BESTCAT Help Documentation

March 20th, 2015

Application Overview

BESTCAT is a web-based mapping application (www.bestcat.org) providing users with the ability to compare and contrast global assets based on biodiversity and ecosystem services. This easy-to-use and efficient application provides businesses with a preset data package that highlights biodiversity and ecosystem service conditions and quickly identifies critical locations that may require more detailed environmental studies. BESTCAT produces a downloadable ranking of user-defined locations based on five biodiversity metrics (i.e. habitat intactness, global species richness, biome-based species richness, threatened species, and small-ranging species) and three ecosystem service metrics (i.e. carbon stock, soil quality, and water availability). All metrics provide a global ranking from 1-100 and were derived from publically available data. BESTCAT is developed by The Nature Conservancy in partnership with Dow Chemical as a free, open source, application based on peer-reviewed scientific data.

Application Layout

BESTCAT has two main components; the map resources panel (left section) and the map display (right section). The map resources panel gives users the ability to modify the displayed information within the Map Display tab. The map display presents the spatial data associated with the application. A set of map tools gives users the ability to interact with the map display by setting the view extent of the map, obtain attribute information for any of the displayed data, add their own spatial data to the map, and/or print the displayed map. The Data Input tab gives users the ability to upload and/or create sites to analyze with regards to the biodiversity and ecosystem services metrics.

Figure 1. Opening page of BESTCAT application

Map Tools

The map tools can be displayed or hidden by clicking on the red arrow to the right of the *Map Tools* text. To select a tool the user clicks on that tool image. Some of the tools will automatically change the display when the tool is clicked while others require the user to interact with the map display. Full Extent sets the map to display back to the map extent shown when the viewer was opened. Zoom In allows the user to zoom the map display into a specific area by clicking on the tool and then maneuvering the mouse pointer to the area they would like to zoom into. This is accomplished by holding the left mouse button down and dragging the mouse across the map until they have drawn a rectangle encompassing their area of interest and then releasing the button. Zoom Out interacts similarly but zooms the map display out based on the ratio of the box to the current display so the smaller the box the greater factor the map will be zoomed out. Pan allows the user to move the display of the map without changing the scale of the map. The user must hold down the left mouse button and drag the pointer to move the map and release the button to end the panning. Next and Previous tools allow the user to scroll back and forth thru all the displays viewed in a web session.
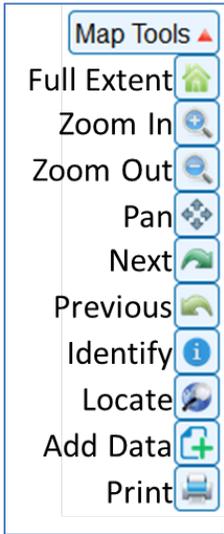
Figure 2. Map tools

The Identify tool allows the user to display information associated with a map which is visible (i.e. checked within the Map Resources panel, see Map Resources section of this document) on the map. In order to use the tool a layer must first be selected and then the user needs to click on a feature displayed in the map. A window will be displayed listing all the information found for that location associated with any of the features selected (Figure 3). If multiple layers are selected and the user clicks on a location the window will display an arrow for each layer that has been selected . The user can click on the arrow to see all attribute information for each feature. To close the window, click the X upper right-hand corner of the box.

Figure 3. Identify Window

The Locate tool gives user the ability to zoom to a location using geographic (i.e. Latitude and Longitude) or UTM (i.e. Northing and Easting). The user must input either of these coordinate pairs into the Locate dialog (Figure 4) and click on the Zoom To button. A red "**X**" will indicate the location with the map display zooming in and centering on this position. For inputting UTM coordinates, the user must first select a UTM zone. Each new position inputted by the user will clear the previous one. To clear the last located position, the user can click on the Clear button which will remove the red "X" and clear the location input boxes.
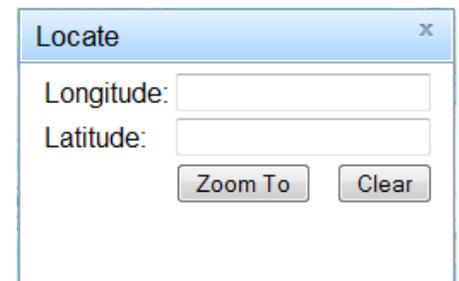
Figure 4. Locate Dialog

The Add Data tool gives users the ability to display their own information within the map display. The user must first click on the Browse button in the Add Zipped Shapefile dialog (Figure 5) and then select a local zipped file containing an ESRI shapefile. At minimum, this zip file must contain the following files: .shp, .shx, .dbf and .prj). Once the user selects the zip file the application will extract the spatial data from the zip file

