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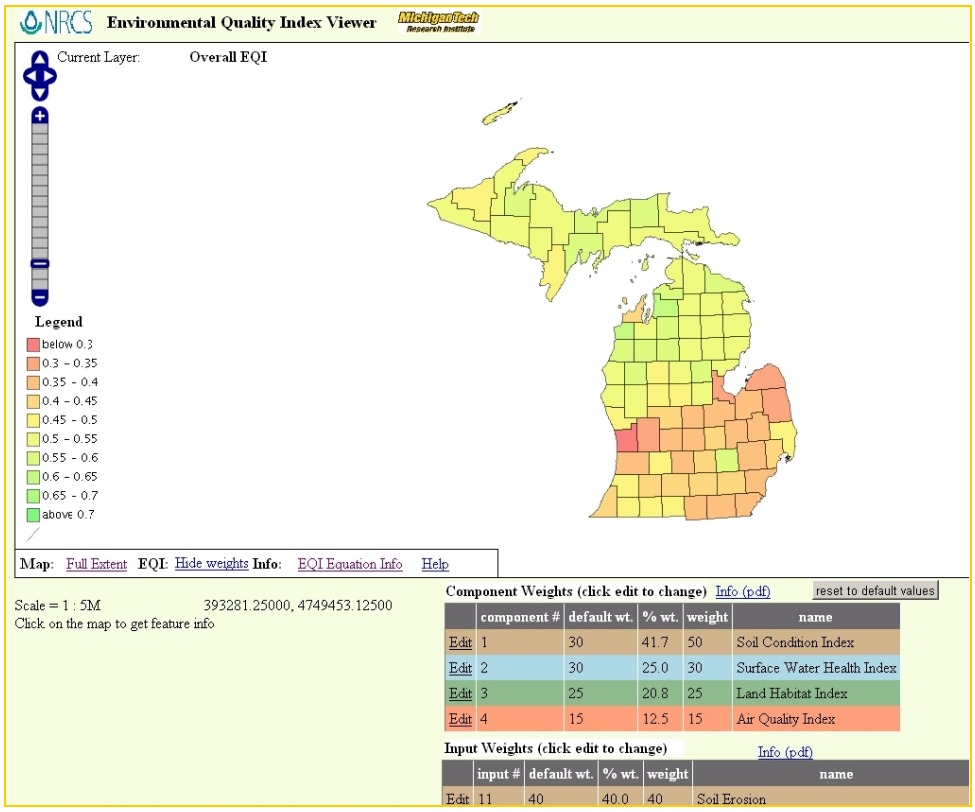

NRCS Data Viewers Technical Documentation

Environmental Quality Index (EQI) Data Viewer ProTracts Data and Expected Benefit Viewer

Tyler Erickson, Eric Keefauver

May 2008

NRCS Data Viewers
Technical Documentation

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ProTracts Data and Expected Benefit Viewer

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May 2008

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Introduction

This report provides an overview of the internet mapping applications that have been developed by MTRI for the Michigan NRCS State Office. The applications described include the:

Environmental Quality Index Viewer - This application allows users to map indexes of environmental quality for counties in the state of Michigan. Information on the concepts and inputs used for the EQI are given in the Year 4 reports: *The Environmental Quality Index Approach: Concepts, methods, and demonstration of the EQI approach for NRCS conservation program assessment* and *Inputs to the Environmental Quality Index*.

ProTracts Data and Expected Benefit Data Viewer - This application allows users to map summaries of ProTracts implementation data for counties in the state of Michigan. Information on the development and use of the Expected Benefits data is given in the Year 4 report: *The Environmental Quality Index Approach: Concepts , methods, and demonstration of the EQI approach for NRCS conservation program assessment.*

Tiffin River Study Area Viewer - This application allows users to interactively map reference layers and water quality data collected in the Tiffin River watershed study area. Information on the collection and analysis of the water quality data collected for the Tiffin River Watershed study is given in the Year 4 report: *Report on In-situ Water Quality Monitoring over Three Years in the Upper Tiffin River, Michigan.*

These applications were developed to provide various functionality for a variety of user groups as described below in the following sections.

System Architecture

In 2007, the national office of the NRCS made the decision to deemphasize the use of ESRI products and to increase the use of other software packages for geospatial analysis and visualization. This change may include the use of software from other commercial companies (such as Microsoft's Virtual Earth) as well as Open Source software. Open Source is a development method based on a set of principles and practices related to writing software that allows for access to the underlying source code. Open source software is distributed under an license that makes the code available under flexible terms that allow for modification and redistribution without having to pay the original author(s). Some noteworthy reasons for utilizing Open Source software are:

- The software is made available to users without charge
- The software source code is open and available for modification and customization
- Simpler systems can be implemented, since no license server is needed to authorize usage Additional information on Open Source principles and their meaning can be found at http://www.opensource.org/docs/definition.php.

