CARAT

A GIS tool for Environmental Assessment

Wyoming Geographic Information Science Center

The Need for CARAT

- BLM receives thousands of applications per year for extraction of natural resources
- Time limitations restrict ability to look at different scenarios and evaluate alternatives
- GIS is a powerful analytical tool, but by itself it does not provide any structure for day-to-day decision making, or documentation
- A structured, efficient, and documented means of performing environmental assessments is needed

CARAT = GIS plus DSS

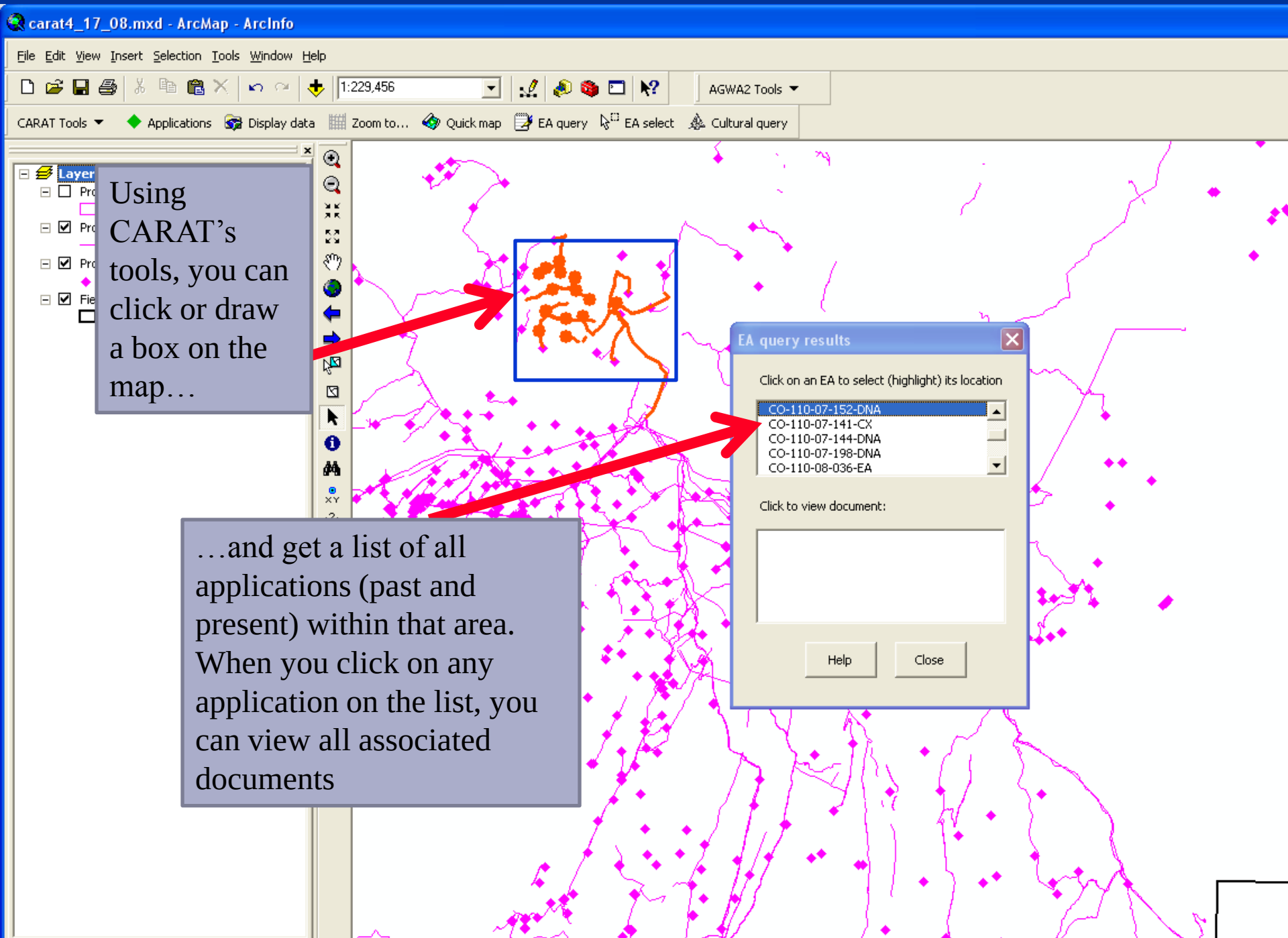
- CARAT: “Computer-Aided Resource Analysis System”
- Couples the power of a GIS (spatial analysis, visualization) with the structure of a decision support system (DSS)
- Definition of DSS:
  - a computerized system designed to support decisions in situations where human judgment is an important contributor to the problem-solving process, but where human information-processing limitations impede decision making
  - A DSS provides structure for decisions and also documentation

How CARAT works

- Applications are entered into CARAT
- CARAT runs automated GIS queries/analysis
- Resource specialists evaluate CARAT's results and add comments and stipulations
- results output to an EA document and are also stored in a spatial database for future analysis (such as for cumulative impacts
- Each CARAT user has permission only to run reviews and make changes in his/her area of expertise

Advantages of CARAT

- Structured
  - CARAT organizes, saves, retrieves, and summarizes results of multiple queries and analysis in a format that is readily digestible by decision-makers
  - Applications, results and comments all stored in a common GIS database
  - Valuable expert knowledge, in the form of comments and recommendations can be searched “spatially” instead of just by name, date, etc.
- Standardized
  - Standard procedures provide more consistency, reliability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AGWA2 Tools
CARAT Tools
Applications
Display data
Zoom to...
Quick map
EA query
EA select
Cultural query
Using CARAT's tools, you can click or draw a box on the map…
…and get a list of all applications (past and present) within that area. When you click on any application on the list, you can view all associated documents
EA query results
Click on an EA to select (highlight) its location
CO-110-07-152-DNA
CO-110-07-141-CX
CO-110-07-144-DNA
CO-110-07-198-DNA
CO-110-08-036-EA
Click to view document:
Help
Close