Figure 5. Add Data Dialog

and display it on the map. Additionally the map display will zoom to the extent of these dataAll features within the shapefile are displayed as a graphic and will have associated attributes of the shapefile available when clicking on the feature. The user can clear the most recently added dataset by hitting the Clear Shapefile button. **Note:** Uploaded data is not saved by the application and is only displayed during the user web session.
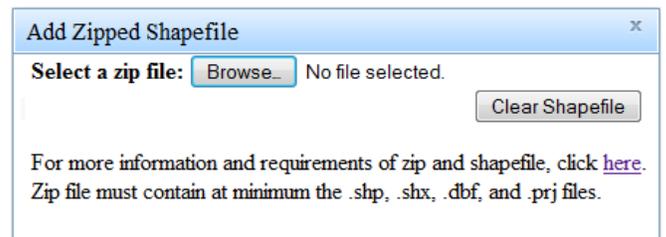
The Print tool provides users with the ability to create a map which can be saved or printed by the user. By clicking on this tool, the Map Properties dialog (Figure 6) is displayed. Through this dialog, the user can set both the title and author of the map by inputting the appropriate text. A legend for the map will automatically be created if the box is checked. The user can select a variety of page sizes (i.e. letter, tabloid, A3, A4) and orientation (i.e. portrait or landscape). Finally the map produced can be created in a PDF, PNG, or JPG file format. Once the user has set all the parameters, they can click on the Create Map button which will start the process of creating the defined map. Once the process has been completed a hyperlink displaying Click Here for Map will be produced which allows for the user to access the map. The user must close the dialog by clicking on the X in the upper right portion of the dialog to return to the interactive mapping application. **Note:** Due to limits with regards to map spacing, layers with long legends or lengthy item descriptions may not be produced even when legend property is checked. User can still capture legend from the web application which will be displayed in the Map Display tab within the Additional Map Resources panel.
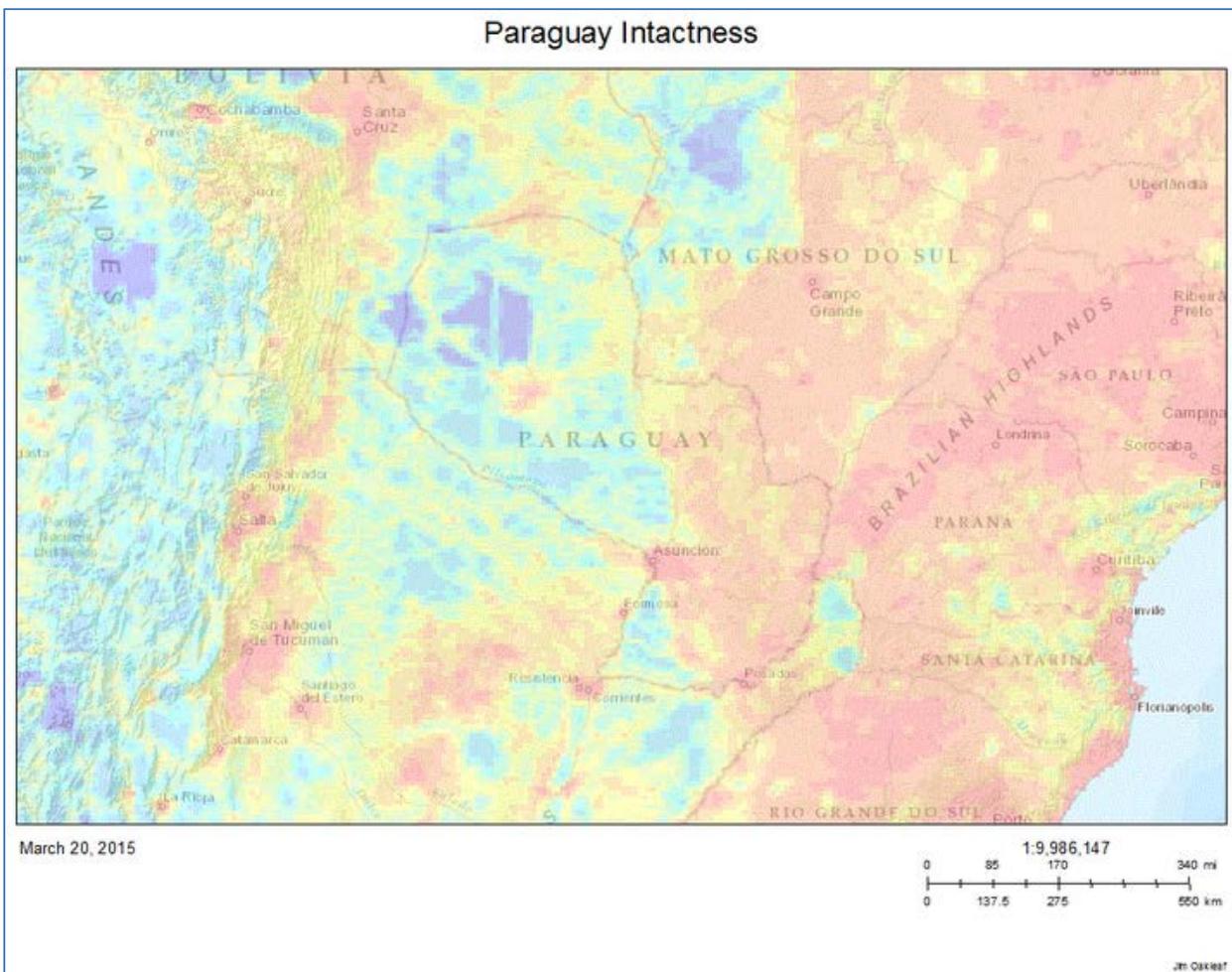

Figure 6. Map Properties Dialog

Figure 7. Map output example

Map Resources Panel

Map Display

The Map Display tab (Figure 8) gives users the ability to modify and display maps within the viewer. There are three major grouping of maps; *Biodiversity Maps, Ecosystem Service Maps,* and *Background Maps*. There is also an *Additional Map Resources* group allowing the user to change the transparency of the displayed map and view the legend of the currently displayed map. Within each group, a list of maps can be access to display by clicking on the heading name (e.g. Biodiversity Maps). To turn on a map within any group (except *Background Maps)*, the user clicks the check box in front of the layer name. To change the background map, the user clicks on one of the thumbnail images listed under this heading.   To obtain more information on any of the maps, the user can click on the ❶ icon to the right of the map name.