Recognizing that the capabilities of storage, analysis, and visualization software programs will continue to evolve, we have designed the visualization systems to be 'loosely-coupled'. Loose coupling of software components allows components to be replaced as needed (due to functionality enhancements, licensing costs) with minimum disruption to the entire system. The intention is to create data systems that can be continually easily improved upon as new software becomes available.

Open Source Software

Following the lead of the NRCS plan of diversifying their use of geospatial software applications, MTRI has developed internet mapping applications using predominantly Open Source software components. The following is a list and brief description of the open source software used in the development of the data viewers.

PostgreSQL / PostGIS

PostgreSQL is an object-relational database management system. It is a highly functional, efficient and robust database management system that supports the SQL Standard. PostGIS is an open source extension to the PostgreSQL database that adds support for geographic objects. This includes support for geometry data types, spatial operators for determining geospatial measurements and operations (such as union, buffer, intersection) and spatial indexes for efficient spatial searches. PostGIS is comparable in functionality to proprietary counterparts such as ESRI's ArcSDE (Spatial Data Engine) software and Oracle's Spatial extension.

References: http://postgis.refractions.net/, http://www.postgresql.org/

GeoServer

GeoServer is an open source geo-spatial server that serves geo-referenced data to the internet in a variety of formats. GeoServer implements open standards that allow for the publishing of geospatial

data as maps/images and features. The focus of the software is ease of use and support for open standards, allowing anyone to rapidly share their geospatial information.

GeoServer Version 1.6.2 was used for the EQI Data Viewer and ProTracts Data and Expected Benefit Viewer.

Reference: http://geoserver.org/display/GEOS/GeoServer+Home

OpenLayers

OpenLayers is an open source JavaScript library that is used to display geo-spatial vector and raster data on web pages that can be displayed by standard web browsers. OpenLayers creates a 'slippy map' that users can pan and zoom.

Reference: http://www.openlayers.org/

Apache Web Server

The Apache HTTP Server is a popular free web server developed and maintained by the Apache Software Foundation. The Apache HTTP Server is the most popular web server software in the world.

An Apache HTTP Server is used to authenticate users and authorize access to the map images served by the GeoServer application.

Reference: http://httpd.apache.org/

Proprietary Software

Microsoft IIS 6.0

Microsoft IIS 6.0 is a proprietary web server that runs on the Windows operating system.

Reference: http://www.microsoft.com/WindowsServer2003/iis/default.mspx

Environmental Quality Index (EQI) Data Viewer

Target User Group: State Office Conservationists
Functionality:

- Allows users to map Environmental Quality Index data by county for the state of Michigan. Users can control what dataset (EQI inputs, EQI component, or overall EQI) are displayed on the map.
- Allows users to display the overall EQI score, the EQI component scores, and the EQI data input scores for a selected county in a tabular format.
- Allows users to interactively edit the relative weights of EQI input datasets and the weights of EQI components. Changes to the weights are immediately propagated to the maps and tabular outputs.

The following diagram show an overview of the software components used by the EQI Viewer (Figure 1).

