 map units (meters)

  *Note: Set a smaller snapping tolerance to 1-2 map units (meters) as needed while digitizing to accommodate complex UUFs.*

- **Snapping parameters**
  - Vertex
  - Edge
  - End

  *Note: Set snapping to the active UUF line feature class and the study area boundary.*

# Results

Once the comprehensive assessment and UUF inventory were completed, mileage totals were generated for the area as well as UUF miles per square mile for both wilderness and non-wilderness areas (figure 3). The inventory was used to create a relative mileage map for the area (figure 4). In addition, several examples of different UUF scenarios encountered during this project such as encroachment from private lands into forest lands and wilderness areas were highlighted (figure 5). Methods and information gained from this project may be used to support other local, regional, and national UUF inventories on FS lands.

# Deliverables

Final deliverables for the project included a personal geodatabase that contained the final geospatial data and

## UUF Mileage for the Logan Ranger District

| Analysis Unit | Analysis Unit Area | UUF Miles | UUF/Square Mile |
|---|---|---|---|
| Wellsville Mt. Wilderness | 36 | 18 | 0.5 |
| Wellsville Mt. Non-Wilderness | 50 | 24 | 0.5 |
| Bear River Range Wilderness | 69 | 7 | 0.1 |
| Bear River Range Non-Wilderness | 390 | 266 | 0.7 |
| Total | 545 | 315 | 0.6 |