Figure 8. Maps resource panel

Data Input Tab

The Data Input Tab (Figure 9 & 10) gives the user the ability to input their locations of interest to analyze. The user has two options; upload an existing comma-delimited value (csv) file containing a listing of their sites (Upload Method) or create the locations on-the-fly within the application (Manual Method). The application does allow for users to combine both methods if need be. Once the user has identified the sites to analyze they must click on the Analyze Sites button to run the analysis. Once all the sites have been analyzed a table at the bottom of the map window with associated metric values for each site will be displayed (see **Results Table** section). The user can also click on the Clear Sites button to remove all analyzed sites and run a new analysis. **Note:** Any data placed into BESTCAT through either the uploaded or manual method is only available to the user who transferred or created these data. By design, any user-defined data are not saved by the application and only available for that user's current web session.

Upload Method: The CSV option or Upload Method is first displayed to the user when clicking on the Data Input Tab (Figure 9). The user can create a file locally by using Excel and then saving the spreadsheet to a CSV format or by just using a text editor. The first line or row of data must contain the labels for all subsequent rows of information. Three fields are necessary for the application to perform properly; *name*, *longitude*, and *latitude*.   Information on the acceptable title of these fields are described within the application. Basically the application will look for any field with the label having the word *name* being part of it (e.g. site_name, loc_name, name) and use that field as the primary name field. Longitude can be titled as: lon, long, longitude, or xlon. Latitude can be titled: lat, latitude, or ylat. Values under

```
Name,Longitude,Latitude
Yana Mine,-78.51311,-6.981731
Buck Mine,31.46797,-3.864779
Wade Mine,28.03475,-26.16331
```

Figure 10. Upload CSV file

the name field must be text with both the longitude and latitude fields containing positive or negative decimal degree values. The application assumes all longitude and latitude locations are referenced using the WGS 84 datum. A link to a properly formatted file is provided within the documentation describe in the Upload Method panel and can be seen in Figure 6.
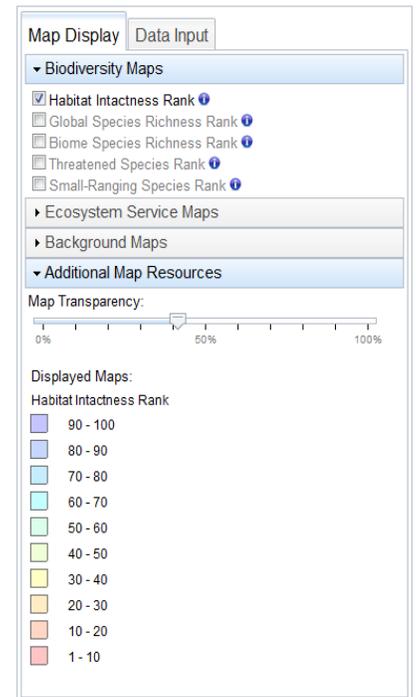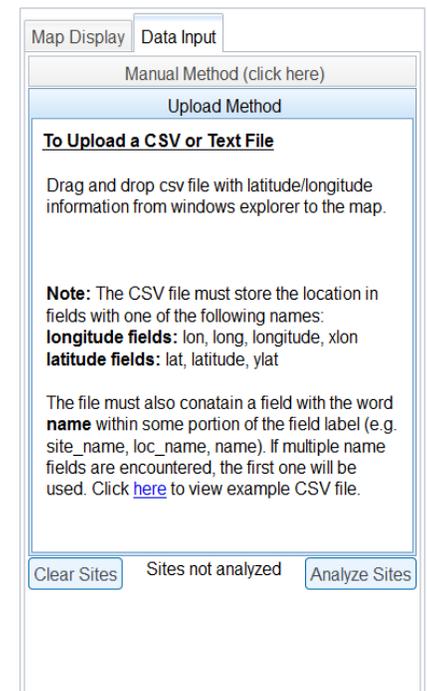
Figure 9. Input Tab - Upload

Once the user has created their CSV file, they can move the information directly into the application. Depending on the browser version being used, the user can either directly drag and drop the file on to the map (currently supported by Firefox 36, Google Chrome 41 and Internet Explorer 11) or use the Browse button (older versions of Internet Explorer) to select the file to be used. If the Browse button is not displayed in the Upload Method panel, the user will be able to use the drag-drop functionality. To drag and drop a file, the user depresses the left mouse button while hovering over the file and keeps this mouse button depressed while maneuvering the pointer onto the map. By releasing the mouse button on the map the user will be automatically presented with three-dimensional, red dots displaying the listed locations.

Manual Method: The Manual Method (Figure 10) is accessed by clicking on the Manual Method (click here) text to expand its panel window. Once expanded, the user is presented with three steps for adding a site to be analyzed. First the user must input a name associated with the site. Next a location must be identified by either clicking on the map or typing in a geographic location. To identify the map location of longitude and latitude prior to submitting the site for analysis, the user can click on the Display on Map button which will draw a red X where that position is located. Once the user has located and named the site, they must click on the Submit button to make that point part of the overall analysis. Clicking Submit will create a three-dimensional red dot which indicates the site is now associated with the points to be analyzed. The user can input as many sites as necessary. All locational and name information will be maintained and available for download after the analysis. This gives the user the ability to use their locations for future analysis without having to input these locations again.

Figure 10. Input Tab - Manual

Results Table

Once the user has analyzed a collection of sites, the Results Table (Figure 11) will automatically be presented within the map display window. The Results Table gives users the ability to view and rank their sites based on all eight metrics. To sort the entire tabled based on a particular metric, the user only has to left-mouse click on the metric name appearing at the top of the table. An up or down arrow indicates whether the metric values are sorted ascending or descending. In addition to the Results Table, two buttons will be displayed above and to the left of the table; Hide Results and Download Table. The Hide Results button minimizes the table to allow the user full display of the map. The Download Table button gives users the ability to save the Results Table to a local CSV file which can then be read within Excel or any other spreadsheet software.