More Advantages

- Procedures and documentation are automated
- Doesn’t require additional expertise in GIS analysis
- Frequent use of digital data results in better data-upkeep

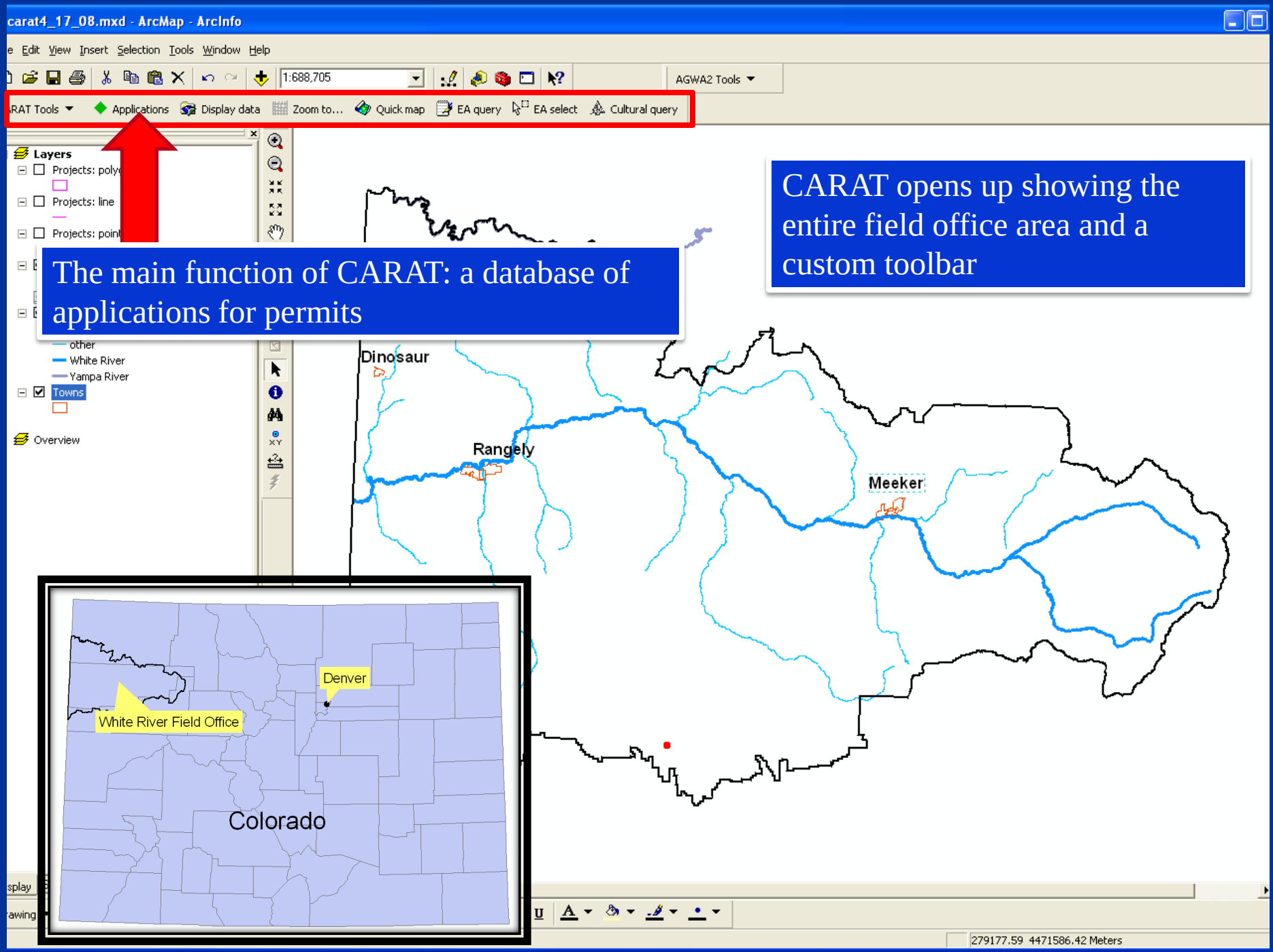
CARAT’s database is easily customizable for different field offices and different states. Data layers, EA categories, and stipulations can be added/modified as needed by editing the database (no programming required)

Development of CARAT

- 1998: Prototype developed for Pinedale Field Office, Wyoming, using ArcView 3.x GIS software. In use since 2000.
- 2004/2005: CARAT ported to ArcGIS 9.x and implemented in White River BLM office, Colorado
- 2004: CARAT modified for use by Wyoming Game and Fish Department
- 2008: Pinedale office upgrades to CARAT for ArcGIS 9.2, with new functionality added for summarizing results within multi-ring buffers
- Future goals: visit more field offices and expand CARAT's functionality so it can be a useful extension for EA's and related applications throughout the BLM