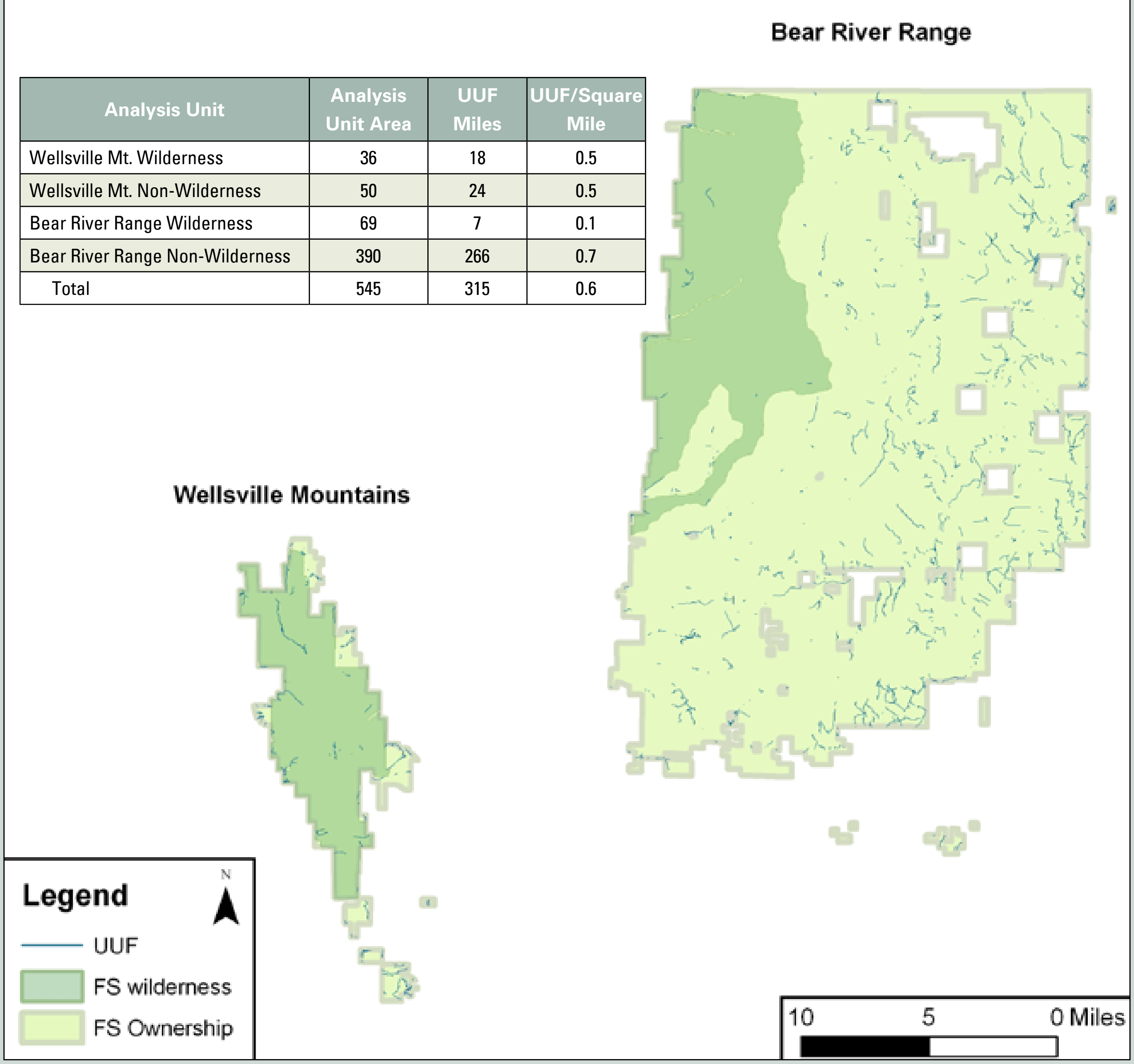


**Figure 3—Total mileage of digitized UUFs per square mile for the wilderness and non-wilderness areas.**

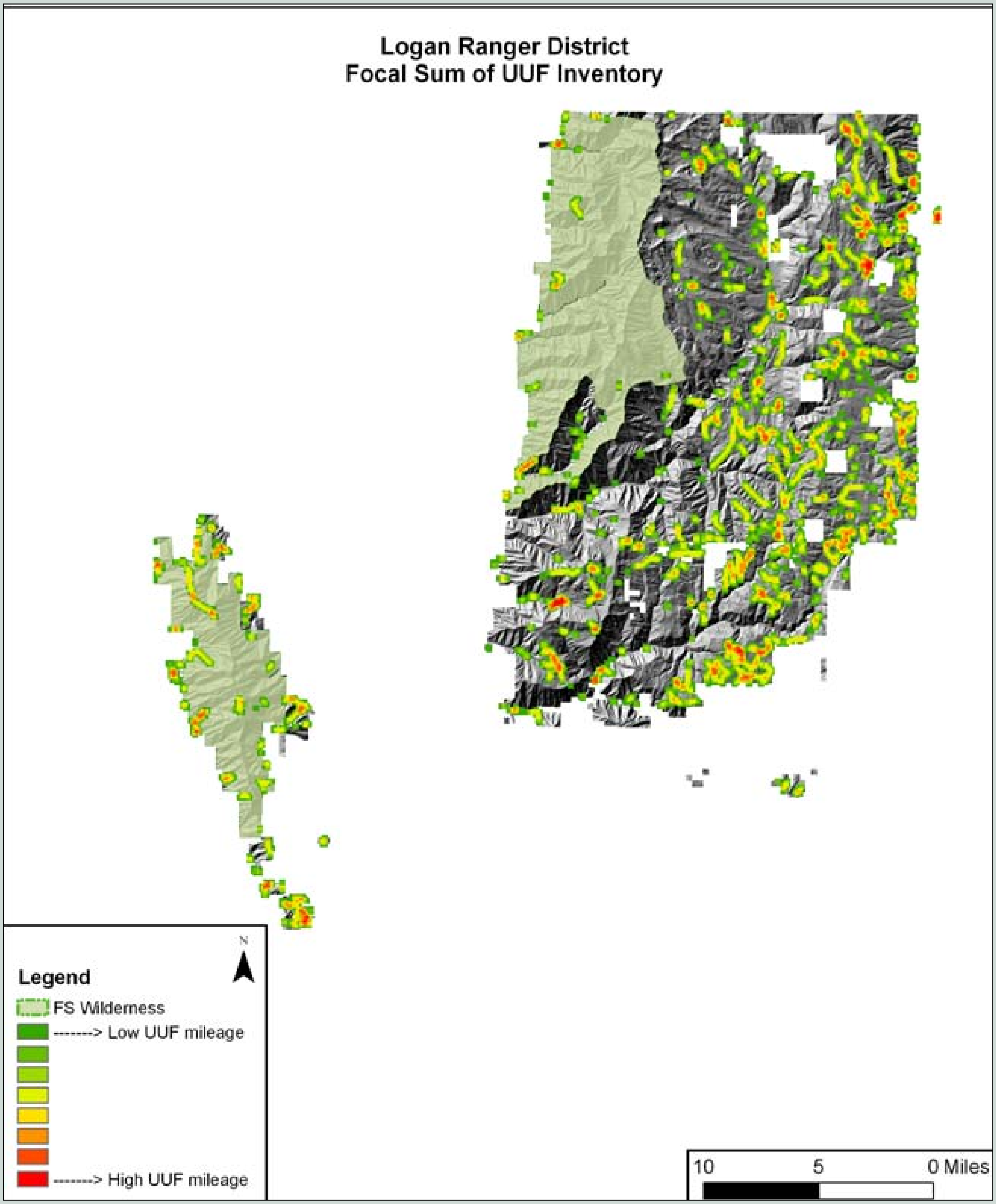


**Figure 4—Linear spatial analysis of digitized UFFs for the Logan RD.**

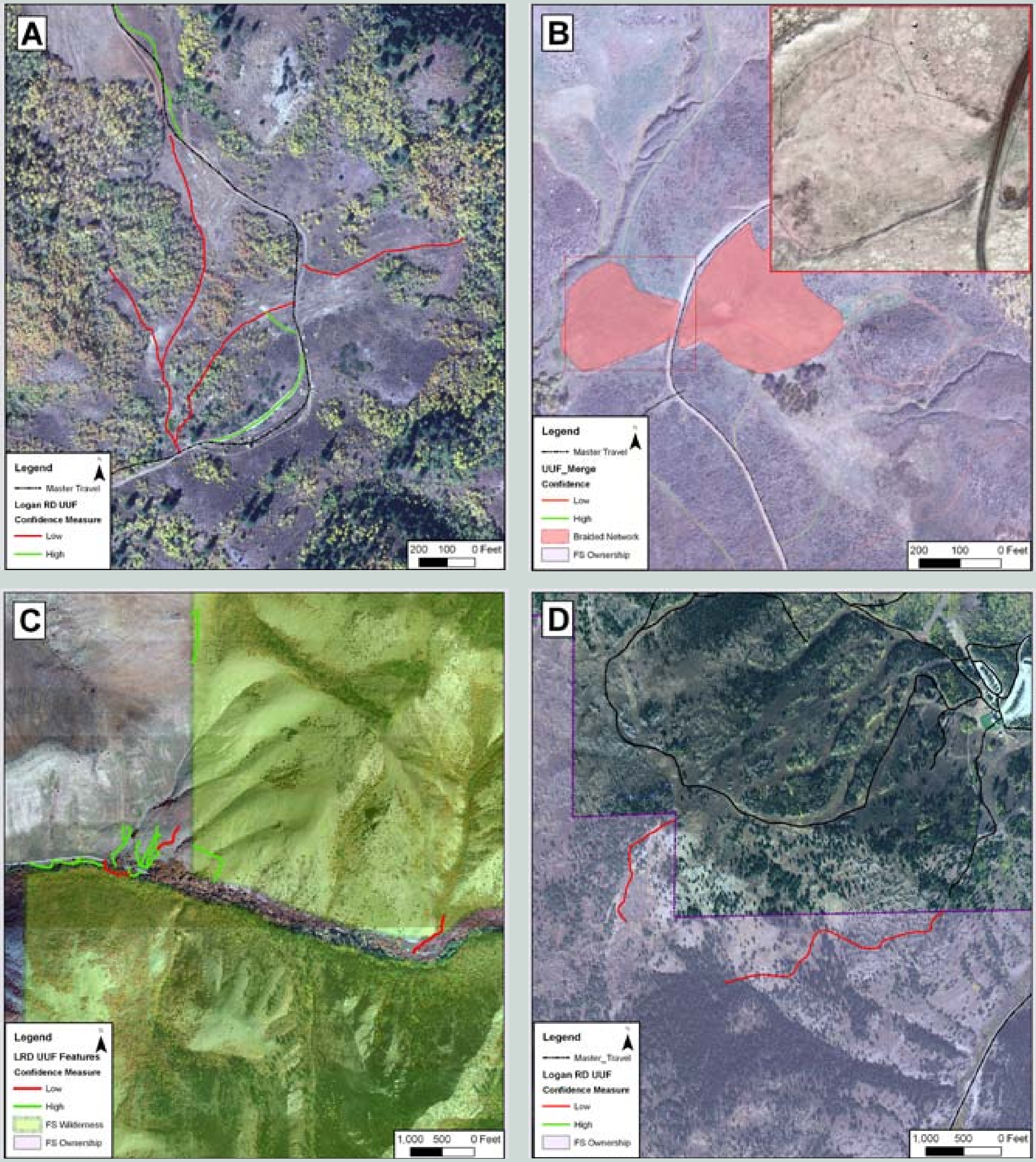


**Figure 5—Examples of four different UUFs scenarios encountered within the Logan RD *(A)* UUFs created with respect to existing roads and trails, *(B)* Braided Networks of UUFs, *(C)* UUFs encroaching wilderness areas and, *(D)* UUFs entering the forest from private lands.**

associated metadata. These also included a final report that summarized the methods used to generate the comprehensive assessment and produce the UUF inventory. The report also contained technical recommendations on geospatial database design, digitizing, quality control, and data delivery (appendix B). The regional office created an FTP site to distribute data and documentation to support the field effort and general project coordination (appendix C).