There are two context menus associated with this table. If the user hovers over one of the metric names found in the top row of the grid and then right clicks their mouse, a menu associated with that metric will be displayed giving the user the option to Symbolize sites by metric, Clear symbols, and/or view a brief Metric description. Symbolizing sites by metric will add a legend to the map and display each site in one of four categories based on the ranking associate with that field (i.e. High > 90, Moderate > 75, Medium > 50 and Low < 50). Clear symbols will remove the legend and site symbols. Selecting a different metric will change the site symbols on the map based on the new categories associated with that particular metric. Finally selecting Metric description displays the detailed information with regards to how that particular metric was created. Right clicking on one of the records within the table allows the user to Zoom to site (centers map and zooms in to location of site selected), Highlight site (a purple X is placed on the selected site), Create a 10 km buffer (produces a circle with a 10km radius from point), Clear site graphics (removes any graphics produced by this context menu).

Note: If sites have blank cells in the table, this indicates the site does not overlap with that metric. For example this could happen in locations close to large water bodies. If need be, a user could create a new site using the Manual Method or they could download the table and manually input the site score by displaying the metric and selecting the metric value closest to the site.
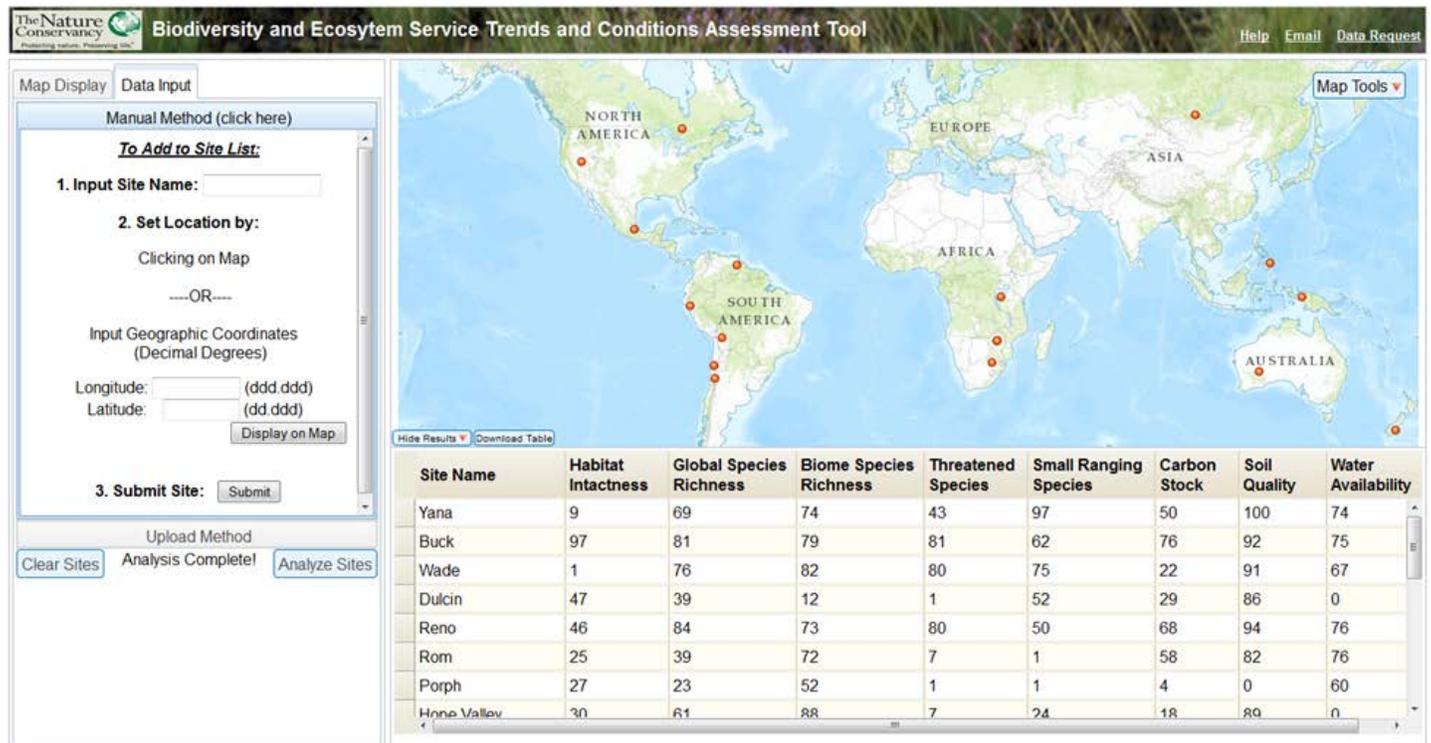

Figure 11. BESTCAT application with result table being displayed.

Metric Data

The data used to produce all the metric for BESTCAT are listed in the Table 1 with source data dates, references and access. Original data sources are identified allowing users to access data which were used in creating each metric. We used all publicly available or soon-to-be publically available data. All data were either licensed under Creative Commons Attribution (CCA) 3.0 (see http://creativecommons.org/licenses/by/3.0/), had no restrictions associated with redistribution based on metadata provided, and/or authors granted TNC use of these data. All derived metrics from these data are also licensed under CCA 3.0. All metrics have been produced at a cell size of 10 km^2 and were produced using relatively coarse in scale data. These data should therefore not be used for an individual, local site assessment but rather used to compare sites relative to others globally and/or regionally (e.g. continent assessment).   Full data documentation for each metric is accessible by via the application or by following the link provided after each metric description below.

Analysis Methods

Analyses (as described below) were applied at a ten km^2 resolution, using the Eckert IV projection to minimize area distortion (Snyder, 1987). Our analysis focused on the Earth's terrestrial surface excluding Antarctica and ranked globally only those cells which overlapped at least 50% land, as identified by Olson et al. (2001). For each metric, we produced an initial score using Equation 1 to calculate the spatial percentile-rank (SPR) for each cell within a raster.