Conclusion

- Successfully in use since 2000
- Users report from 25–75 % increase in efficiency
- Better documentation = better legal defense
- Better informed decisions
- www.wygisc.uwyo.edu/blmtool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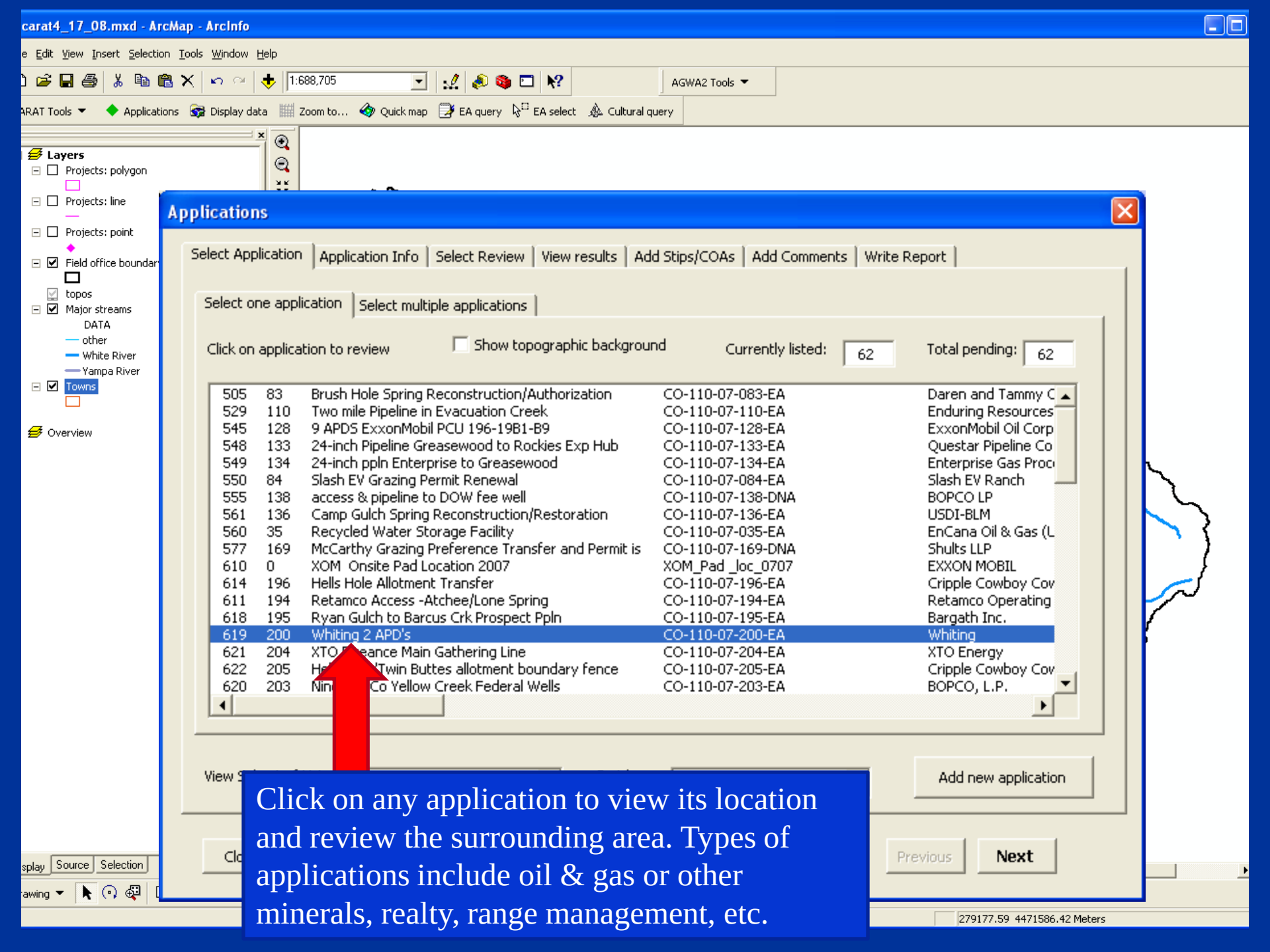
AGWA2 Tools
RAT Tools
Applications
Display data
Zoom to...
Quick map
EA query
EA select
Cultural query
Layers
Projects: poly
Projects: line
Projects: point
other
White River
Yampa River
Towns
Overview
The main function of CARAT: a database of applications for permits
CARAT opens up showing the entire field office area and a custom toolbar
Dinosaur
Rangely
Meeker
Denver
White River Field Office
Colorado
279177.59 4471586.42 Meters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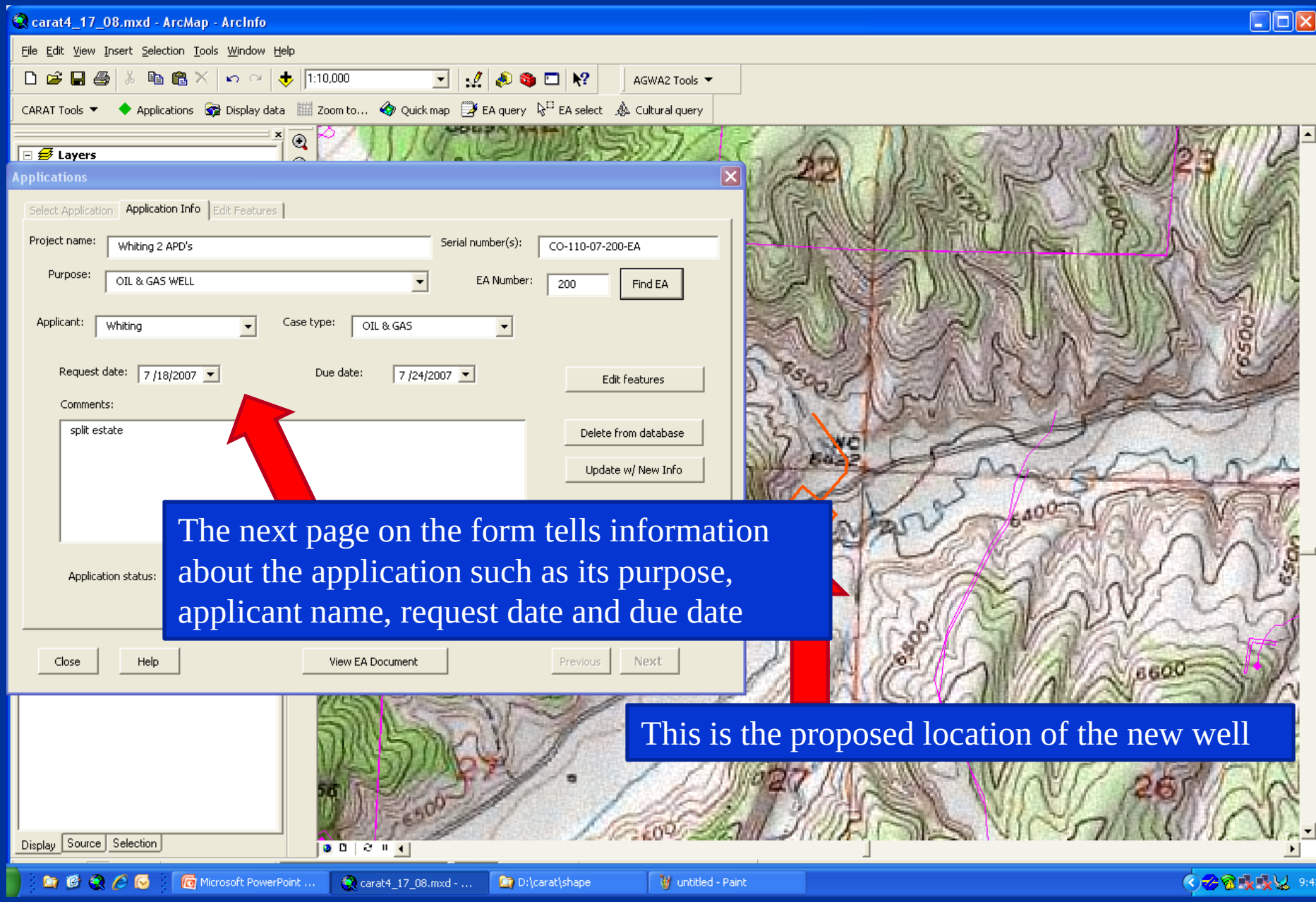
EA query
EA select
Cultural query
Layers
Projects: polygon
Projects: line
Projects: point
Field office boundar
topos
Major streams
DATA
other
White River
Yampa River
Towns
Overview
Applications
Select Application
Application Info
Select Review
View results
Add Stips/COAs
Add Comments
Write Report
Select one application
Select multiple applications
Click on application to review
Show topographic background
Currently listed: 62
Total pending: 62
