

# Dam Removal Visualization

Picturing the future of the Klamath River

**Location:** Klamath River, California and Oregon

**Partners:** American Rivers; TerraCognito GIS Services, Inc.

**Context:** The Klamath River rises in a high basin ringed by Oregon's Cascade Mountains and flows over 250 miles to the Pacific Ocean at Klamath, California. Its watershed includes tribal trust lands, parts of Crater Lake National Park, six National Wildlife Refuges, and three reaches designated Wild and Scenic.<sup>1</sup> Straddling the Oregon/California border, PacifiCorp operates the Klamath Hydropower Project, a series of five mainstream dams. In 2001, PacifiCorp began a dam relicensing process with the Federal Energy Regulatory Commission (FERC), thereby starting a series of studies and proceedings about the future of the project and the possibility of removing the dams.

The relicensing study process has focused on social, environmental, and economic issues. Economic studies are showing that it will be less expensive for PacifiCorp to remove the dams and replace the power than to bring the project into compliance with current environmental and operational standards. Environmental benefits could also be expected. According to American Rivers, an active participant in the relicensing process, "removal of four dams on the Klamath would put the river's legendary salmon and steelhead runs on the road to recovery, and would help end decades-long disputes over river management in the basin."<sup>2</sup>



**Project Description:** American Rivers has participated throughout the relicensing process, playing a lead role in communications and in negotiations among PacifiCorp and federal and state government agencies. In addition, American Rivers has coordinated the development of much of the scientific and technical information related to benefits and effects of removal of the dams.

American Rivers retained TerraCognito GIS to develop detailed visualizations of the removal of the two largest dams—the Copco and Iron Gate—to show first existing conditions and then stages of dam removal, including the drawdown of reservoirs and subsequent riverbed restoration and re-vegetation. The interactive visual models allow people to “fly” up the river, to float down it, or to view it from their own vantage points and virtually “see” the visual effects of the dam removal. The models have been widely used. According to American Rivers’ California Field Office Director Steve Rotherth, “the visualizations

<sup>1</sup> “Economic Modeling of Relicensing and Decommissioning Options for the Klamath Basin Hydroelectric Project,” prepared for the California Energy Commission in Cooperation with the US Dept. of the Interior, by M. Cubed and the U.S. Bureau of Reclamation Technical Services Center, November, 2006.

<sup>2</sup> “Restoring the Klamath River for people and salmon,” American Rivers, [http://www.americanrivers.org/assets/pdfs/Klamath\\_Fact\\_Sheet8394.pdf](http://www.americanrivers.org/assets/pdfs/Klamath_Fact_Sheet8394.pdf)

may not have changed any opponent's minds about whether the dams should be removed, but they went a long way to inform nearby landowners about the visual impacts, to help them understand the extensive restoration/re-vegetation process, and to have the whole process seem less threatening." The visualizations were seen as exciting and helpful during the settlement negotiation process and in meetings with legislators, and "inspiring" to potential funders who may be called upon to help with the costs of restoration.



**Technology and Tools:** TerraCognito employed CommunityViz 3.0, SiteBuilder 3D, ModelBuilder 3D, Spatial Analyst and Photoshop to develop the visualizations. To model existing conditions, TerraCognito fused satellite imagery with aerial photography and USGS digital elevation models (DEMs). Recent bathymetric data and historic maps provided the basis for re-creating the post-removal valley floor and river course, while historic photos, US Forest Service forest data, and 3D spatial analysis were all used to model post-removal conditions. Useful details of the models include landscape features like cliffs, sand bars, sediment rings, and properly located vegetation for each stage of drawdown and removal. The visualizations are available in multiple forms – as a slide show of still images, as time-lapse animations over 10 years of dam removal to full restoration, and as animated movie clips of fly-throughs following the course of the river.

*“The [CommunityViz] visualizations allayed many fears, filled in gaps and also served to inspire many people about how soon a free-flowing Klamath River could become a functional, aesthetic resource that could benefit the environment and community.”*

—Steve Rothert,  
American Rivers California  
Field Office Director

#### KEY LINKS

CommunityViz  
<http://www.communityviz.com>  
 American Rivers  
<http://www.americanrivers.org>  
 Klamath information  
<http://www.americanrivers.org/our-work/restoring-rivers/dams/projects/restoring-klamath-river.html>  
 Klamath visualizations  
<http://www.americanrivers.org/our-work/restoring-rivers/dams/projects/envisioning-a-restored-klamath.html>  
 TerraCognito GIS Services, Inc:  
<http://www.terracog.com>

**Outcomes:** Based upon a large body of evidence, in 2006 FERC issued a draft Environmental Impact Study extensively describing the ecological and economic benefits of decommissioning and removal of the dams. In November 2008, PacifiCorp, the federal government, and the states of California and Oregon signed an Agreement in Principle stating the preliminary view that “...the benefits of dam removal outweigh the potential costs and impacts.”<sup>3</sup> Settlement parties expect to complete a final dam removal settlement agreement in fall 2009, which will require the Secretary of the Interior to make a final de-

termination on the public interest of dam removal. After a positive Secretarial Determination in 2012, more detailed design work and permitting will follow, with actual dam removal expected by 2020.

<sup>3</sup> “The Klamath River Agreement in Principle”, November 13, 2008, [http://www.americanrivers.org/assets/pdfs/Klamath\\_AIP\\_11-13-08\\_Talking\\_Points\\_FINALc71b.pdf](http://www.americanrivers.org/assets/pdfs/Klamath_AIP_11-13-08_Talking_Points_FINALc71b.pdf)

Sources: American Rivers; TerraCognito GIS Services, Inc; “Restoring the Klamath River for people and salmon,” American Rivers, [http://www.americanrivers.org/assets/pdfs/Klamath\\_Fact\\_Sheet8394.pdf](http://www.americanrivers.org/assets/pdfs/Klamath_Fact_Sheet8394.pdf); “The Klamath River Agreement in Principle”, November 13, 2008, [http://www.americanrivers.org/assets/pdfs/Klamath\\_AIP\\_11-13-08\\_Talking\\_Points\\_FINALc71b.pdf](http://www.americanrivers.org/assets/pdfs/Klamath_AIP_11-13-08_Talking_Points_FINALc71b.pdf); “Economic Modeling of Relicensing and Decommissioning Options for the Klamath Basin Hydroelectric Project,” prepared for the California Energy Commission in Cooperation with the US Dept. of the Interior, by M. Cubed and the U.S. Bureau of Reclamation Technical Services Center, November, 2006. CommunityViz is a registered trademark of Placeways LLC.