Equation (1) $SPR = (c_l + 0.5f_i)/N \times 100$

where:

c_l = count of all cells with values less than the target cell value

f_i = number of cells with the target cell value

N = total number of cells in the raster.

This formula is an adaptation of percentile ranks used for the scoring of standardized educational tests which indicates the number of examinees at or below a score of interest (Crocker & Aligina, 2006; May & Nicewander, 1994). To resolve discrepancies in the ranges of percentile-ranks among metrics, all ranks were normalized from 1-100 to ensure consistency across metrics with 1 always being the lowest ranking cell and 100 being the highest.

Habitat Intactness

To create a habitat intactness metric, we followed the procedures identified by Oakleaf et al (2013). To classify lands as natural habitat (vs. human-dominated) we used four global datasets; land cover (European Space Agency, 2008), beta 2010 croplands dataset following procedures established by Ramankutty and Foley (1999), nighttime lights (NOAA, 2012), and roads (Center for International Earth Science Information Network - CIESIN & Information Technology Outreach Services - ITOS, 2013). We reclassified the 300-m resolution land cover data into five classes: water, artificial areas, crops, semi-natural, and natural. We removed all cells classified as water and grouped artificial areas and crops in to one converted class. Using the croplands specific dataset that identifies the proportion of a 10-km^2 cell in agriculture, we further refined our three remaining classes of converted, semi-natural, and natural. We switched any cell classified as natural to a converted class if that cell overlapped a cropland cell having a proportion value > 0.995, and switched those semi-natural cells that overlapped cropland cells having proportion values > 0.5. Conversely, any converted or semi-natural cells that overlapped cropland cells having proportion values < 0.005 and < 0.5, respectively, were considered as natural. Finally with this simplistic land cover dataset (i.e. converted or natural), we considered any cell converted if it overlapped a binary raster (300-m resolution) depicting any lit area (NOAA, 2012) or roads (Center for International Earth Science Information Network - CIESIN & Information Technology Outreach Services - ITOS, 2013).

Our analysis identified 76% of the Earth's land (excluding Antarctica) as natural habitat. This estimate is higher relative to previous ones that range from 50-80% (Ellis, Klein Goldewijk, Siebert, Lightman, & Ramankutty, 2010; Hooke & Martin-Duque, 2012; Ramankutty & Foley, 1999) mainly because we used an additional filtering procedure to include rangeland and semi-natural areas as natural given that they can support diverse, native species (Fuhlendorf & Engle, 2001; Lambin & Meyfroidt, 2011; Tscharntke, Klein, Kruess, Steffan-Dewenter, & Thies, 2005) and partially due to our

percentage included rock and ice areas (e.g. Greenland) often removed when calculating overall percentages (Smith et al., 2010). When looking at only ice-free lands our analysis showed 27% being human-dominated which were similar results to Ellis *et al* (Ellis et al., 2010) showing 25% of ice-free land being either densely settled or croplands and nearly matching Hooke *et al* (Hooke & Martin-Duque, 2012) when combining mostly natural lands (46.5%) and mostly uncultivated meadows and pastures (25.8%).

To calculate levels of intactness of natural areas, we applied the Landscape Fragmentation Tool (LFT) (CLEAR, 2010). The LFT tool measures habitat fragmentation and classifies target habitat types into four main categories—core, perforated, edge and patch—based on specified edge effects from anthropogenic disturbance (CLEAR, 2010). Core areas of habitat are outside the edge effect and are not degraded from proximity to disturbance; edge and perforated areas occur along the periphery of habitat tracts containing core areas, with edges making up the exterior peripheries and perforated areas making up the interior edges along small gaps. Patches are small fragments that are completely degraded by the edge effect. We applied an edge-width of two kilometers, a distance used by other global analyses of habitat intactness (Alkemade et al., 2009; SANDERSON et al., 2002) and supported by empirical fragmentation research (Alkemade et al., 2009; Benítez-López, Alkemade, & Verweij, 2010; BROADBENT et al., 2008). We then applied the following ordinal ranking to the LFT output: 7: core areas > 1,000,000 ha, 6: 100,000 ha < core areas < 1,000,000 ha, 5: 10,000 ha < core areas < 100,000 ha, 4: core areas <10,000 ha, 3: perforated areas, 2: edges, 1: patches, and 0: converted areas (lacking natural habitats). These data were resampled from 300 m to 10 km resolution calculating the mean LFT score.   Finally, these mean values were then spatially-ranked and normalized to produce the final ranking.

Full data documentation available at:
http://s3.amazonaws.com/DevByDesign-Web/MappingAppsVer2/bestcat/docs/HabitatIntactness.pdf

Global Species Richness

We produced a global, species richness metric based on combining vertebrate species richness (Jenkins, Pimm, & Joppa, 2013; Pimm et al., 2014) with an ecoregional plant richness dataset(Kier et al., 2005).   To produce vertebrate richness, we summed species richness values for three categories of species; birds, mammals, and amphibians. This produced overall global richness values ranging from 1 to 924. For plant richness, we performed a vector to raster conversion based on species count, which produced cell values ranging from zero to 10,000. Due to differences in the ranges of vertebrate and plant counts, we normalized values based on min/max normalization from zero to one and then summed these normalized values. Finally, these summed values were then spatially-ranked and normalized to produce the final ranking.

Full data documentation available at:
http://s3.amazonaws.com/DevByDesign-Web/MappingAppsVer2/bestcat/docs/SpeciesRichnessGlobal.pdf

Biome Species Richness

We used the same datasets and procedures as identified in producing the global species richness metric however we normalized summaries of vegetation and vertebrate richness for each of the 15 biomes globally and summed these individually. These individual biome summaries were then spatially-ranked and normalized before and merging together to produce one global metric.