505 83 Brush Hole Spring Reconstruction/Authorization CO-110-07-083-EA Daren and Tammy C
529 110 Two mile Pipeline in Evacuation Creek CO-110-07-110-EA Enduring Resources
545 128 9 APDS ExxonMobil PCU 196-19B1-B9 CO-110-07-128-EA ExxonMobil Oil Corp
548 133 24-inch Pipeline Greasewood to Rockies Exp Hub CO-110-07-133-EA Questar Pipeline Co
549 134 24-inch ppln Enterprise to Greasewood CO-110-07-134-EA Enterprise Gas Proc
550 84 Slash EV Grazing Permit Renewal CO-110-07-084-EA Slash EV Ranch
555 138 access & pipeline to DOW fee well CO-110-07-138-DNA BOPCO LP
561 136 Camp Gulch Spring Reconstruction/Restoration CO-110-07-136-EA USDI-BLM
560 35 Recycled Water Storage Facility CO-110-07-035-EA EnCana Oil & Gas (L
577 169 McCarthy Grazing Preference Transfer and Permit is CO-110-07-169-DNA Shults LLP
610 0 XOM Onsite Pad Location 2007 XOM_Pad _loc_0707 EXXON MOBIL
614 196 Hells Hole Allotment Transfer CO-110-07-196-EA Cripple Cowboy Cov
611 194 Retamco Access -Atchee/Lone Spring CO-110-07-194-EA Retamco Operating
618 195 Ryan Gulch to Barcus Crk Prospect Ppln CO-110-07-195-EA Bargath Inc.
619 200 Whiting 2 APD's CO-110-07-200-EA Whiting
621 204 XTO eance Main Gathering Line CO-110-07-204-EA XTO Energy
622 205 Twin Buttes allotment boundary fence CO-110-07-205-EA Cripple Cowboy Cov
