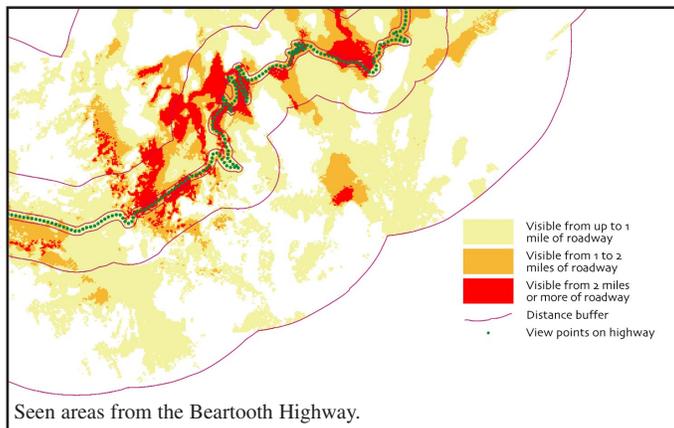


## Specialized Analysis Aids in Visual Impact Studies

New construction or improvements along nationally-designated scenic byways require that Environmental Impact Statements (EIS) be conducted to insure compliance with the National Environmental Policy Act (NEPA). Visual impact studies play a vital role in EIS compliance, since visual resources are so integral to the scenic byway experience.

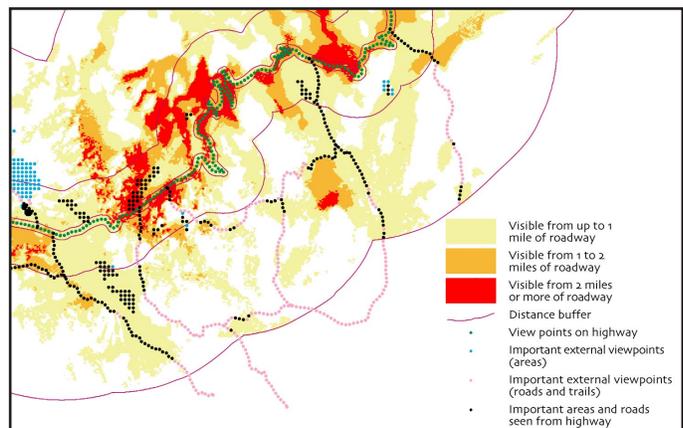
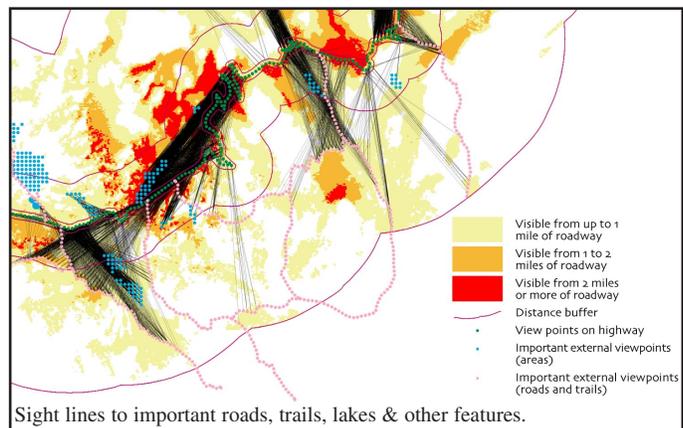
These visual impact studies typically have a qualitative component, assessing factors such as scenic quality and landscape character, along with a quantitative component to assess external visibility. In two recent projects with ERO Resources and Mark Holdeman, Computer Terrain Mapping has developed specialized visual analysis tools that improve the analytical results over those achieved using simple viewshed mapping.



The typical external visibility modeling scenario involves estimating the visibility of a segment of roadway from a variety of external viewing platforms such as roads, trails or overlooks. Since many scenic byways have heavily wooded sections, view blocking from trees (usually derived from aerial photographs or satellite

images) as well as topography is important. In addition, since the visual impact of a disturbance diminishes with distance from that disturbance, distance zones are also important.

In the end, for each segment of roadway, the reviewer wishes to know: (1) how many external observation points “see” this segment; (2) at what distances from the segment; and (3) in what directions. Simple viewshed mapping is a cumbersome tool for this analysis since it illustrates only the seen area for an observation point. Other tools, such as point in polygon, distance and direction applications are required to fully answer the questions.



The most important locales for view protection may not be the most visible portions of the landscape.