Full data documentation available at:
http://s3.amazonaws.com/DevByDesign-Web/MappingAppsVer2/bestcat/docs/SpeciesRichnessBiome.pdf

Threatened Species

We produced a global, threatened species metric based on summing three categories of endangered species; birds, mammals, and amphibians (Jenkins et al., 2013; Pimm et al., 2014). Threatened species were identified by Jenkins *et al.* (2013) and are those species having an IUCN Red List status of; vulnerable, endangered or critically endangered. This produced an overall threatened species count ranging from 1 to 62. These data were then spatially-ranked and normalized to produce the final ranking.

Full data documentation available at:
http://s3.amazonaws.com/DevByDesign-Web/MappingAppsVer2/bestcat/docs/ThreatenedSpecies.pdf

Small-Ranging Species

We produced a global, small-ranging species metric based on summing three categories of small-ranging species; birds, mammals, and amphibians (Jenkins et al., 2013; Pimm et al., 2014). Jenkins *et al.* (2013) identified small-ranging species as those species having geographic range sizes smaller than the global median. The summation produced an overall small-ranging species counts ranging from 1 to 283. These data were then spatially-ranked and normalized to produce the final ranking.

Full data documentation available at:
http://s3.amazonaws.com/DevByDesign-Web/MappingAppsVer2/bestcat/docs/SmallRangingSpecies.pdf

Carbon Stock

We produced a global, carbon stock metric using a global vegetation biomass carbon stocks map (Ruesch & Gibbs, 2008) and the global soil organic carbon density map (Global Soil Data Task Group, 2002). We multiplied soil organic carbon by 1000 to convert kg C/m2 values to 0.01 tons C/hectare (i.e. vegetation biomass units). We then summed these carbon values with units of 0.01 tons C/hectare, maintaining the 1km resolution of the vegetation biomass carbon stock map. Finally, we calculated the average summed value at 10km resolution and area-ranked 1-100 these averages. All unassessed areas were set to -99.

Full data documentation available at:
http://s3.amazonaws.com/DevByDesign-Web/MappingAppsVer2/bestcat/docs/CarbonStock.pdf

Soil Quality

To create a soil quality metric we summed seven layers of soil quality based on constraints with tillage, nutrient availability, oxygen availability, rooting conditions, calcium carbonate and gypsum toxicities, excess salts and nutrient retention capacity (Fischer et al., 2008). Summed seven layers with only constraint values (i.e. None or Slight - 1, Moderate – 2, Severe -3, Very Severe-4). Inverted summed layers so highest value equal highest soil quality. Inverted summed values and normalized to 1-100. All areas without any constraint values (i.e. non-soil and/or permafrost) set to zero.

Full data documentation available at:
http://s3.amazonaws.com/DevByDesign-Web/MappingAppsVer2/bestcat/docs/SoilQuality.pdf

Water Quantity

To produce a water quantity metric, we downloaded the Aqueduct Global Maps 2.0 (Gassert, Luck, Landis, Reig, & Shiao, 2013). This dataset is a polygon feature class representing hydrological catchments with 12 global indicators of

water related issues. All indicators and values supporting these indicators are available within the feature class's attribute table. We calculated water availability by subtracted total withdrawals, identified by the attribute name – "WITHDRAWAL" from the available blue water, identified by the attribute name – "BA". We set all negative values to 0 indicating there is no water currently available for appropriation. We then converted these catchments to a 1km grid using this calculated water availability value. We then added one to all values and calculated the natural log of this value. We then resampled this 1km resolution raster to our standard 10km analysis cell size maintaining the mean value. Finally we min/max normalized values greater than 0 from 1-100. All zero values were added back in indicated a water deficit area.

Full data documentation available at:
http://s3.amazonaws.com/DevByDesign-Web/MappingAppsVer2/bestcat/docs/WaterQuantity.pdf

Table 1. Listing of source data used to produce BESTCAT metrics.

BESTCAT Metric	Source Dataset (date)	Data Reference	Data Access	Permission*
Habitat Intactness	Land cover (2006)	European Space Agency. (2008). GlobCover Land Cover v2 2008 database	http://www.esa.int/spaceinimages/Images/2008/12/Envisat_global_land_cover_map	Both
Habitat Intactness	Croplands (2012)	Beta release following procedures of – Ramankutty, N., & Foley, J. A. (1999). Estimating historical changes in global land cover: croplands from 1700 to 1992. *Global Biogeochemical Cycles*, *13*(4), 997–127	http://www.ramankuttylab.com/	Author
Habitat Intactness	Night-time lights (2012)	NOAA. (2012). Version 4 DMSP-OLS Nightime Lights Time Series. NOAA's National Geophysical Data Center (data and image processing), US Air Force Weather Agency (data collection).	http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html	Both
Habitat Intactness	Roads (2013)	Center for International Earth Science Information Network - CIESIN - Columbia University, and Information Technology Outreach Services - ITOS - University of Georgia. 2013. Global Roads Open Access Data Set, Version 1 (gROADSv1). Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC).	http://sedac.ciesin.columbia.edu/data/set/groads-global-roads-open-access-v1	Both
Global & Biome Species Richness	Plants (2005)	Kier, G., Mutke, J., Dinerstein, E., Ricketts, T. H., Küper, W., Kreft, H., & Barthlott, W. (2005). Global patterns of plant diversity and floristic knowledge. *Journal of Biogeography*, *32*(7), 1107–1116. doi:10.1111/j.1365-2699.2005.01272.x	http://databasin.org/datasets/43478f840ac84173979b22631c2ed672	Doc
Global & Biome Species Richness	Species Richness for Birds, Mammals, and Amphibians (2011)	Jenkins, CN, SL Pimm, LN Joppa (2013) Global Patterns of Terrestrial Vertebrate Diversity and Conservation. *PNAS* 110(28): E2602-E2610. doi: 10.1073/pnas.1302251110 Pimm, SL, CN Jenkins, R Abell, TM Brooks, JL Gittleman, LN Joppa, PH Raven, CM Roberts, JO Sexton (2014) The biodiversity of species and their rates of extinction,	http://databasin.org/datasets/bdc972049e0f476481e2c1f572fe7eeb or http://biodiversitymapping.org/download.htm	Both