The personal geodatabase (UUF_UWC.mdb) contained three feature datasets, UUF_Logan_RD, FS_Reference_layers and the Comprehensive_Assessment, and one raster dataset (table 1).

**Table 1—The personal geodatabase contains these data**

| Personal Geodatabase Deliverable Items | |
|---|---|
| Forest Service Reference Layer | |
| Logan_RD_surveyarea | FS ownership layer for the Logan RD |
| Logan_RD_wilderness | FS wilderness layer for the Logan RD |
| Logan_RD_Master_Travel | Line features created by combining the line features from the forest's transportation and heritage data into one complete transportation layer |
| Wellsville_FAZ | FAZs for the Wellsville Mountains |
| BearRiverRange_FAZ | FAZs for the Bear River Range. |
| Comprehensive Assessment | |
| DGC_5ac_UWCNF | Five acre DGC layer for the Uinta-Wasatch-Cache National Forest |
| DGC_5ac_Wellsville | Five acre DGC layer for the Wellsville Mountains |
| DGC_5ac_BearRiverRange | Five acre DGC layer for the Bear River Range |
| Comp_Assessment.img. | Relative UUF presence and absence for the Logan Ranger District |
| UUF Logan Ranger District | |
| UUF_<Area>_Braided_Network_FAZ<#> | Digitized Polygon of delineated braided network UUFs |
| UUF_<Area>_FAZ<#> | Digitized line features of delineated and QAQC verified UUF's |
| Other_point_features | Empty points feature class created for additional information acquired by forest service ground personnel |
| Photo_points_<Area>_FAZ<#> | Empty FAZ specific photo points feature class for photos acquired by forest service ground personnel |

## References


Johnson, V.; Werstak Jr., C.; Maus, P.; Lachowski, H. 2006. Inventorying trails using imagery. RSAC-0063-TIP1. Salt Lake City, UT: U.S. Department of Agriculture, Forest Service, Remote Sensing Applications Center. 4 p.

Werstak Jr., C.; Johnson, V.; Maus, P.; Lachowski, H.; Merigliano, L.; Molyneux, M.; Meier, N. 2003. Mapping and monitoring non-system trail changes using remote sensing and GIS. RSAC-0063-RPT2. Salt Lake City, UT: U.S. Department of Agriculture, Forest Service, Remote Sensing Applications Center. 12 p.