CTM has developed special software to directly derive the needed information. Sight lines are constructed

continued on page 6 ...

## “High Elk” Presents Conservation Challenge

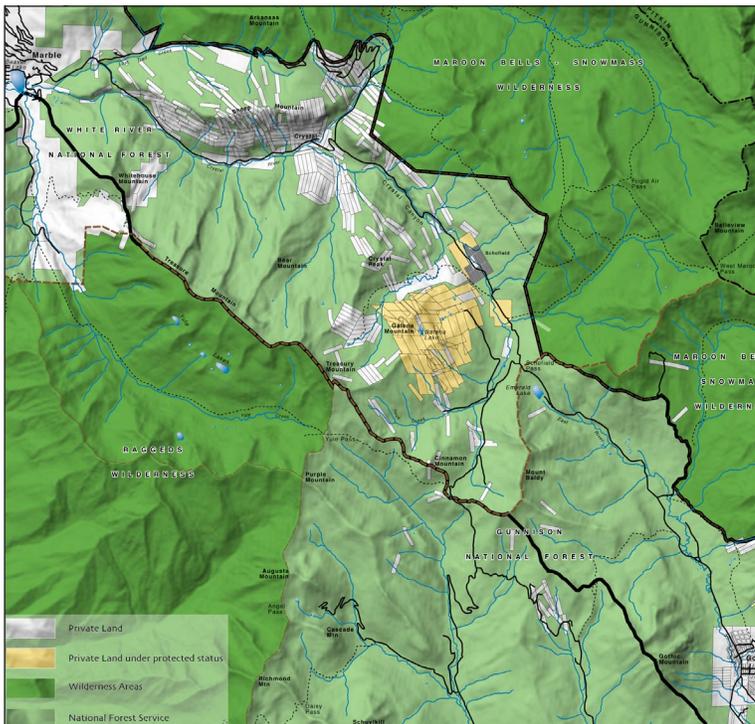


Library of Congress, Prints & Photographs Division, FSA-OWI Collection

The High Elk Conservation Corridor is a strip of land lying between the Maroon Bells Wilderness to the northeast and the Raggeds Wilderness to the southwest, connecting the townsite of Gothic with the Town of Marble. While much of this land is under U. S. Forest Service jurisdiction, several thousand acres remain in private hands, in the form of patented mining claims and historic subdivisions. This patchwork of private ownership presents a unique conservation challenge: literally hundreds of landowners have parcels that range from a fraction of an acre to over a hundred acres in size.

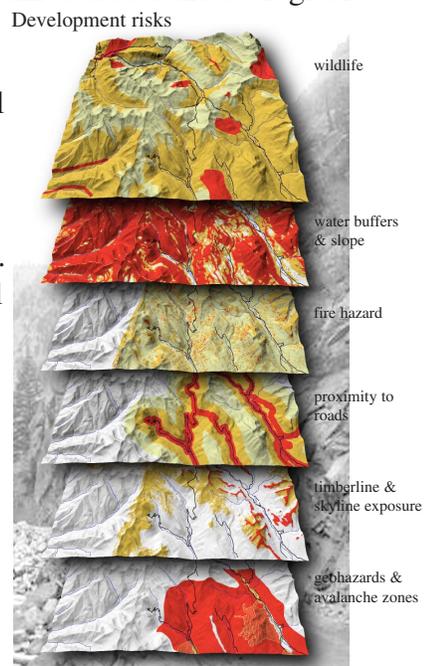
This is an area of sublime beauty – a beauty that draws visitors back time and again. Complementing this setting are the world-class recreational opportunities that the area provides. Furthermore, this region contains wildlife habitat so important that two state-designated Natural Areas and four potential conservation areas occur within its bounds. Finally, High Elk contains the headwaters of both the Crystal River and the East River – important water sources for downstream communities.

Unfortunately, funds may not be available to conserve all the worthy properties. Consequently, a planning effort has been put in place to prioritize parcels based on their conservation value and risk of development. Local stakeholders – Friends of High Elk, which include the Crested Butte Land Trust, Aspen Valley Land Trust, Rocky Mountain Biological Lab, Gunnison County, Crested Butte Mountain Resorts, High Country Citizens Alliance and Pitkin County – have teamed with the Trust for Public Land, Computer Terrain Mapping and James McClements to develop an analytical framework to guide future land acquisition.