		distribution, and protection. *Science* 344(6187): 1246752		
Biome Species Richness	Biomes (2001)	Olson, D. M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G. V. N., Underwood, E. C., Kassem, K. R. (2001). Terrestrial Ecoregions of the World: A New Map of Life on Earth. *BioScience*, *51*(11), 933. doi:10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2	http://databasin.org/datasets/68635d7c77f1475f9b6c1d1dbe0a4c4c	Doc
Threatened and Small-Ranging Species	Threatened and small-ranging Birds, Mammals, and Amphibians (2011)	Jenkins, CN, SL Pimm, LN Joppa (2013) Global Patterns of Terrestrial Vertebrate Diversity and Conservation. *PNAS* 110(28): E2602-E2610. doi: 10.1073/pnas.1302251110 Pimm, SL, CN Jenkins, R Abell, TM Brooks, JL Gittleman, LN Joppa, PH Raven, CM Roberts, JO Sexton (2014) The biodiversity of species and their rates of extinction, distribution, and protection. *Science* 344(6187): 1246752	http://databasin.org/datasets/bdc972049e0f476481e2c1f572fe7eeb or http://biodiversitymapping.org/download.htm	Both
Carbon	Biomass Carbon Map (2000)	Ruesch A, Gibbs HK (2008) New IPCC Tier-1 Global Biomass Carbon Map For the Year 2000. *Science* 344(6187): 1246752	http://databasin.org/datasets/2d7ed4b20ed2439f8ba3d2976d6aa801 or http://cdiac.ornl.gov/	Doc
Carbon	Soil Organic Carbon Density (2002)	Global Soil Data Task Group (2002) Global Soil Organic Carbon Density in kg Carbon/m2 to 1 meter depth.	http://databasin.org/datasets/a4cb6d367eae4e52a08902874f8bfedf or http://www.sage.wisc.edu/atlas/maps.php?datasetid=21&includerelatedlinks=1&dataset=21	Doc
Soil Quality	Soil Qualities for Crop Production (2008)	Fischer, G., F. Nachtergaele, S. Prieler, H.T. van Velthuizen, L. Verelst, D. Wiberg, 2008. *Global Agro-ecological Zones Assessment for Agriculture (GAEZ 2008)*. IIASA, Laxenburg, Austria and FAO, Rome, Italy.	http://databasin.org/search/#query=Global%20Agro-ecological%20Zones%20Assessment%20for%20Agriculture or http://webarchive.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/SoilQualityData.html?sb=11	Doc
Water	Aqueduct Global	Gassert, F., M. Luck, M. Landis, P. Reig, and T. Shiao. 2013.	http://www.wri.org/resources/data-	Doc

| Quantity | Maps 2.0 (2013) | "Aqueduct Global Maps 2.0." Working Paper. Washington, DC: World Resources Institute. Available online at http://wri.org/publication/aqueduct-global-maps-20. | sets/aqueduct-global-maps-20 | |

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Data Access

Data Request Dialog

To access data produced in the analysis, the user needs to click on the Data Request link found in the upper-right corner of the application and fill out the Data Request dialog (Figure 9). The user must fill out all information and accept the data use clause by clicking on the check box. To view the data use clause, the user can click on the View Clause link. Then by clicking on the Submit Request button, a table listing available data to download will be produced within this dialog, e.g. Figure 10. The user can then download data by clicking on the *File Access* links provided.

Figure 12. Initial data request dialog
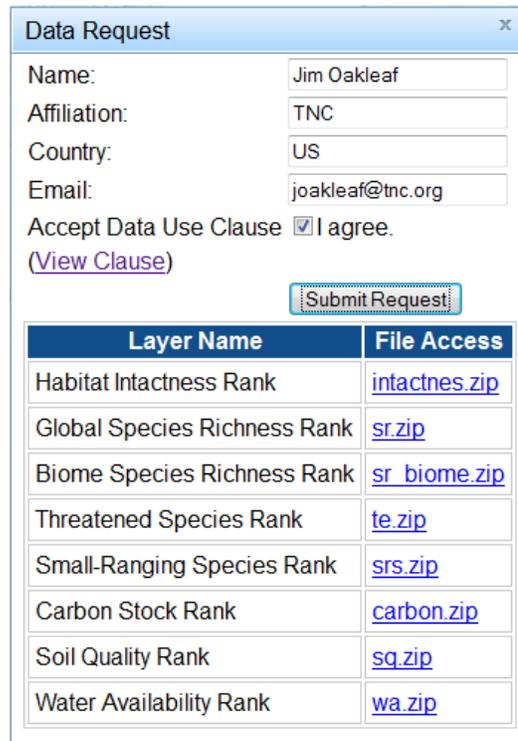
Figure 13. Data request dialog after submitting