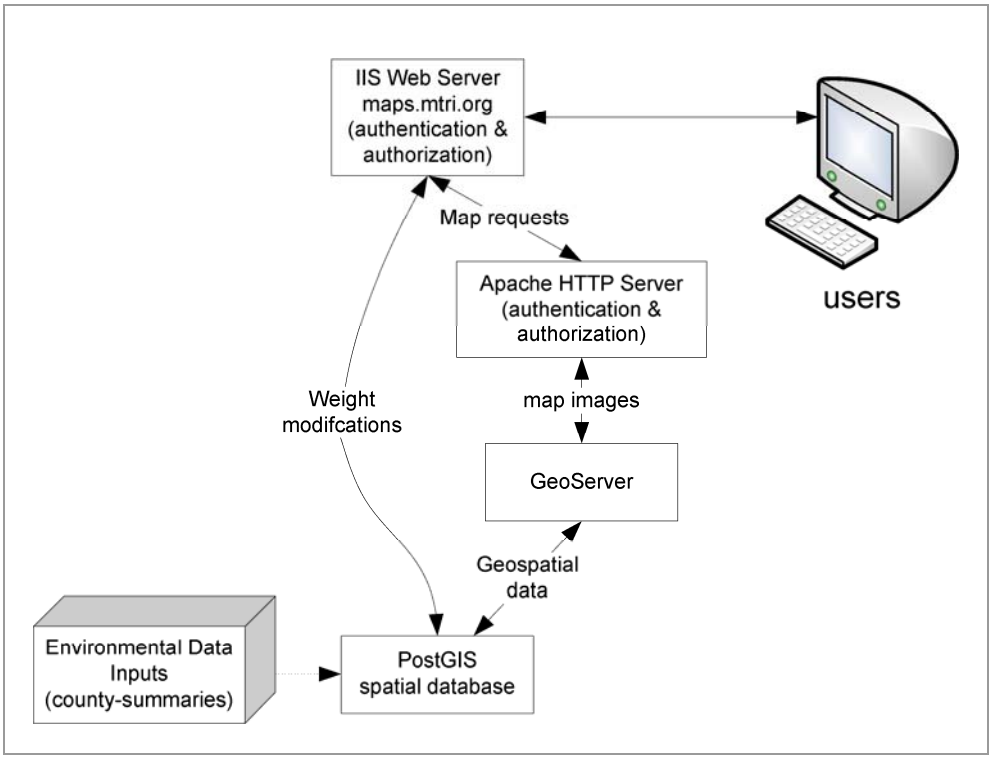

Figure 1: Overview of the software components used by the EQI Viewer.

Spatial Database

The EQI Viewer uses a PostGIS database to manage the spatial (county polygons) and tabular (environmental input summaries) EQI data. Both the EQI Data Viewer and ProTracts Data and Expected Benefit Data Viewer applications use data stored in a database name 'weighted_index_sql'. GeoServer uses the username 'geoserver' to access this information contained within this database.

The relationships between the database tables and views used by the EQI Data Viewer is illustrated below in Figure 2.

