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South Platte River Basin Data Browser

RESEARCH AND DEVELOPMENT

South Platte River Basin Data Browser

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SUMMARY

The purpose of this data browser is to provide a spatial toolkit that delivers primary data that can be used for primary input information for assessments related to environmental endpoints, e.g. surface water hydrology and habitat mapping, related to ecosystem services.

A necessary component in these landscape scale analyses is a contemporary land cover dataset and the ancillary spatial coverages which provide a baseline for subsequent habitat and hydrologic modeling, and conservation assessments. Thus, the content of this site can be used as the basis for landscape-scale assessments of ecological characteristics of aquatic ecosystems and impacts from land use and water quality management.

The extent of the datasets include all sub-watersheds of the South Platte River Basin (HUC 101900) that fall within the U.S. Environmental Protection Agency Region 8 states of Colorado and Wyoming and a portion of western Nebraska in Region 7.

The South Platte watershed contains many rapidly growing cities, each with increasing pressures on the natural environment and stressors on aquatic ecosystems due to land use change and water development. With projected population growth in excess of 50% by 2050, the need for data and best available science for environmental decision-making is critical to maintaining the integrity of the waters within the South Platte River Basin.

Disclaimer

Users are advised that the majority of coverages within the database have been provided by a number of other agencies. Verification of the quality and use of any data supplied via this product are the responsibility of the user. This report has been subjected to the U.S. Environmental Protection Agency peer and administrative review process and approved for publication.

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ACKNOWLEDGEMENTS

We would like to acknowledge those individuals that collaborated with us in order to collect these datasets. Specifically, we would like to thank Tyler Rogers and Elizabeth Samson whom without their assistance this data browser would not have been possible. We would like to also acknowledge the key reviewers for this report and the spatial database. Our thanks in particular go to Karl A. Hermann, Regional Coordinator, Monitoring and Assessment Team, Water Quality Unit, U.S. Environmental Protection Agency, Region 8 (Denver, CO) and Donald W. Ebert, U.S. Environmental Protection Agency, Office of Research and Development, Landscape Ecology Branch (Las Vegas, NV).

INTRODUCTION

Evaluating connectivity and ecosystem services and projecting land development within river basins is a critical component to contemporary natural resource management. Understanding base environmental conditions allows managers to evaluate forecasts concerning outcomes of alternative future land-use scenarios. Spatial datasets and land-use change scenarios at the river basin scale are a necessary tool for conducting such analyses. We collected datasets that were freely available, and organized them into an online data browser for access in order to conduct habitat, hydrological modeling, and conservation assessments.

The study area for this project was the South Platte River Basin (Figure 1, 62,580 km^2), that includes northeast Colorado and parts of Nebraska and Wyoming, and is delineated by the 6-digit Hydrologic Unit Code, 101900. The South Platte watershed contains many rapidly growing cities, each with increasing pressures on the natural environment and stressors on aquatic ecosystems due to land use change and water development. With projected population growth in excess of 50% by 2050, the need for data and best available science for environmental decision-making is critical to maintaining the integrity of the waters within the South Platte River Basin.