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This publication can be downloaded from the RSAC Web sites: http://fsweb.rsac.fs.fed.us

# Appendix A: Data Dictionary

USDA Forest Service
Uinta-Wasatch-Cache National Forest
Logan Ranger District
Unauthorized Use Feature Inventory 2009
Final Data Dictionary v2.0
Originators: Ron Vance and Toby Weed 6/15/2009

Revised by: Toby Weed/Ron Vance 06-15-09
Revised by: TC Christensen 06-16-09
Revised by: Chuck Werstak 06-18-09
Revised by: TC Christensen 06-22-09
Revised by: Toby Weed 06-24-09
Revised by: TC Christensen 06-24-09
Revised by Chuck Werstak 06-25-09
Revised by: TC Christensen 06-26-09

**Final approval**:

/s/:___*Charlie Condrat*________________________________________ Date: June 29, 2009
Charlie Condrat Project Leader, UWC NF

/s/:___*Ronald E. Vance*________________________________________ Date: June 29, 2009
Ron Vance, Project Leader, UWC NF, LRD

/s/:___*Toby Weed*______________________________________________ Date: June 29, 2009
Toby Weed, Field Crew Leader, UWC NF, LRD

## Line Features

***Name of feature class:***

*UUF_<Area>_FAZ#*. UUFs digitized by RSAC.

Domains and Attributes:

**Surveyor ID**: The last name of the person collecting data. (Toby Weed, Colin Sibbernsen, Chris Brothersen, and others will collect the field data for the 2009 Logan Ranger District survey.)

1 = Weed (Toby Weed)
2 = Sibbernsen (Colin Sibbernsen)
3 = Brothersen (Chris Brothersen)
4 = Other

**Surveyor ID Other Comments**: Empty text to input text notes for Surveyor ID

**Survey Status**: Has the feature been field surveyed?
1 = Not Surveyed (***default*** – needs to be set with calculate values tool)
2 = Partial Survey
3 = Full Survey

**Confidence Measure:** Estimated confidence of feature description from digitized line work. (This attribute will be assigned to each UUF line feature identified by RSAC prior to the field survey.)
1 = Low
2 = High

**OR_Date**: Date the original line work was created (***default*** – needs to be set with calculate values tool or when original line work is digitized)

**UP_Date**: Date that the line work was updated in the field.

**Source Code:** How the data were collected and/or derived.
1 = Digitized from digital resource photography (***default*** – needs to be set with calculate values tool or when original line work is digitized)
2 = GPS Uncorrected
3 = GPS Differentially Corrected Data
4 = GPS Survey Grade and Sub-meter
5 = GPS Uncorrectable (e.g., collected with navigation-grade GPS)
6 = Re Survey plat
7 = CFF (Cartographic Feature File)
8 = Digitized from DRG (Digital Raster Graphic)
9 = Digitized from DOQ (Digital Orthophoto Quadrangle)
10 = Digitized from hardcopy PBS/SEQ

11 = Digitized from hardcopy resource photography
12 = Automated Land Project (ALP)
13 = Geographic Coordinate Database (GCDB)
14 = Remote Sensing Data – Base Level
15 = Remote Sensing Data – Mid Level
16 = Remote Sensing Data – Broad Level
17 = Remote Sensing Data – National Level
18 = Other Agency Digital
19 = Digitized Other
20 = Other Cadastral
21 = Other/Unknown

**Trail Width Type:** Approximate average trail width, based on visible evidence of user type.
1 = Single Track <=48 in: Less than 48" *Non-motorized use, (hikers, horses, stock, bikes,) motorcycles*
2 = Double Track = 48 in < = 60 in: 48" to 60" *ATVs (usually two parallel tracks visible)*
3 = 4X4 >= 60 in =Jeeps, small trucks, SUVs
4 = Other

**Trail width other comments**: Empty text to input text notes for Trail Width Type

**Braided:** Two or more obvious UUFs (usually running parallel to each other). A braided feature will consist of more than one line feature originating from and re-converging with a single line.
1 = No
2 = Yes

Merge_UUFs: Clusters of UUFs (similar to Braided Networks) which may need to be merged (based on their attributes) as part of a post-processing GIS routine.
1 = 1=N/A (not applicable) (***default*** – needs to be set with calculate values tool)
2 = No
3 = Yes