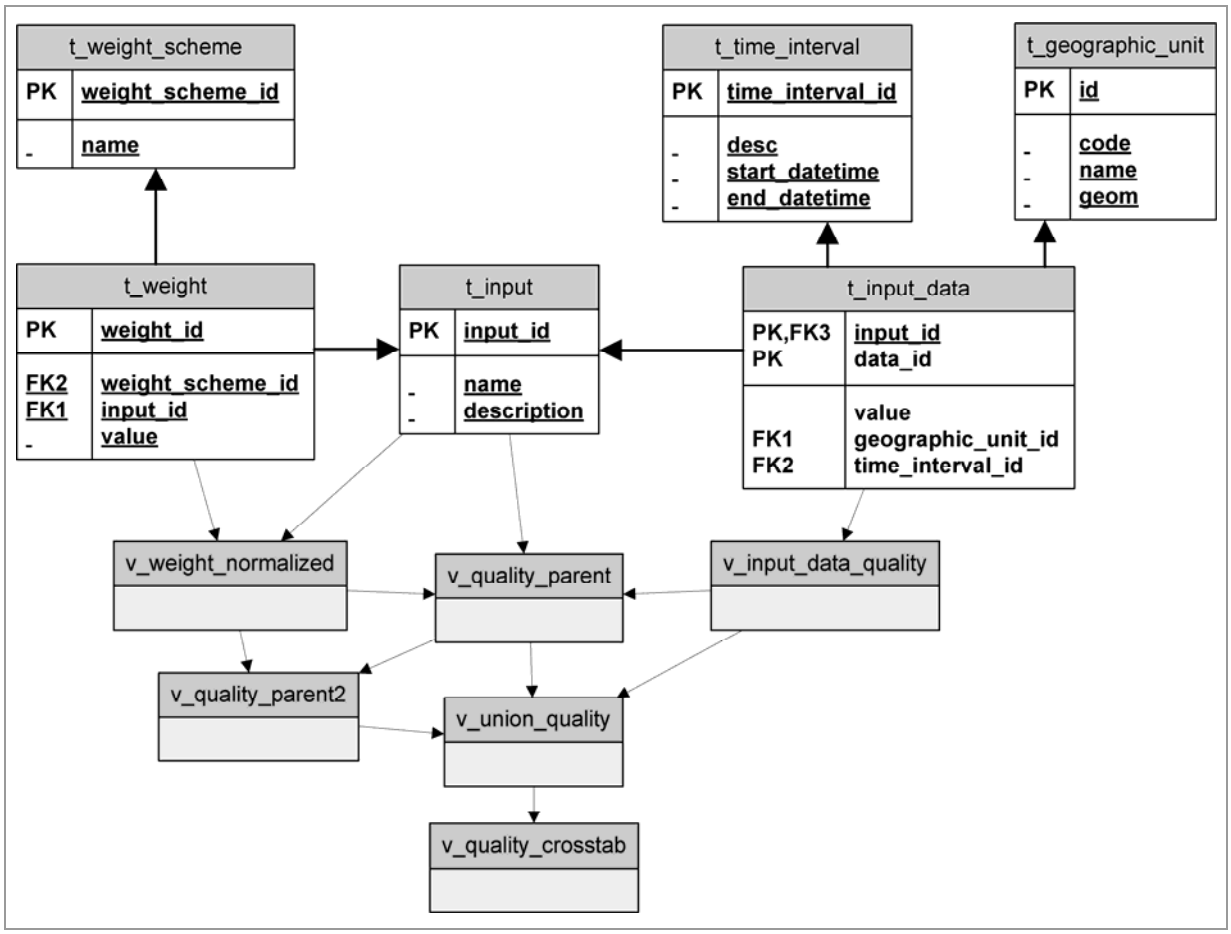

Figure 2: The relationships between the database tables and views used by the EQI Data Viewer

A brief overview of the functionality of the database tables and views is given below. For a full description of the database objects is given in the Appendix.

Environmental input data is loaded into the t_input_data table. Each record in this table contains information on a summary statistic of an environmental parameter for a particular geographic unit (i.e. county) and time interval in the native units of that parameter. The v_input_data_quality view converts the data records into normalized 'quality' scores between 0 and 1. The v_quality_parent view calculates the quality score for EQI components by weighting the quality scores of data inputs according to weights in the t_weight table. The v_quality_parent2 view calculates the overall EQI score by weighting the quality scores of the EQI components. The EQI data is then aggregated in to a single view (v_union_quality) and reorganized into a format that is usable by the GeoServer application (v_quality_crosstab).

Spatial Server

The GeoServer application is configured to merge and format the spatial and tabular data from the spatial database and serve it in a format that is usable by the client application of the EQI Data Viewer. To accomplish this, GeoServer needs to have access to several database objects in the weighted_index_sql database, and needs information on how that data should be symbolized (or styled). Figure 3 summarizes the GeoServer objects (FeatureTypes and Styles) that were created to enable the serving of the EQI data.

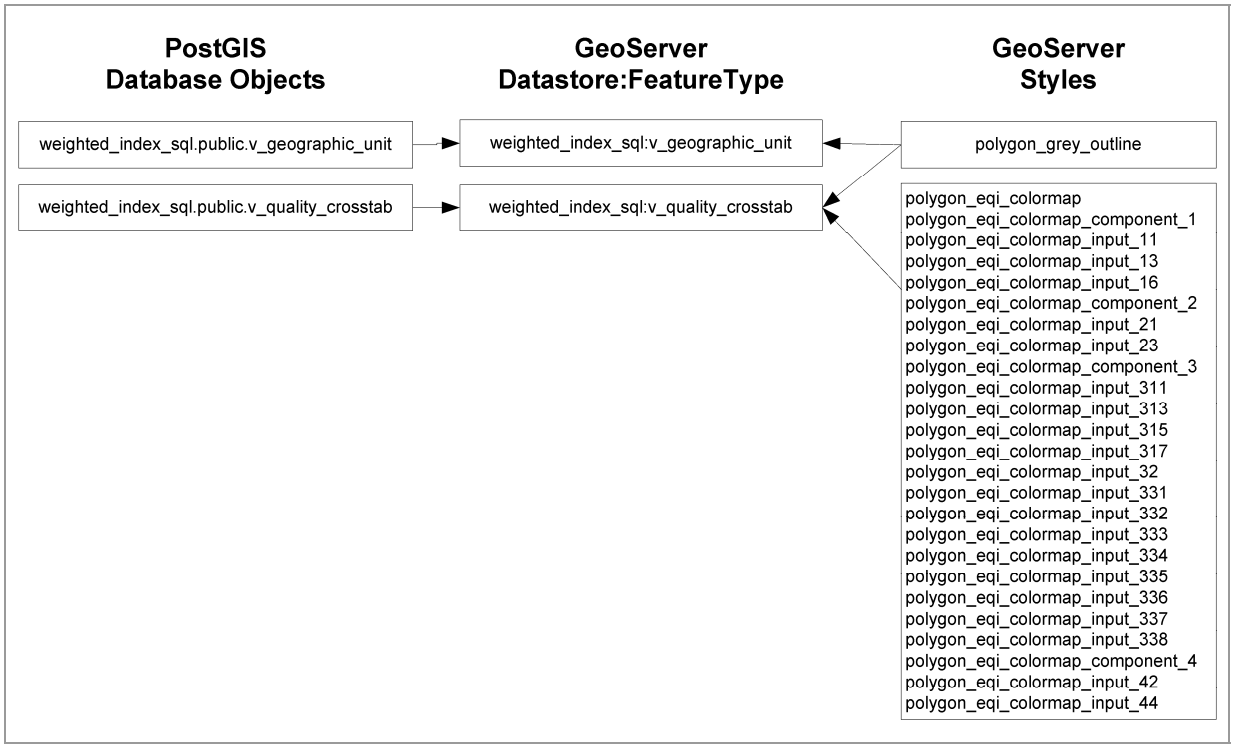

Figure 3: Summary of the GeoServer objects (FeatureTypes and Styles) that were created to enable the serving of the EQI data