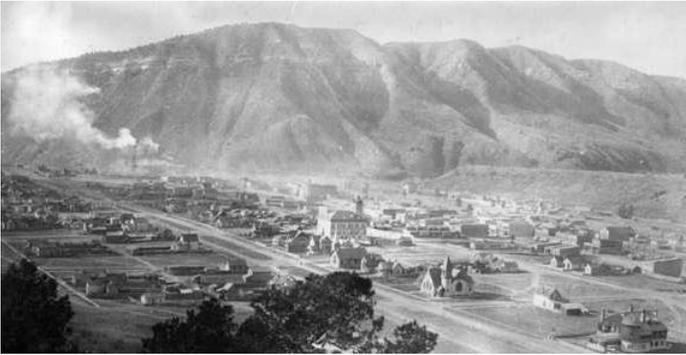
Ownership in the High Elk valley.

Spatial analysis has played a pivotal role, forming the foundation for this planning effort. This analysis allowed the team to assess the ecological and scenic value of the properties within the context of physical constraints, which impact a property’s residential development potential. Most of these physical constraints were taken from the Gunnison County Land Use Resolution (LUR), a regulatory document covering land use issues of importance to County residents. These constraints



continued on page 5 ...

# Critical Visual Resources Mapped in Animas Valley

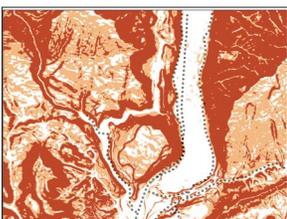


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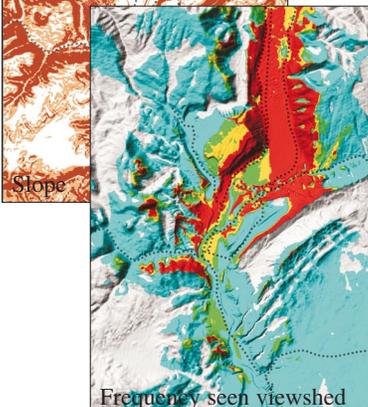
The City of Durango and La Plata County teamed with Computer Terrain Mapping to map critical visual resources within the Animas Valley. These visual resources included highly visible hillsides along with areas important to skyline views.

Durango, Colorado is a scenic community located on the Animas River in the southwestern corner of the state. High mountains and arid landscapes make this a tourist destination, with the Durango-Silverton narrow gauge railway among its many attractions. Recently, however, a number of development proposals, both within Durango and in surrounding unincorporated areas, have created concern among citizens that views may be compromised.

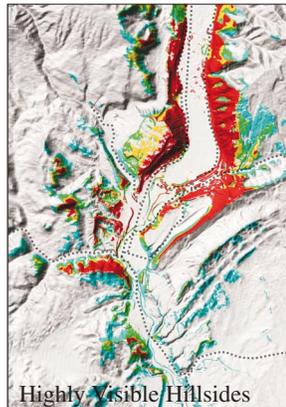
In response, Durango and La Plata County hired CTM to inventory visually sensitive areas that may be threatened by development.



CTM developed a methodology to identify highly visible hillsides by combining slope steepness with viewshed mapping from

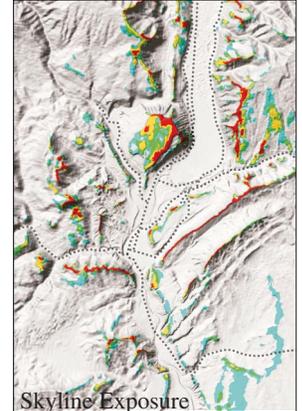


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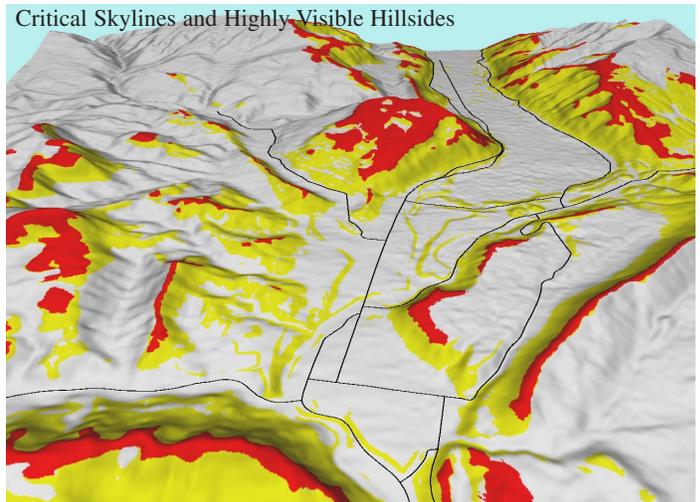


highways and important local roadways. Delineating areas that exceed both a slope steepness threshold (15% in this case) and a visibility threshold (highly visible from selected roadways) identifies visually significant hillsides. These are areas where the visual impact of construction will be the greatest.