620 203 Co Yellow Creek Federal Wells CO-110-07-203-EA BOPCO, L.P.
Add new application
Previous
Next
Click on any application to view its location and review the surrounding area. Types of applications include oil & gas or other minerals, realty, range management, etc.
Source
Selection
279177.59 4471586.42 Meters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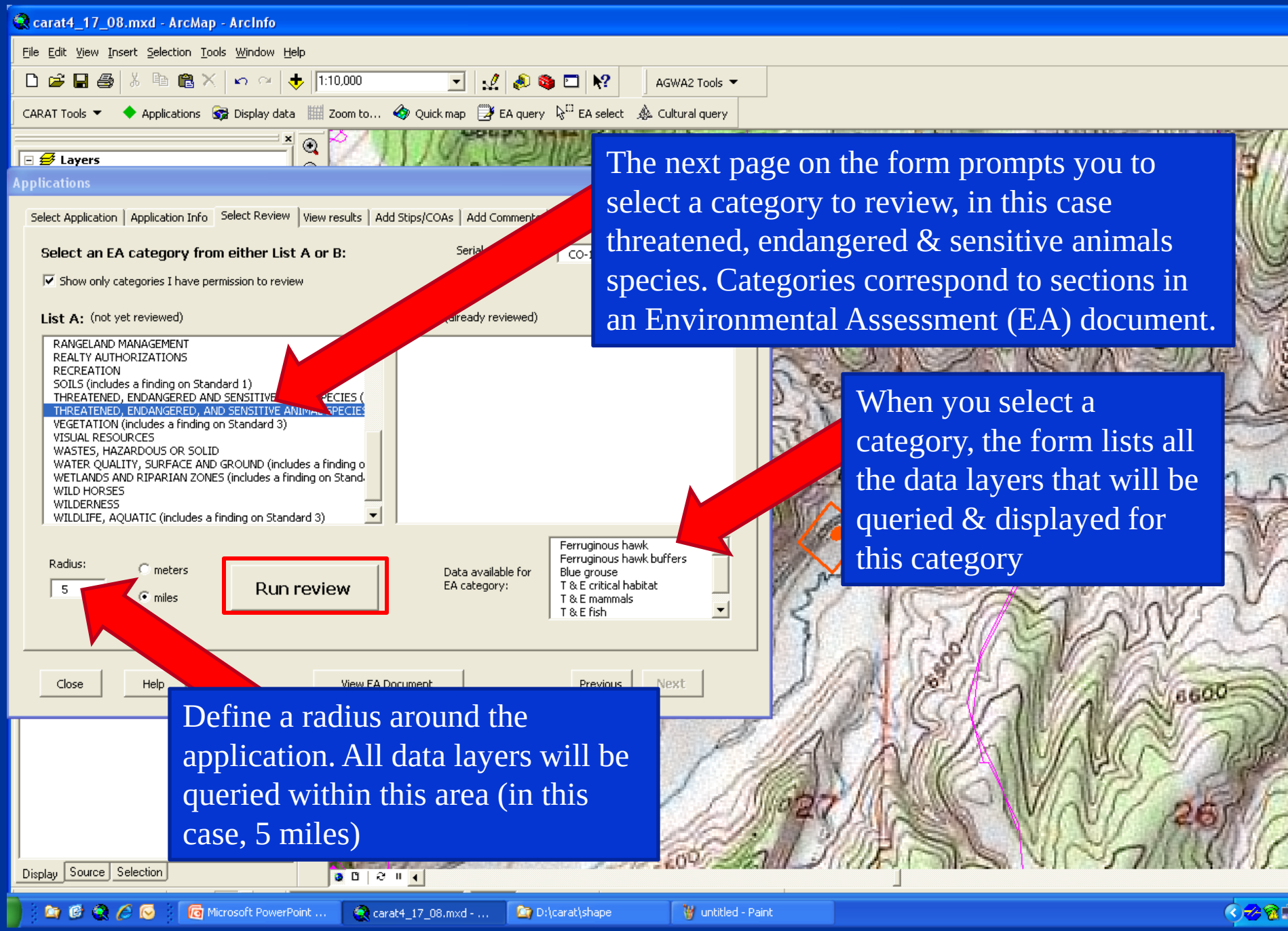
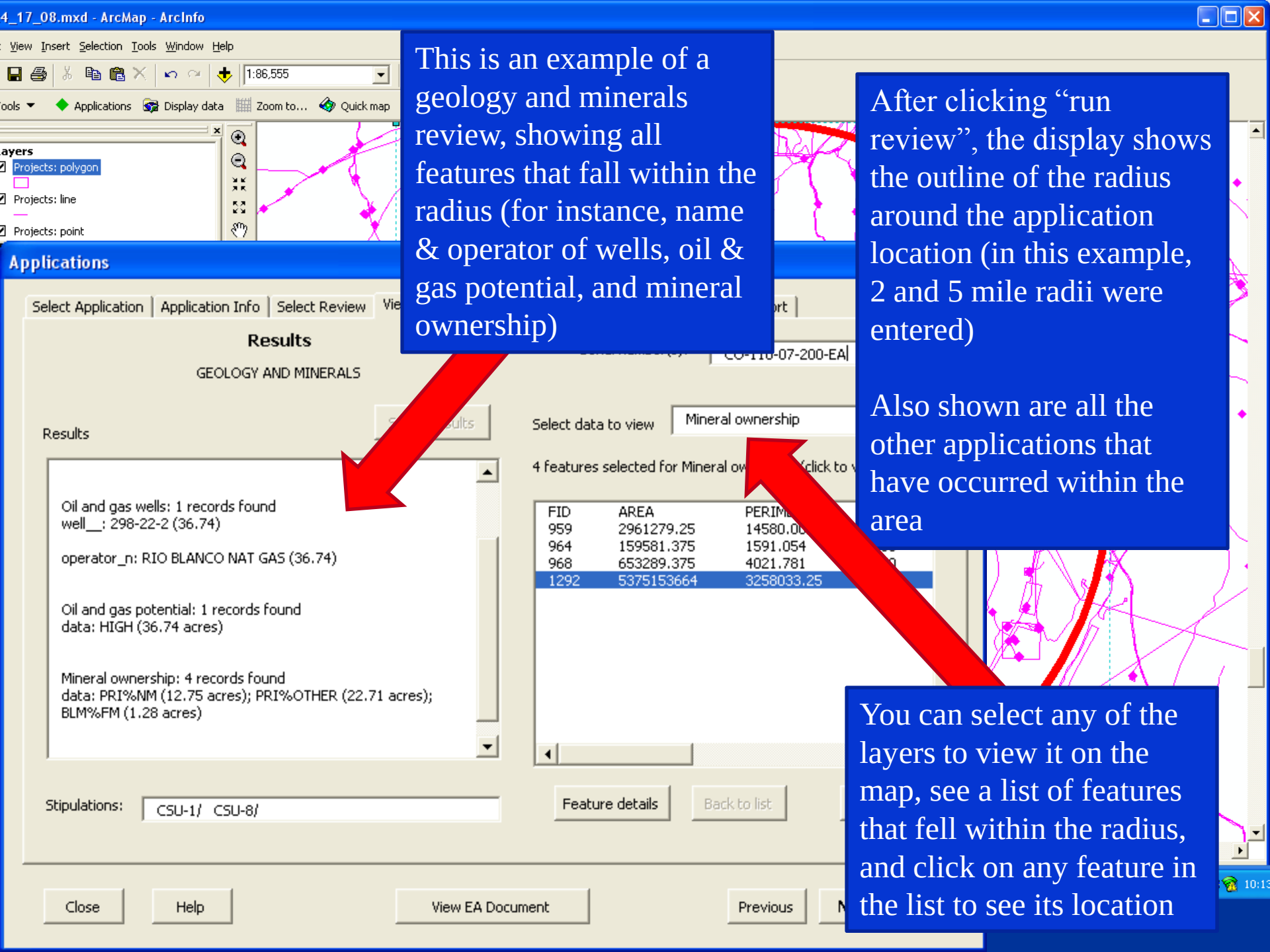
CARAT Tools
Applications
Display data
Zoom to...
Quick map
EA query
EA select
Cultural query
Layers
Applications
Select Application
Application Info
Edit Features
Project name:
Whiting 2 APD's
Serial number(s):
CO-110-07-200-EA
Purpose:
OIL & GAS WELL
EA Number:
200
Find EA
Applicant:
Whiting
Case type:
OIL & GAS
Request date:
7 /18/2007
Due date:
7 /24/2007
Edit features
Comments:
split estate
Delete from database
Update w/ New Info
Application status:
Close
Help
View EA Document
Previous
Next
The next page on the form tells information about the application such as its purpose, applicant name, request date and due date
This is the proposed location of the new well
Display
Source
Selection
Microsoft PowerPoint ...
carat4_17_08.mxd - ...
D:\carat\shape
untitled - Paint