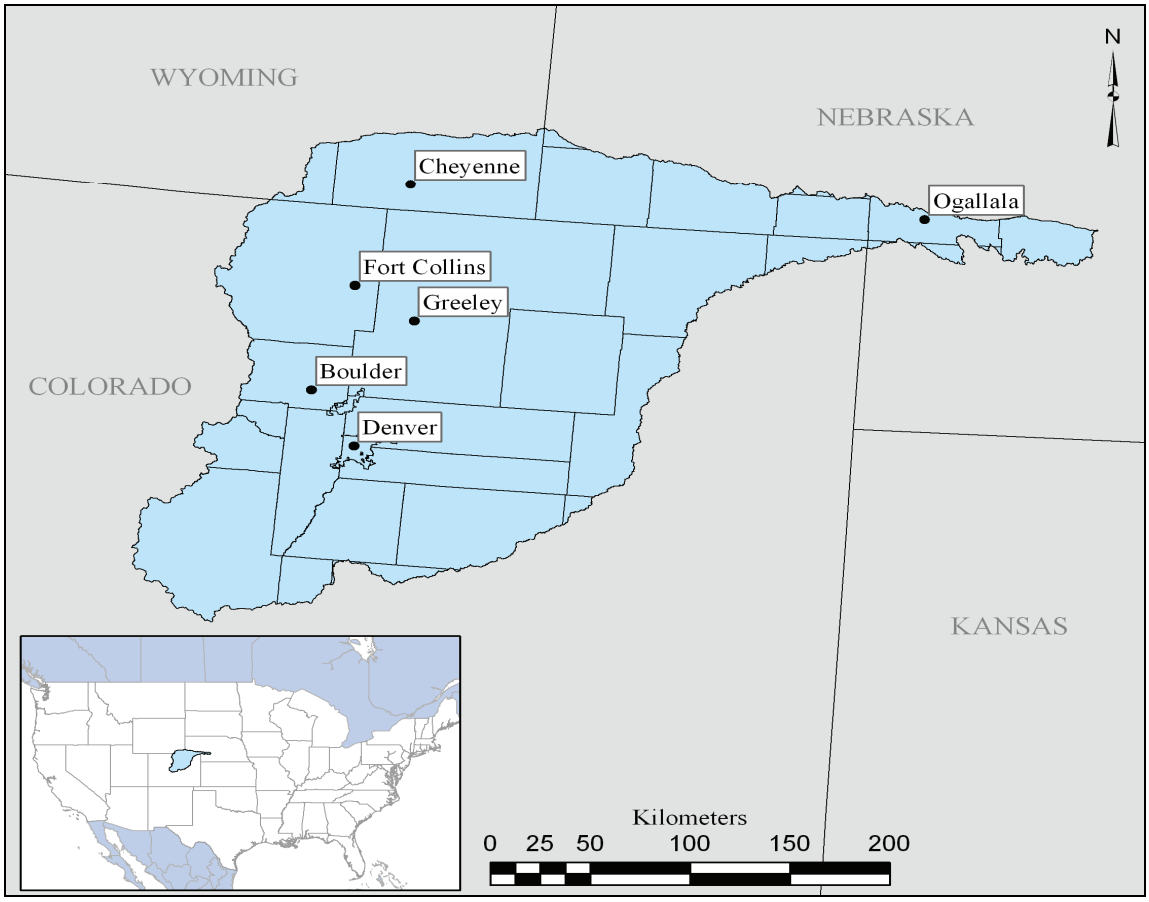

Figure 1. South Platte River Basin study area

To facilitate the analyses of the South Platte River Basin, the necessary datasets included land cover, geology, hydrology, wildlife habitat, ancillary (e.g. census tracts, satellite imagery, cities, counties, and land ownership datasets), and land-use change scenario datasets. Thus, the

4) organize datasets and supplementary data into an online data browser. The output of this project provides data elements (Appendix A) that include an online database that will make possible analyses of physical, biological and chemical functions of the watershed.

APPROACH

Spatial and tabular data collection from freely available internet sources

From September 2010 through January 2011, 32 datasets relevant to the South Platte watershed were collected from a variety of free web resources (Appendix B). Categorically, these included hydrological, geological, elevation, and land cover (Table 1). Additionally 447 terrestrial vertebrate habitat models (311 birds, 105 mammals, 22 reptiles, and 9 amphibians) derived from the Southwest Regional Gap Analysis Project (SWReGAP) were included in the database (Boykin et al. 2007). Within the datasets, there were also 32 Digital Ortho Quarter Quads (DOQQs), 24 digital raster graphics (DRGs), and 2 digital land cover datasets. When possible, all raster datasets were converted to ERDAS Imagine formatting, while vector datasets remained in their native format.

Finally, we downloaded the EPA Integrated Climate and Land Use Scenario (ICLUS v 1.3) datasets (EPA 2010). The ICLUS datasets are in ESRI Grid format of housing densities projected out from the year 2000 to the year 2100 in ten year increments based on five climate change scenarios (Table 2): A1, B1, A2, B2 and BC. The five scenarios represent different Intergovernmental Panel on Climate Change (IPCC) emission storylines related to population growth and economic strategy (U.S. Environmental Protection Agency 2009). This resulted in a total of 55 spatial datasets.