Web Server

The Microsoft Internet Information Server (IIS) web server is is used to serve the web pages used for the EQI Data Viewer. This web server was chosen to allow the developers to use .NET web controls to edit records in the underlying database, which allows users to change the EQI data weights. Specifically, the Grid View control allowed for user interaction in editing and modifying component and input values (weights) of the EQI in an efficient manner within an organized display.

The Open Layers JavaScript library was used to create an interactive map in web browsers. Users can select which data layer is to be displayed, and GeoServer creates a stylized (colored) image based on the value of the displayed EQI score. An example screenshot of the EQI Data Viewer is shown below in Figure 4.

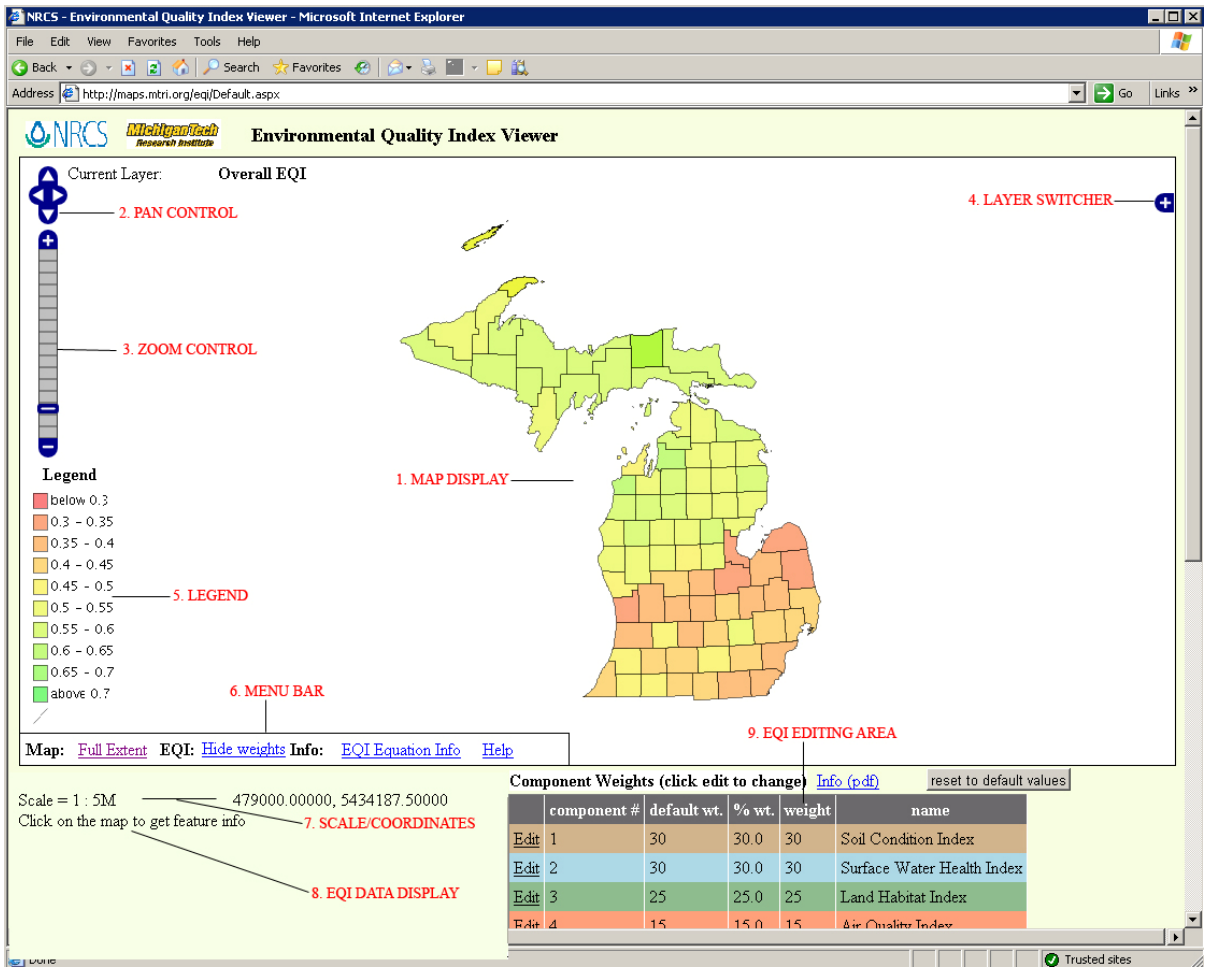

Figure 4: An example screenshot of the EQI Data Viewer.