Settings Necessary for Data Access with Internet Explorer

When using Internet Explorer (IE), most users using standard security settings will need to make minor changes to these settings in order to be presented with a list of downloadable data. To access these settings users will go the Tools>Internet Options link and select the security tab (Figure 14).   The users must add in http://184.72.33.222 and http://s3.amazonaws.com as a trusted site. It will be necessary to uncheck *Require server verification.* in order to add these two websites (Figure 10). The user must also *Enable* for *Access data sources across domains* within the Security Settings – Trusted Sites Zones dialog (Figure 15).   To access this dialog, the user needs to click on the Custom level. button within the Internet Options> Security tab (Figure 16). Once these settings have been changed the user must reload the application with IE browser window, again click on the Data or Report Request link, fill out the
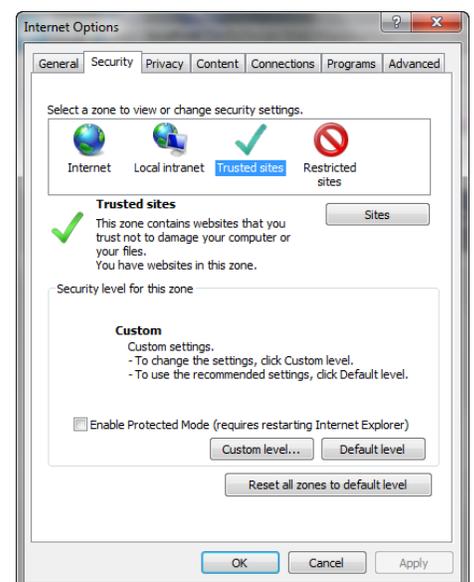

Figure 14. Internet Explorer Options dialog.

form and click on the Submit Request button. This time the user should obtain a list of downloadable data for the application.
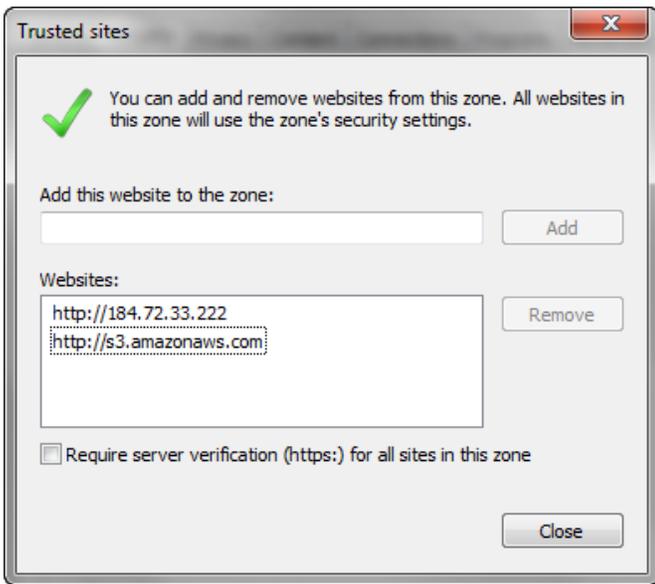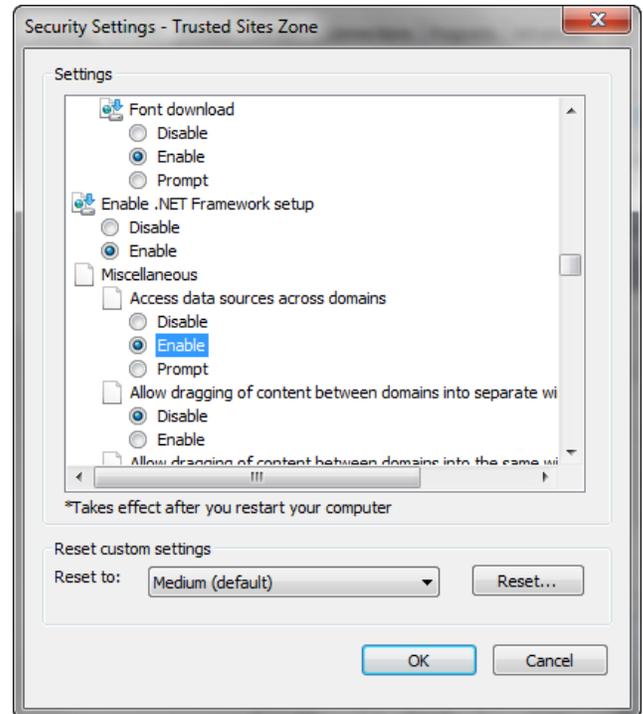

Figure 15. Trusted sites dialog

Figure 16. Security Settings dialog.

Technical Description of Application

BESTCAT was developed using HTML, CSS and JavaScript with mapping functionality built using the ArcGIS API for JavaScript hosted by ESRI. Maps being displayed and all analysis routines are built using ESRI ArcGIS Server technology. BESTCAT has been developed and tested for use in Firefox 36, Google Chrome 41 and Internet Explorer 11. It has also been tested successfully to run in older versions of these browsers but may require different methods and specific settings listed below.

All Browser Requirements

- BESTCAT will require the user turn off the popup blocker within their browser or at minimum allow for popups from this site.

Internet Explorer 9 and 8

- You will need to use the browse button (Figure 17) in the upload panel instead of dragging and dropping the CSV file on to the map.

Internet Explorer 8 only

- Saving output from Results Table (ie Save Table button) will not produce dialog for saving and instead will require the user save the output to a text file through the Save As menu in the IE8 toolbar. This text file can then be moved into Excel via the import text file within the Excel application.
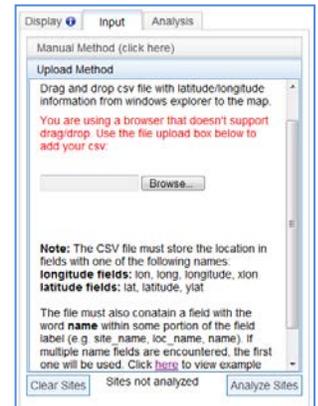

Figure 17. Upload panel for older version of IE

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