**Current User**: Visible evidence of user (vehicle) type with the greatest environmental impact. This evidence might include vegetation damage, visible vehicle tracks, and extent of barren or compacted soil.
1 = 4x4 (wheelbase >= 51" Examples: jeeps, small trucks, SUVs)
2 = ATVs, (wheelbase <= 50" Examples: three wheeled vehicle, Mule, Quads, etc…)
3 = Motorcycle (motorized bicycle)
4 = Mt. Bike
5 = Stock (cattle/sheep trail/deer trail)
6 = Horse
7 = Hikers
8 = Other
****need text space to enter current user other comments*

**Current user other comments**: Empty text field to input text notes for current user

**Use level** (environmental impacts)**:** This is based on visible current use (trail condition) evidence.

1 = None….= *No evidence of recent use.*
2 = Low….= *Visible evidence of light use with little environmental impact.*
3 = High….= *Visible evidence of heavy use and obvious or significant environmental impacts.*
4 = Historic = *Evidence of historic use, no evidence of recent use.*

**Surface Type:** Type of ground surface observed on the line segment.

1 = Vegetation *(approximately 60% or more)*
2 = Rock *(approximately 60% or more)*
3 = Mixed, *vegetation and rock (approximately 60% or more)*
4 = Bare soil *(approximately 40% or more)*
5 = Other

**Surface type other comments**: Empty text to input text notes for Surface Type

**Constructed:** Is there visible evidence of trail construction? (cut, fill, imported surface material)?

1 = No
2 = Yes

**Trees Cut:** Is there evidence of tree damage or removal? (stumps, cut limbs, or other evidence of tree removal).

1 = No
2 = Yes

***Sediment entering water:** Is there evidence of sediment entering stream at crossing or adjacent to the line feature?

1 = No = *Feature does not cross or run adjacent (within 60'?) to a live stream. No visible evidence of sediment entering stream.*
2 = Yes = *Evidence of sediment in the water. Usually expressed as a small pocket of sand or silt deposited where line feature crosses the stream, or muddy water entering stream during a rain event.*

**Gully Erosion:** Is erosion gully of any size evident for more than 100 continuous feet?

1 = No
2 = Yes

**Gully Erosion Comments**: Empty text field to input notes for Gully Erosion.

**Photo_001**: Empty text field for inputting filename for digital photo

**Photo_002**: Empty text field for inputting filename for digital photo

**Photo_003**: Empty text field for inputting filename for digital photo

## Point Features

***Name of Feature class:***

*Photo_Points_<Area>_FAZ#*

Domains and Attributes:

**Surveyor ID**: The last name of the person collecting data…( Toby Weed, Colin Sibbernsen, Chris Brothersen, and others will collect the field data for the 2009 LRD UUF survey

1 = Weed (Toby Weed)
2 = Sibbernsen (Colin Sibbernsen)
3 = Brothersen (Chris Brothersen)
4 = Other

**Surveyor ID Other Comments**: Empty text to input text notes for Surveyor ID

**Date:** Date field for the date photo point was collected.

**Source Code:** How the data were collected and/or derived.

1 = Digitized from digital resource photography
2 = GPS Uncorrected (***default***)
3 = GPS Differentially Corrected Data
4 = GPS Survey Grade and Sub-meter
5 = GPS Uncorrectable (e.g., collected with navigation-grade GPS)
6 = Re Survey plat
7 = CFF (Cartographic Feature File)
8 = Digitized from DRG (Digital Raster Graphic)
9 = Digitized from DOQ (Digital Orthophoto Quadrangle)
10 = Digitized from hardcopy PBS/SEQ
11 = Digitized from hardcopy resource photography
12 = Automated Land Project (ALP)
13 = Geographic Coordinate Database (GCDB)
14 = Remote Sensing Data – Base Level
15 = Remote Sensing Data – Mid Level
16 = Remote Sensing Data – Broad Level
17 = Remote Sensing Data – National Level
18 = Other Agency Digital
19 = Digitized Other
20 = Other Cadastral
21 = Other/Unknown