The EQI Data Viewer can be accessed using the following URL. Users must supply an authorized username and password to access the page. Authentication and authorization is controlled by an Apache HTTP Server.

http://maps.mtri.org/eqi

The EQI Data Viewer website is best viewed using Microsoft's Internet Explorer web browser.

ProTracts Data and Expected Benefit Viewer

Target User Group: Area and State Office Conservationists
Functionality:

- Allows users to map summaries of ProTracts Implementation data by county for the state of Michigan. Users can select a variety of criteria that limit the records that are summarized.
- Allows users to produce summary tables for a selected county.

Figure 5 is diagram showing an overview of the software components used by the ProTracts Data and Expected Benefit Viewer.

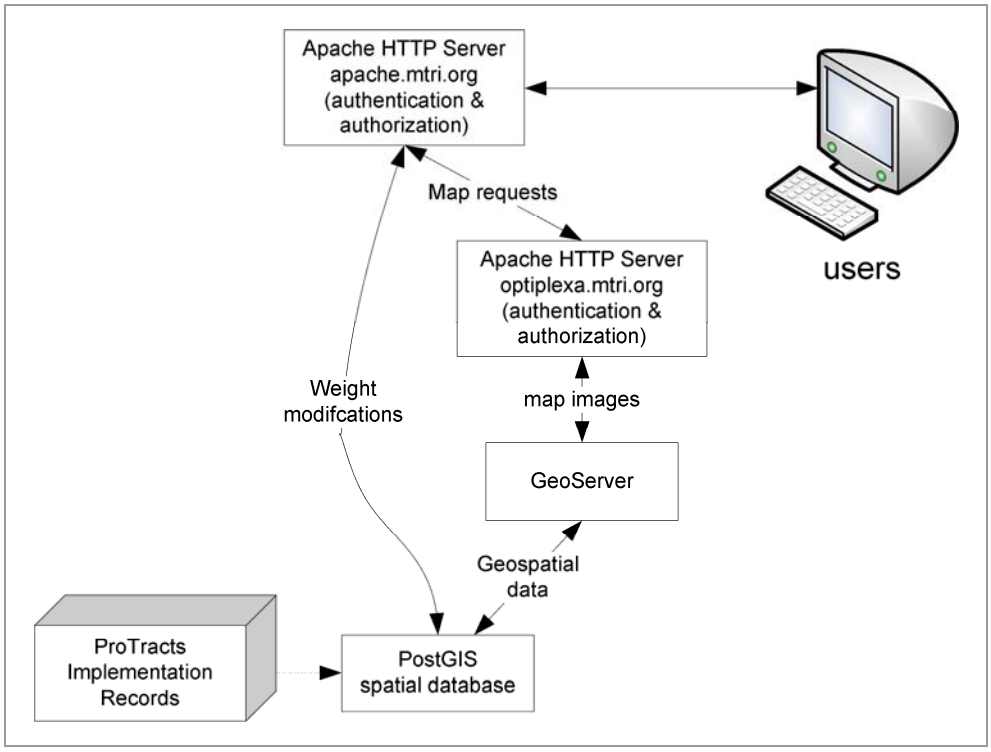

Figure 5: Overview of the software components used by the ProTracts Data and Expected Benefit Viewer.

Spatial Database

The ProTracts Data and Expected Benefit Viewer uses a PostGIS database to manage the spatial (county and administrative area polygons) and tabular (ProTracts implementation records) data. Both the EQI Data Viewer and ProTracts Data and Expected Benefit Data Viewer applications use data stored in a database name 'weighted_index_sql'. GeoServer uses the username 'geoserver' to access this information contained within this database.

The relationships between the database tables and views used by the EQI Data Viewer is illustrated below in Figure 6.