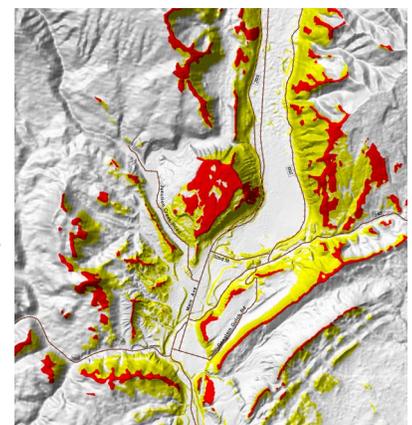
In addition, using CTM's skyline viewshed algorithm, visually critical skyline areas – particularly ridgelines and mesa edges – were inventoried. This skyline algorithm was described in CTM Newsletter Issue 1 (“At the Edge – Analyzing Ridgeline Development Issues”, URL:



[http://www.ctmap.com/ctm\\_newsletter.html](http://www.ctmap.com/ctm_newsletter.html)) and was also the basis for the Town of Castle Rock's Skyline/Ridgeline Protection Ordinance (see “Castle Rock Enacts Ridgeline Regulations”, CTM Newsletter Issue 2 – same URL as above).



With this inventory completed, both the City and County can look toward policy or regulatory approaches to visual resource protection. 🐾



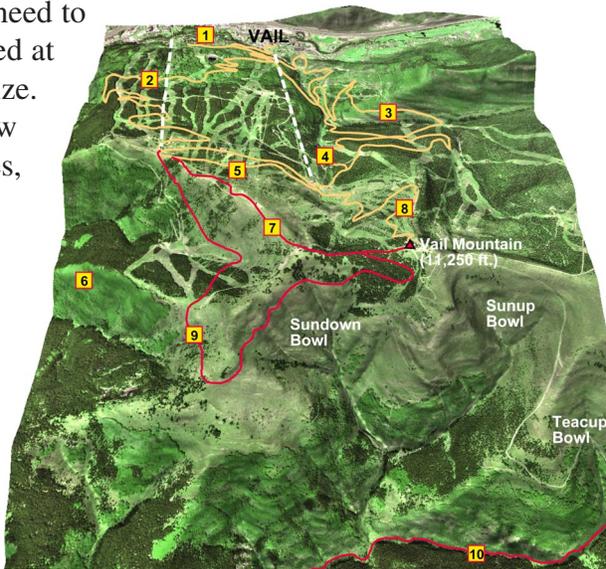
Spatial Bytes

High Res. Rendering

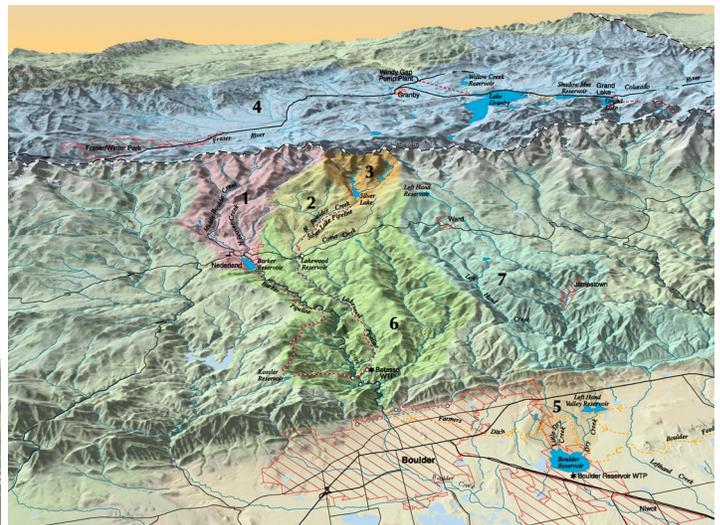
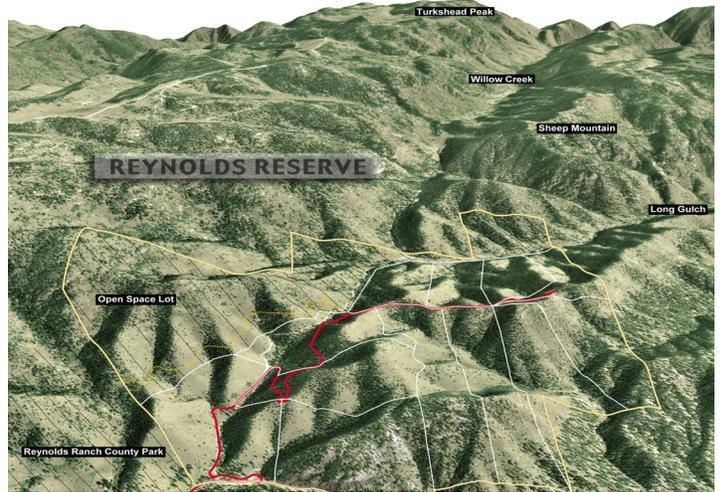