Table 1. Spatial Datasets for the South Platte Watershed

Category	Dataset	# of Datasets
Land Cover	Ecological System (Gap Level 3) [2011]*	1
	Formation Class(Gap Level 1)[2011]*	1
	National Land Cover Dataset [2006]+	1
Hydrology	National Weather Service Meteorological Gages	1
	PRISM Annual Precipitation [1971-2000]	1
	USGS Stream Gages	1
	Flow Accumulation	1
	Flow Direction	1
	8-Digit Hydrologic Unit Code	1
	12-digit Hydrologic Unit Code	1
	National Hydrography Dataset+ Features	5
Elevation/Geology	Elevation	1
	Aspect	1
	Slope	1
	Shaded Relief (Hillshade)	1
	FAO Soils	1
	STATSGO Soils	1
	SSURGO Soils	1
	Geology/Lithology	1
Ancillary	GAP Management	1
	GAP Ownership	1
	Roads	1
	Digital Raster Graphics (DRGs)	24
	Digital Ortho Quarter Quads (DOQQs)	32
	Quadrangle Frames 12k-250k	4
	Populated Places	1
	Non-populated Places	1
	Places	1
	Census Tracts	1
	Urban Areas	1
	Counties	1
	BLM Allotments	1
Habitat Models		447
ICLUS		55
	Total Datasets:	595

*Created using 1999-2001 Landsat imagery

+Created using 2006 Landsat imagery

Table 2. Integrated Climate and Land-Use Scenarios Categories Related to the IPCC Emissions Storylines (U.S. Environmental Protection Agency 2009, Nakicenovic N., and Swart R., eds. 2000).

Scenario	Description
BC	Baseline Condition. Medium fertility, medium domestic migration, and medium international migration
A1	Low fertility, high domestic and international migration. Fast economic growth, low population growth, and high global integration
B1	Low fertility and domestic migration, high international migration. Globally integrated world with emphasis on environmentally sustainable economic development.
A2	High fertility and domestic migration, medium international migration. Continued economic development with regional focus and slower economic convergence between regions.
B2	Medium fertility and international migration, low domestic migration. Regionally oriented world of moderate population growth, local solutions to environmental and economic issues.

Data processing and co-registration (including metadata)

Once datasets were downloaded, they were manipulated in ArcGIS 9.3 and ArcGIS 10 in order to clip the data only to the area of the South Platte River Basin. Raster datasets were rescaled to a 30 m resolution. If data were downloaded in subsets of the river basin, then each subset was mosaicked together in order to create a seamless dataset prior to masking the data only to the river basin. Some datasets were not available in a spatial form and had to be derived from the data that were available. These datasets included the National Weather Service meteorological gages, aspect, slope, and shaded relief. We created the National Weather Service meteorological gage dataset from tabular data available from the National Oceanic and Atmospheric Administration and used specified GPS coordinates to export the dataset into a point shape file.

Some datasets were too large to mosaic into seamless datasets. Both DRGs and DOQQs were downloaded in their native format as MrSID rasters, a format meant to handle very large data. Converting these datasets to ERDAS Imagine (.img) or .tiff formats would have resulted in a loss of detail. Therefore, both DRGs and DOQQs were downloaded by county in order to be easily referenced and retain detail.

Once all datasets were collected they were projected to NAD 83 Albers UTM Zone 13 to create uniform data in a common projection. After they were projected, metadata were created for each dataset using a combination of the original metadata. We generated the metadata using the EPA Metadata Editor 3.1 and validated it for completeness. All files were then zipped using WinZip 9.0.