**Photo_001**: Empty text field for inputting filename for digital photo

**Photo_002**: Empty text field for inputting filename for digital photo

**Photo_003**: Empty text field for inputting filename for digital photo

**Entry Point:** ***(Ingress:)*** Point at which a UUF line feature connects to a legal travel route or enters FS lands. (The start of an unauthorized spur or either side of a line which departs from and then returns to a legal route, *i.e., a short-cut*)

1=N/A (not applicable)
2=Closure
3=No closure

**End Point:** Termination point of a spur trail.

1=N/A (not applicable)
2=Overlook
3=Point of Interest
4=Dispersed Camp Site (CUA)…Fire Pit
5=Natural Barrier
6=Other (empty text field)

**End Point Other Comments**: Empty text to input text notes for End Point

**Water:** Presence of a water feature.

1=N/A (not applicable)
2=Stream Crossing (point at which a UUF line feature crosses running water)
3=Spring
4=Trough
5=Stock Pond

**Fence:** Point at which line feature crosses a fence or property line.

1=N/A (not applicable)
2=Gate
3=Fence Line.
4=Sign (usually "No Trespassing" or "FS or Wilderness Boundary")

***Name of Feature class:***

*Other Point Feature(s)*: generic points with a text field for potential points of interest with or without photos

Domains and Attributes:

**Surveyor ID**: The last name of the person collecting data…( Toby Weed, Colin Sibbernsen, Chris Brothersen, and others will collect the field data for the 2009 LRD UUF survey

1 = Weed (Toby Weed)
2 = Sibbernsen (Colin Sibbernsen)
3 = Brothersen (Chris Brothersen)
4 = Other

**Surveyor ID Other Comments**: Empty text to input text notes for Surveyor ID

**Date:** Date field for date other point feature was created

**Source Code:** How the data were collected and/or derived.

1 = Digitized from digital resource photography
2 = GPS Uncorrected (***default***)
3 = GPS Differentially Corrected Data
4 = GPS Survey Grade and Sub-meter
5 = GPS Uncorrectable (e.g., collected with navigation-grade GPS)
6 = Re Survey plat
7 = CFF (Cartographic Feature File)
8 = Digitized from DRG (Digital Raster Graphic)
9 = Digitized from DOQ (Digital Orthophoto Quadrangle)
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14 = Remote Sensing Data – Base Level
15 = Remote Sensing Data – Mid Level
16 = Remote Sensing Data – Broad Level
17 = Remote Sensing Data – National Level
18 = Other Agency Digital
19 = Digitized Other
20 = Other Cadastral
21 = Other/Unknown

**Comments**: Empty text field to input notes about other point features

**Photo_OT_001**: Empty text field for inputting filename for digital photo that belongs to Other Point Features

**Photo_OT_002**: Empty text field for inputting filename for digital photo that belongs to Other Point Features

## Area Features

***Name of Feature class:***

*UUF_<Area>_Braided_Network_FAZ#*. Geographic area where braided networks of UUFs were identified on the imagery and needs field verification.

Domains and Attributes:

**Surveyor ID**: The last name of the person collecting data…( Toby Weed, Colin Sibbernsen, Chris Brothersen, and others will collect the field data for the 2009 LRD UUF survey

1 = Weed (Toby Weed)
2 = Sibbernsen (Colin Sibbernsen)
3 = Brothersen (Chris Brothersen)
4 = Other

**Surveyor ID Other Comments**: Empty text to input text notes for Surveyor ID.

**Date Assessed**: Date the braided network was assessed in the field.

**Source Code:** How the data were collected and/or derived.

1 = Digitized from digital resource photography (***default*** – needs to be set with calculate values tool or when original line work is digitized)
2 = GPS Uncorrected
3 = GPS Differentially Corrected Data
4 = GPS Survey Grade and Sub-meter
5 = GPS Uncorrectable (e.g., collected with navigation-grade GPS)
6 = Re Survey plat
7 = CFF (Cartographic Feature File)
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18 = Other Agency Digital
19 = Digitized Other
20 = Other Cadastral
21 = Other/Unknown

**Survey_status**: Has the suspected braided network area been field surveyed?

1 = Not Visited (***default*** – needs to be set with calculate values tool or set when digitized)
2 = Partial Survey
3 = Full Survey