Ever wonder why so many 3d computer images look so cheesy? It's because most 3d rendering programs write to the computer screen, which then needs to be "cut" or "dumped" into an image file. Since most computer monitors have pixel dimensions like 1024x768 or 1280x1024, the resulting images look "pixelly" when scaled to larger sizes for printing.

Computer Terrain Mapping can cure those big pixel blues. We've written our own 3d rendering software that allows a high resolution database to be rendered to an output file vs. the computer screen. Therefore the final image size is limited only by hard disk space. This makes a dramatic difference when 3D images need to be printed at poster size. For a few examples, see:



National Geographic, November 1996 (p. 88-89), National Geographic Adventure, July/August 2000 (p. 38), City of Boulder Watershed Map at [www.ctmap.com/ctm/3d.html](http://www.ctmap.com/ctm/3d.html) and Reynolds Reserve at [www.openlands.com/reynolds/3d.html](http://www.openlands.com/reynolds/3d.html).



Mapping Critical Visual Resources DVD and Video

Mapping Critical Visual Resources; Viewsheds, Hillsides and Ridgelines is now available on DVD or VHS tape. Intended for local government planners, this multimedia presentation details how communities can defensibly identify visually sensitive landscapes to form a foundation for a visual resource protection strategy. Several real world examples illustrate how specialized visual analysis can be tailored to different communities and aid in developing a policy or regulatory protection framework. Call 303-444-1670 or email [ctm@ctmap.com](mailto:ctm@ctmap.com) for more information.

ONLINE :

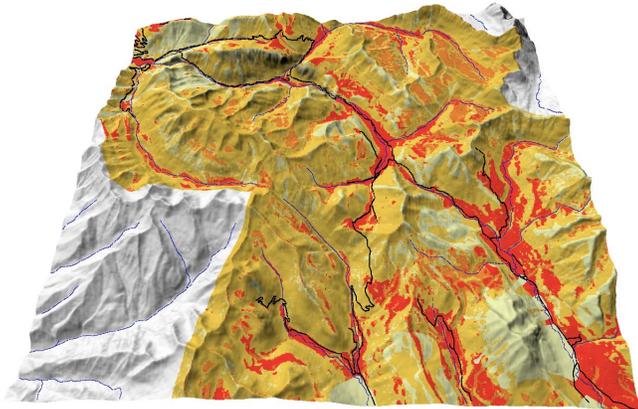
NIMA (National Imagery and Mapping Agency) now provides 10 meter resolution satellite imagery for the world. Not all areas are covered, but their 'Geospatial Engine' makes the search easy. You can find them at:

<http://geoengine.nima.mil>

If you need help getting the imagery to match your database, CIM can project files into any known (as well as unknown) projection. Call us at 303-444-1670 or email us at [ctm@ctmap.com](mailto:ctm@ctmap.com).

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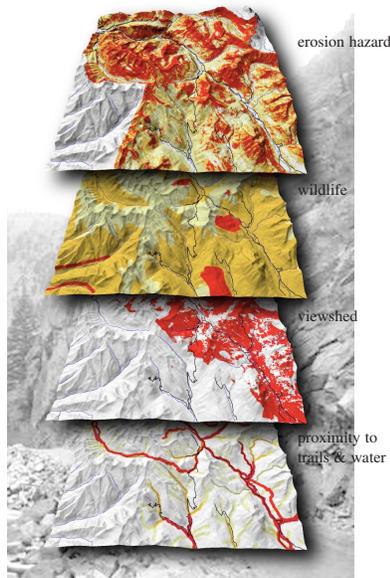
Buildability composite.