The next page on the form prompts you to select a category to review, in this case threatened, endangered & sensitive animals species. Categories correspond to sections in an Environmental Assessment (EA) document.

When you select a category, the form lists all the data layers that will be queried & displayed for this category

Define a radius around the application. All data layers will be queried within this area (in this case, 5 miles)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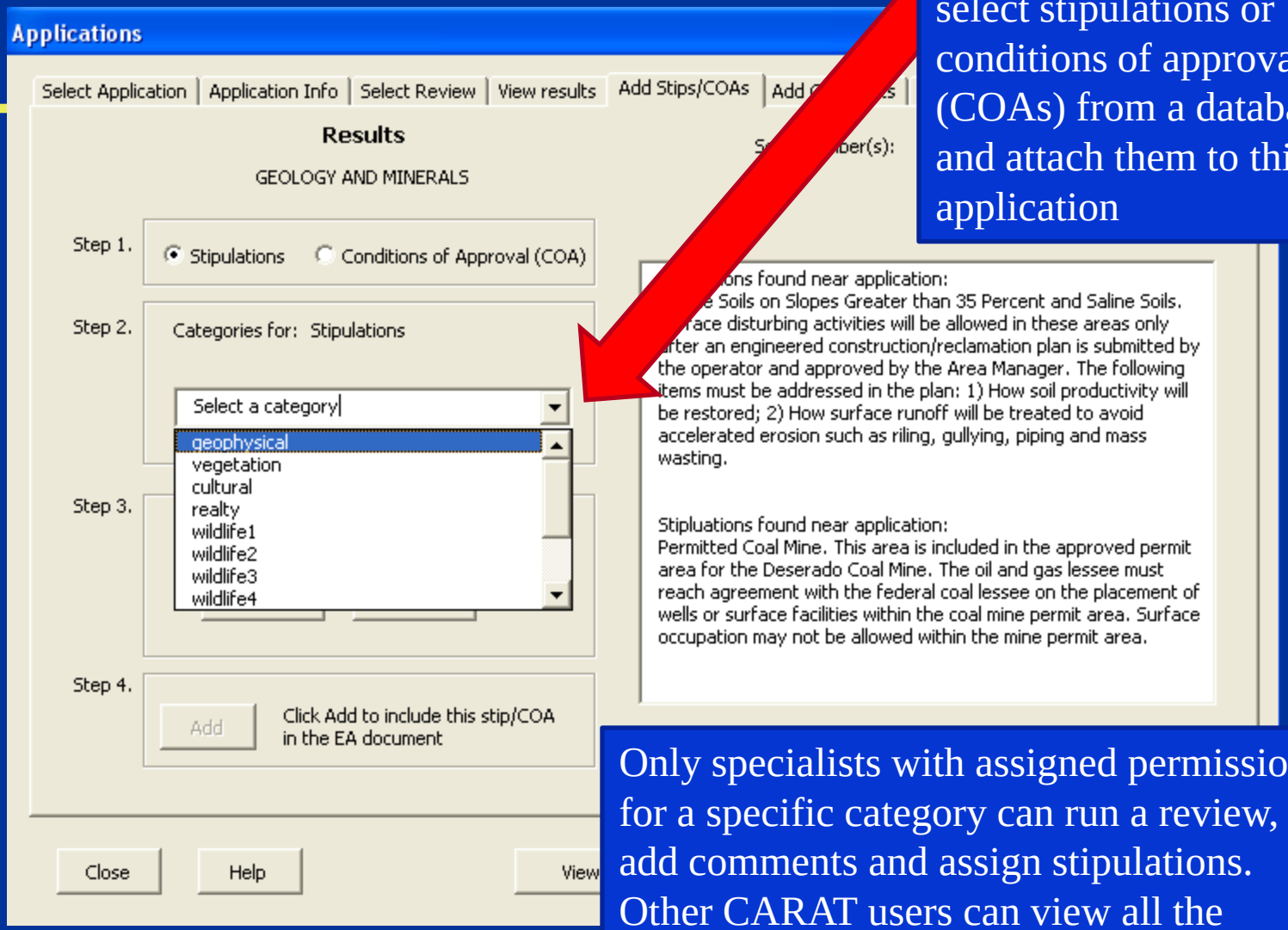
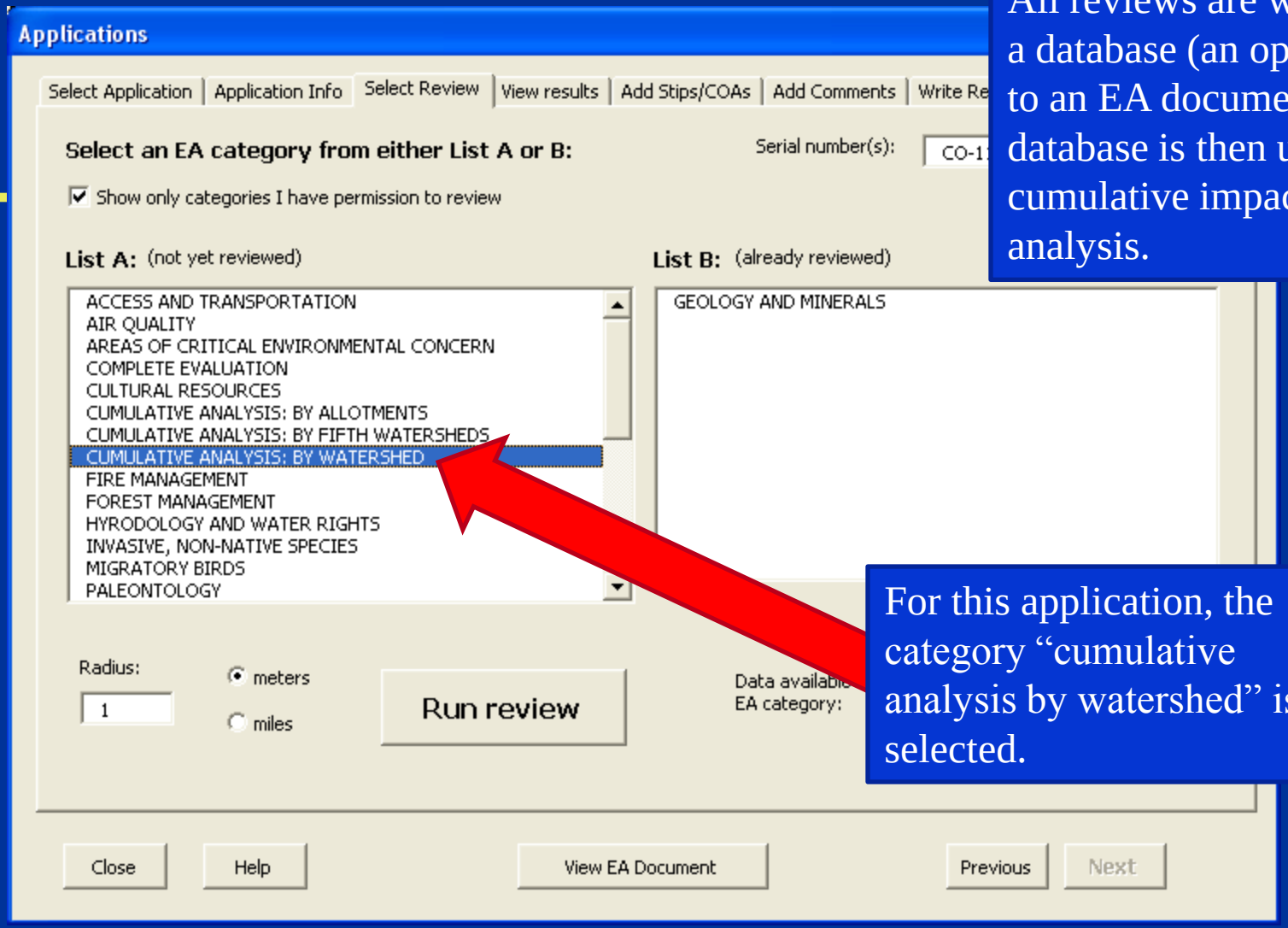
Applications
Display data
Zoom to...
Quick map
Projects: polygon
Projects: line
Projects: point
Applications
Select Application
Application Info
Select Review
Results
GEOLOGY AND MINERALS
Results
Oil and gas wells: 1 records found
well__: 298-22-2 (36.74)
operator_n: RIO BLANCO NAT GAS (36.74)
Oil and gas potential: 1 records found
data: HIGH (36.74 acres)
Mineral ownership: 4 records found
data: PRI%NM (12.75 acres); PRI%OTHER (22.71 acres);
BLM%FM (1.28 acres)
Select data to view
Mineral ownership
4 features selected for Mineral ow
FID AREA
959 2961279.25
964 159581.375
968 653289.375
1292 5375153664
Stipulations:
CSU-1/ CSU-8/
Feature details
Back to list
Close
Help
View EA Document
Previous
This is an example of a geology and minerals review, showing all features that fall within the radius (for instance, name & operator of wells, oil & gas potential, and mineral ownership)
After clicking “run review”, the display shows the outline of the radius around the application location (in this example, 2 and 5 mile radii were entered)
Also shown are all the other applications that have occurred within the area
You can select any of the layers to view it on the map, see a list of features that fell within the radius, and click on any feature in the list to see its location