**Comments**: Empty text field for inputting comment for a Braided Network location.

# Appendix B: Unauthorized Use Feature Inventory Technical Tip

**Logan Ranger District,**
**Uinta-Wasatch-Cache National Forest**
**November 12, 2009**

1. Geodatabase Design and Management
    a. Use simple and logical naming conventions for domains and sub-types, feature datasets, and feature classes.
    b. Data dictionary must be defined and finalized before any analysis and/or inventory is conducted.
    c. Database design must be defined and finalized before any analysis and/or inventory is conducted.
    d. Assign one database manager for the project.
    e. ArcSDE may provide a more powerful and flexible architecture over individual or personal geodatabases for organization, multi-user access and editing, and data dissemination.

2. Digitizing
    a. Clarify resolutions to issues encountered during initial digitizing for example, when a UUF terminates at the canopy coverage, and appears on the other side.
    b. Specify operational parameters for adequate delineation and feature attribution as required for example, digitize a UUF through the canopy at exit and end of feature and classify the whole line feature as "Low" Confidence.
    c. Adhere to digitizing parameters outlined in the protocol to maintain consistency.
    d. Ancillary GIS layers with potential use.
        i. Wilderness Boundaries
        ii. Existing transportation layers
        iii. Recreation sites
        iv. Utilities (fence lines, power lines etc…)

    e. Turn monitor backlight down to reduce eyestrain, and if possible wear polarized glasses when eyes become tired to reduce fatigue.
    f. Keep Zoom and Pan efforts to a minimum.
        i. 1:1,200 for digitizing and taking measurements
        ii. 1:4,350 or greater for trail delineation and pattern recognition (depending on monitor size)
        iii. 1:10,000 for 500 acre overview
        iv. 1:25,000 for multiple 500 acre overview of Digital grid cell analysis points, and FAZ zone bookmark for verifying boundaries containing digitized trails, and zoom to layer of the 500 acre Grid for project overview)
    g. Set book marks in your map document for each prioritization zone (FAZ1-FAZ9 etc…).
    h. Set up custom keyboard shortcuts.
        i. Ctrl+B = back to previous extent
        ii. Ctrl+M = merge selected features
        iii. Only merge lines with the same confidence rating, and if they are determined to be the same trail feature

i. Use 5 acre grid as a survey guide to ensure full visual coverage within each 500 acre grid cell.
    i. Set the outline of the grid cells as a light grey line with a slashed black inner line (2-3 point) and make the layer semi transparent (45-55%)
    ii. Use 500 acre grid to check off previously viewed grid cells by calculating the values of the digitizing or QAQC field, and setting the Layer properties symbology under categories that use the QAQC code field
    iii. Set all 0 codes to transparent with a thin outline, and all 1 codes to an opaque color

j. Use 500 acre grid as a progress boundary.

3. Quality Assurance Quality Control (QAQC)
    a. The analyst that performs the digitizing should also perform the QAQC to maintain consistency.
    b. QAQC checks for positional accuracy, Attribute codes, and node snaps at all intersections, validates digitizing adjustments, protocol, and updates the date field in the line work layer if edits were made.
    c. Pay close attention to start and end points of all digitized lines to verify accurate placement.
    d. Review line features at the 1:3350-1:4500 scale depending on monitor size, but edit and digitize line features at the 1:1200 scale
    e. Review all DGC points that don't have line features to re-evaluate the reasoning and situation for not placing a line in their respective 5 acre grid cells.
    f. Check off DGC 500 acre grid cell to ensure progress and maintain proper visual coverage like with the initial digitizing methods (same as i i-iii above).
    g. Have the QAQC point layer loaded in the .mxd next to the FAZ line feature for quick editing.

4. Data Delivery
    a. Using ArcSDE is recommended for large study areas such as multiple districts of entire forests.
    b. The delivery of multiple geodatabases containing data from one FAZ at a time over an FTP transfer site is the best if ArcSDE is not used.

# Appendix C: Flowchart for Data Distribution of Unauthorized Use Feature Geodatabases