Provide land cover datasets

In 2011, the seamless National Land Cover Gap Analysis Project (GAP) dataset at the Ecological System level was made available on the U.S. Geological Survey National GAP website (http://gapanalysis.usgs.gov; USGS GAP 2011). A revised beta version was provided to the project; however, it is not yet publicly available. This dataset was aggregated into the Ecological System level (GAP Level 3), and also at the Formation Class thematic level (Gap Level 1). For reference, the U.S. Geological Survey National Land Cover Database (USGS NLCD 2006; Fry et al. 2011) data were also downloaded and masked to the South Platte Watershed. At GAP Level 3, the resulting dataset for the South Platte Watershed included 73 land cover classes, while at Level 1 (Formation Class) the resulting dataset included only 8 land cover classes. The USGS NLCD 2006 dataset included 16 land cover classes.

Organize datasets and supplementary data and operationalize into an online data browser

All datasets collected were uploaded to a project website. These were organized by pages in order to provide an intuitive and user-friendly navigation environment. Main categories covered in separate webpages (and subsets thereof) include the home page with an introduction to the project, the downloadable datasets, contact information, related links and references to the project such as to SWReGAP, and a copy of this document.
Datasets were organized first by their category: Land Cover, Hydrology, Elevation/Geology, Ancillary, Habitat Models, and ICLUS. The first four categories fit on the main data page.

These were organized in a table under the category. Columns of the table include the name of the dataset, the file format, a link to an image of the dataset in JPEG format, a link to metadata for the dataset in XML format, and a link to the online source of the dataset. ICLUS, however, links to a zip file of the entire dataset.

The Habitat Model link will bring you to the Habitat Model main page with links to Metadata, Reptiles and Amphibians, Birds, and Mammals. The large number of birds in the project area necessitated further sub-setting of passerines to their own page. Under each Habitat Model Page, species were organized alphabetically by their taxonomic order or suborder and scientific name.

CONCLUSIONS

Datasets relevant to the South Platte River Basin were downloaded, or created, and then processed and co-registered into seamless datasets. We provided a land cover dataset classified to the National Vegetation Classification System Formation Class thematic level (Gap Level 1) and the original National Land Cover Dataset (2000). Additionally, we made available seamless Integrated Climate and Land Use Scenarios, elevation, geology, hydrology, satellite imagery, ancillary and wildlife habitat datasets. Finally, these datasets were uploaded and organized into an online data browser in order to be easily accessible for public access and download.

With these contemporary datasets available, analyses on the South Platte Watershed's hydrology, habitat and conservation practices are possible in conjunction with future land-use change scenarios. Considering the projected population growth within the basin and its rapidly growing cities, it is these kinds of analyses that become necessary in order to maintain the integrity of the water resources of the watershed. This online database will provide important information for environmental decision making within the South Platte River Basin.

LITERATURE CITED

Boykin, K.G., B.C. Thompson, R.A. Deitner, D. Schrupp, D. Bradford, Lee O'Brien, C. Drost, S. Propeck-Gray, W. Rieth, K. Thomas, W. Kepner, J. Lowry, C. Cross, B. Jones, T. Hamer, C. Mettenbrink, K.J. Oakes, J. Prior-Magee, K. Schulz, J. J. Wynne, C. King, J. Puttere, S. Schrader, and Z. Schwenke. 2007. Predicted Animal Habitat Distributions and Species Richness. Chapter 3 *in* J.S. Prior-Magee, ed. Southwest Regional Gap Analysis Final Report. U.S. Geological Survey, Gap Analysis Program, Moscow, ID. Available on-line at: http://fws-nmcfwru.nmsu.edu/swregap/.

Comer, P.J. and Schulz, K.A. 2007. Standardized Ecological Classification Mesoscale Mapping in the Southwestern United States Rangeland Ecology and Management. 60:324- 335.

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J. 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, *PE&RS*. 77(9):858-864.

IPCC (2001) Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, Cambridge, UK). p 881.

Jennings, M.D., Faber-Langendoen, D., Loucks, O.L., Peet, R. K. and Roberts, D. 2009. Standards for Associations and Alliances of the U.S. National Vegetation Classification. Ecological Monographs. 79(2): 173-199.

Nakicenovic N, and Swart R, eds. 2000. Special Report on Emissions Scenarios (Cambridge University Press, Cambridge, UK). p 570.