After looking at the results, the reviewer can select stipulations or conditions of approval (COAs) from a database and attach them to this application

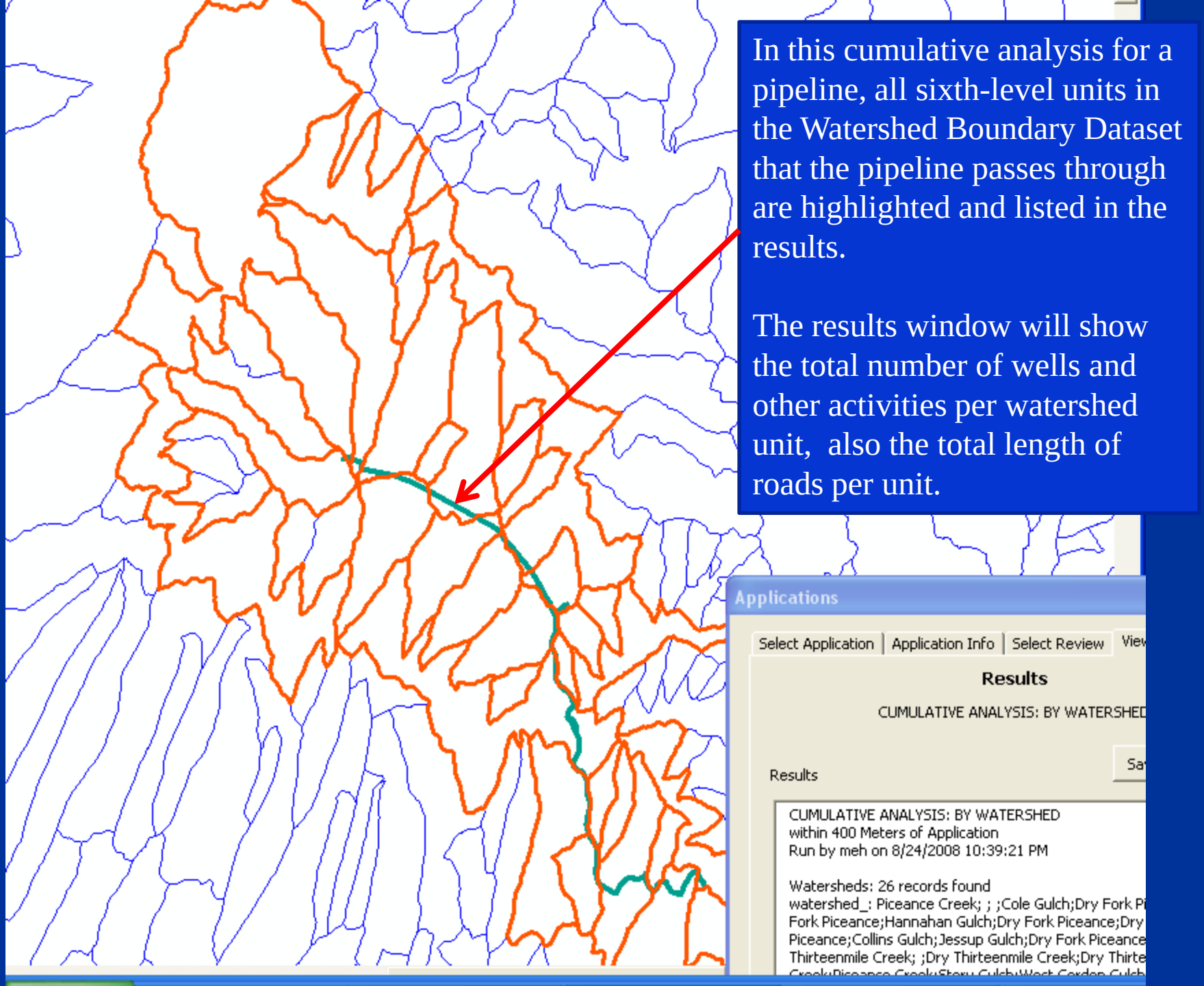


Only specialists with assigned permission for a specific category can run a review, add comments and assign stipulations. Other CARAT users can view all the reviews, but can only make changes to categories they have permission to review.



All reviews are written to a database (an optionally, to an EA document). This database is then used for cumulative impacts analysis.

For this application, the category “cumulative analysis by watershed” is selected.


In this cumulative analysis for a pipeline, all sixth-level units in the Watershed Boundary Dataset that the pipeline passes through are highlighted and listed in the results.
The results window will show the total number of wells and other activities per watershed unit, also the total length of roads per unit.
Applications
Select Application
Application Info
Select Review
Results
CUMULATIVE ANALYSIS: BY WATERSHED
Results
CUMULATIVE ANALYSIS: BY WATERSHED
within 400 Meters of Application
Run by meh on 8/24/2008 10:39:21 PM
Watersheds: 26 records found
watershed_: Piceance Creek; ; ;Cole Gulch;Dry Fork
Fork Piceance;Hannahan Gulch;Dry Fork Piceance;Dry
Piceance;Collins Gulch;Jessup Gulch;Dry Fork Piceance
Thirteenmile Creek; ;Dry Thirteenmile Creek;Dry Thirte