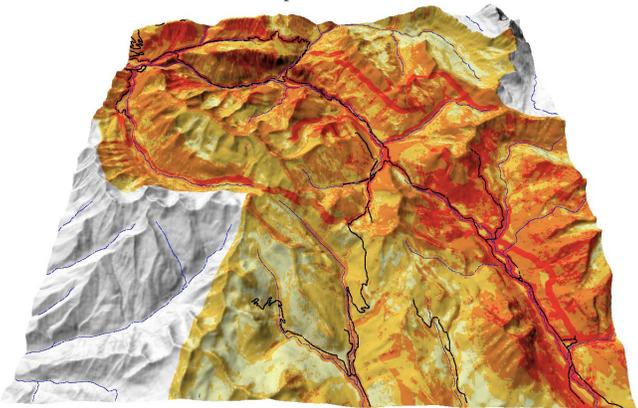
included slope steepness; proximity to streams, lakes and mud flows; critical ridgeline areas; important wildlife habitat; areas above timberline; geologic hazards (including areas of avalanche hazard); wildfire hazard; and proximity to existing access roads.

Resources.

Conservation value was determined by mapping important resources, including important wildlife habitat; critical viewsheds; proximity to roads, trails and streams (with public access protection in mind); and soil erosion hazard (as a surrogate for water quality).

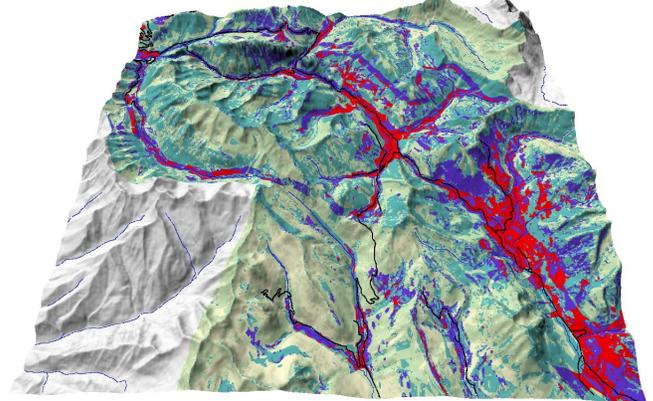


Natural resources constraints composite.



The priorities established through this approach suggest a two-pronged acquisition strategy: target the lots with the greatest development risk, along with those that have the highest ecological and scenic value. In this way, the most important resources will be protected, while simultaneously removing the most likely building sites.

Buildability / natural resources constraints composite.



Along with land conservation challenges, CTM encountered many GIS challenges. Data acquisition in this remote, multi-jurisdictional area was a daunting task. Spatial modeling - including watershed, visual, fire hazard, soil erosion and overlay analysis - played a significant role in deriving essential quantities. Perhaps most satisfying, however, was the challenge of using public data and derived products to match the newly approved regulatory document - the Gunnison County LUR.

Through this prioritization, of the 6,000 acres of private property in the valley, 2,000 acres, held by 12 different landowners, have been targeted as critical to the preservation effort.

“ It is inevitable that development will happen in this area, but the results of the planning effort will help ensure that the natural, scenic, recreation and scientific values are protected,” Doug Robotham, Colorado director for the Trust for Public Land, said in an interview with the Aspen Times. ♪



continued from page 1 ...

between roadway segment points and external observation points and quantities listed above (number of points, distances, directions) are tabulated and made available in both “spreadsheet” and mapping formats.

This software has proven to be extremely useful on two recent projects: the Beartooth Highway in northwestern Wyoming and the Tarryall Highway in central Colorado. Results were produced much faster than in the past and could be readily field checked by

reviewers.

As computer modeling is used more and more on projects that were previously preformed with “wind shield” surveys, we must be sure that the modeling is really addressing the questions that need to be answered. Often times, generic algorithms are not up to the task of answering these questions, producing imprecise results. 



Beartooth Highway, Wyoming



Tarryall Highway, Colorado



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CTM and this newsletter can be found on the web at [www.ctmap.com](http://www.ctmap.com)  
email: [ctm@ctmap.com](mailto:ctm@ctmap.com) | phone: 303-444-1670 | fax: 303-443-4856

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Boulder, Colorado 80306

### *Inside View:*

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**2** “High Elk” Presents Conservation Challenge

**3** Critical Visual Resources Mapped in Animas Valley

**4** Spatial Bytes  
- High Resolution Rendering  
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DVD and Video