U.S. Environmental Protection Agency (EPA). 2009. Land-Use Scenarios: National-Scale Housing-Density Scenarios Consistent with Climate Change Storylines. Global Change Research Program, National Center for Environmental Assessment, Washington, DC; EPA/600/R-08/076F. Available from: National Technical Information Service, Springfield, VA, and online at http://cfpub.epa.gov/ncea/global/recordisplay.cfm?deid=203458.

U.S. Environmental Protection Agency. 2010. ICLUS V1.3 User's Manual: ARCGIS Tools for Modeling US Housing Density Growth. U.S. Environmental Protection Agency, Global Change Research Program, National Center for Environmental Assessment, EPA/600/R-09/143F. http://cfpub.epa.gov/ncea/global/recordisplay.cfm?deid=205305.

U.S. Geological Survey, Gap Analysis Program (GAP). 2011. National Land Cover, Version 2. Accessed on October 2011, online at: http://gapanalysis.usgs.gov/gaplandcover/data/.

APPENDICES

Appendix A. Data inventory

There are a number of data elements associated with the South Platte River Data Browser (http://fws-case-12.nmsu.edu/SouthPlatte/). All data are provided in WinZIP 9.0 compressed zip files.

Data elements include:

1. Data Collection
    - Minimum of 23 datasets and associated metadata for use in subsequent tasks.
2. Data Process
    - Zip files of seamless datasets and associated metadata
3. Land Cover Mapping
    - Land cover map for South Platte River Basin study area
        - Ecological System Level similar to product for SWReGAP
        - NLCD Classification
    - Combined DEM for South Platte River Basin Study Area
    - FGDC metadata for delivered geospatial datasets
4. Summary report describing methods, processing and data.

Appendix B. South Platte Watershed Datasets and Sources

Dataset	Source
NWS Meteorological Gauge Locations	http://www.ncdc.noaa.gov/oa/ncdc.html
USGS Stream Gauge Locations	http://www.horizon-systems.com/nhdplus/data.php
FAO Soils	http://www.fao.org/
STATSGO Soils	http://datagateway.nrcs.usda.gov
SSURGO Soils	http://datagateway.nrcs.usda.gov
Elevation	http://seamless.usgs.gov
Slope	http://seamless.usgs.gov
Aspect	http://seamless.usgs.gov
Shaded Relief(Hillshade)	http://seamless.usgs.gov
Flow Accumulation	http://www.horizon-systems.com/nhdplus/data.php
Flow Direction	http://www.horizon-systems.com/nhdplus/data.php
Land Ownership	http//gapanalysis.usgs.gov
Gap Management	http//gapanalysis.usgs.gov
Geology/Lithology	http://datagateway.nrcs.usda.gov
USGS HUC - 8 Digit	http://datagateway.nrcs.usda.gov
USGS HUC - 12 Digit	http://datagateway.nrcs.usda.gov
Roads	http://www.census.gov
Digital Raster Graphics	http://datagateway.nrcs.usda.gov
DOQQs	http://datagateway.nrcs.usda.gov
National Hydrography Dataset+	http://www.horizonsystems.com/nhdplus/data.php
Quadrangle Frames 12K - 250K	http://datagateway.nrcs.usda.gov
Geographic Names Populated	http://datagateway.nrcs.usda.gov
Non-Populated Place Names	http://datagateway.nrcs.usda.gov
Place Names	http://www.census.gov
Census Tract	http://www.census.gov
Urban Areas	http://www.census.gov
Counties	http://www.census.gov
BLM Allotments	http://www.blm.gov
USGS National Land Cover Dataset	http://www.mlrc.gov
SWReGAP Habitat Models	http://fws-nmcfwru.nmsu.edu/swregap
USGS Land Cover GAP Datasets	http//gapanalysis.usgs.gov
Annual Precipitation (PRISM) 1971-2000	http://www.prism.oregonstate.edu/
Integrated Climate and Land-Use Scenarios	http://cfpub.epa.gov/ncea/global/recordisplay.cfm?deid=205305

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