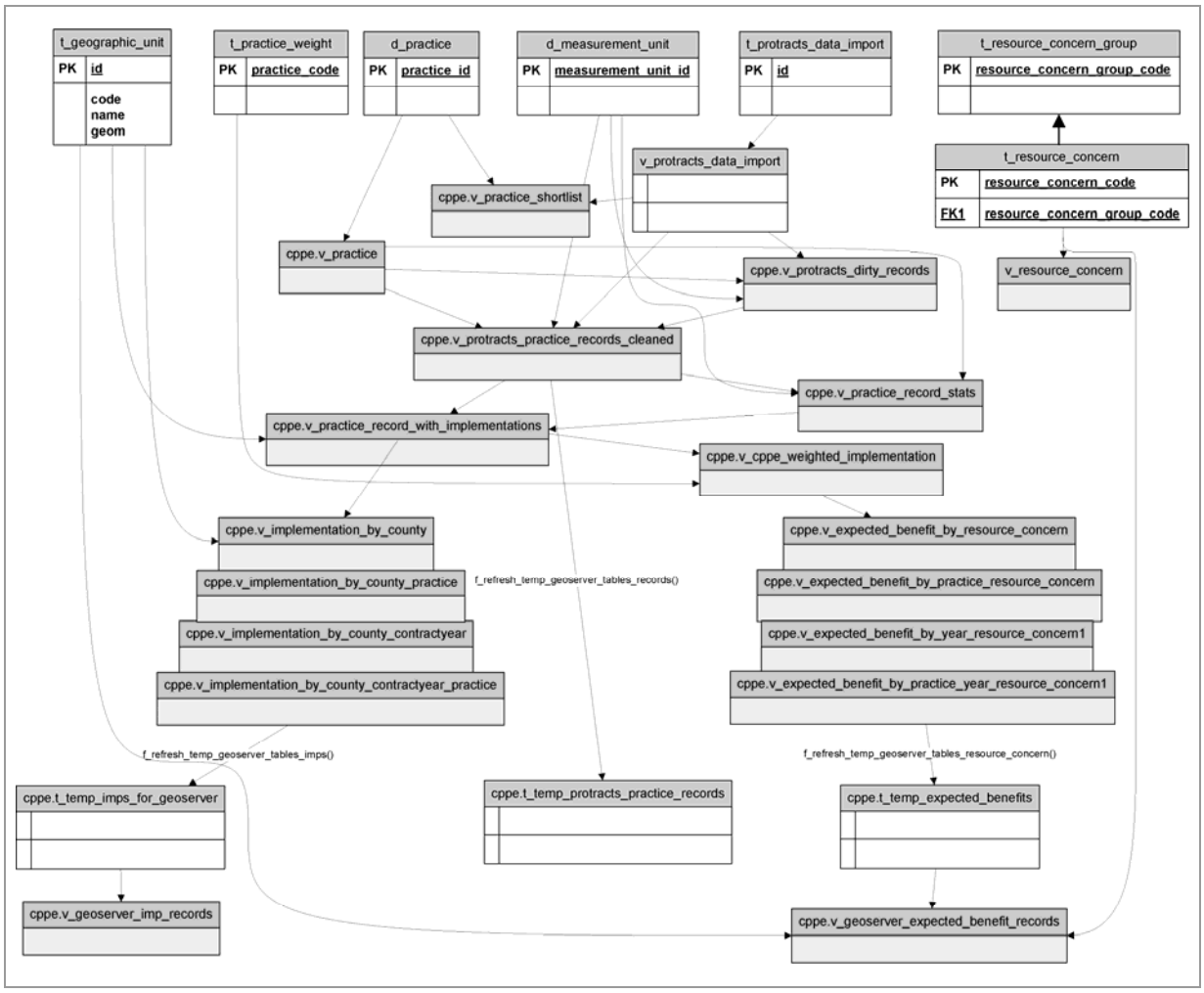

Figure 6: Relationships between the database tables and views used by the EQI Data Viewer is illustrated

Loading ProTracts Data Records

ProTracts Implementations records are downloaded from the ProTracts website (http: prohome.nrcs.usda.gov). Contracts are exported as Microsoft Excel files for one program at a time (CSP, EQIP 1996, EQIP 2002, WHIP) using the 'All Contracts Returned' and 'One line per contract and item' export options. The exported Excel files are opened in Excel, the cell formats of the 'Amount' and 'Contract Acres' columns are change to 'General' and then the files are saved as CSV text files.

The ProTracts data records are imported into the PostGIS database using the following commands:

1. clear the existing records

   ```
   DELETE FROM cppe.t_protracts_data_import;
   ```

2. Open the PostgreSQL Query window and execute the following SQL statements...

Import Code

```
COPY cppe.t_protracts_data_import
    (program_code, state_name, county_name, field_office, participant,
       contract_no, contract_status, contract_obligation, contract_payments,
       contract_acres, contract_item, practice_code, practice, units,
       item_amount, year_planned, item_status, item_obligation, item_payment_status,
       item_payment)
  FROM 'C:/temp/ProtractsExportData_CSP.csv'
  WITH CSV HEADER;

COPY cppe.t_protracts_data_import
    (program_code, state_name, county_name, field_office, participant,
       contract_no, contract_status, contract_obligation, contract_payments,
       contract_acres, contract_item, practice_code, practice, units,
       item_amount, year_planned, item_status, item_obligation, item_payment_status,
       item_payment)
  FROM 'C:/temp/ProtractsExportData_EQIP1996.csv'
  WITH CSV HEADER;

COPY cppe.t_protracts_data_import
    (program_code, state_name, county_name, field_office, participant,
       contract_no, contract_status, contract_obligation, contract_payments,
       contract_acres, contract_item, practice_code, practice, units,
       item_amount, year_planned, item_status, item_obligation, item_payment_status,
       item_payment)
  FROM 'C:/temp/ProtractsExportData_EQIP2002.csv'
  WITH CSV HEADER;

COPY cppe.t_protracts_data_import
    (program_code, state_name, county_name, field_office, participant,
       contract_no, contract_status, contract_obligation, contract_payments,
       contract_acres, contract_item, practice_code, practice, units,
       item_amount, year_planned, item_status, item_obligation, item_payment_status,
       item_payment)
  FROM 'C:/temp/ProtractsExportData_WHIP.csv'
  WITH CSV HEADER;
```

A brief overview of the functionality of the database tables and views is given below. For a full description of the database objects is given in the Appendix.

ProTracts Implementation records are contained in the t_protracts_data_import table. Cancelled records are filtered out by the cppe.v_protracts_data_import view. Records that have non-standard units are filtered out by the cppe.v_protracts_dirty_records and cppe.v_protracts_practice_records_cleaned views. The size (amount) of a 'typical' implementation is calculated by the cppe.v_practice_record_stats view, and cppe.practice_record_with_implementations added a normalized implementation field based on the implementation amount and the 'typical' implementation amount.

Implementation Summaries

The four cppe.v_implementation_by_county views summarize the implementations and normalized implementations by county for all combinations of practice and contract year. The cppe.t_temp_imps_for_geoserver is a temporary table that stores the implementations by county statistics, and the cppe.v_geoserver_imp_records view combines the data with a county geometry field that is used by GeoServer to create county outlines.

Expected Benefit Summaries

The cppe.v_cppe_weighted_implementation view calculates the expected benefit of each implementation record based on the weights contained in the t_practice_weight table, which contains NRCS Conservation Practice Physical Effects (CPPE) weights. The four

cppe.v_expected_benefit_by_resource_concern views summarize the total expected benefit by county for all combinations of practice and contract year. The cppe.t_temp_expected_benefits is a temporary table that stores the expected benefit by county statistics, and the cppe.v_geoserver_expected_benefit_records view combines the data with a county geometry field that is used by GeoServer to create county outlines.

Spatial Server

The GeoServer application is configured to merge and format the spatial and tabular data from the spatial database and serve it in a format that is usable by the client application of the ProTracts Data Viewer. To accomplish this, GeoServer needs to have access to several database objects in the weighted_index_sql database, and needs information on how that data should be symbolized (or styled). Figure 7 summarizes the GeoServer objects (FeatureTypes and Styles) that were created to enable the serving of the ProTracts implementation records data.

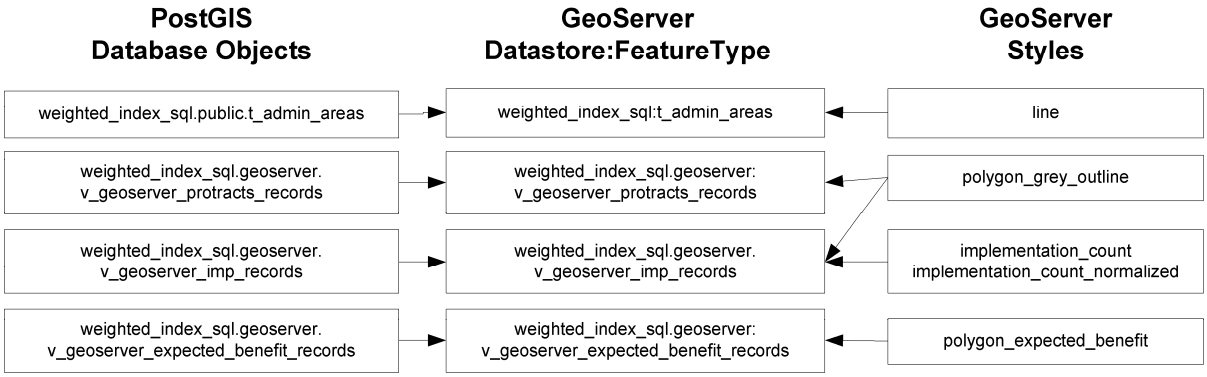

Figure 7: Summary of the GeoServer objects (FeatureTypes and Styles) that were created to enable the serving of the ProTracts implementation records data

Website

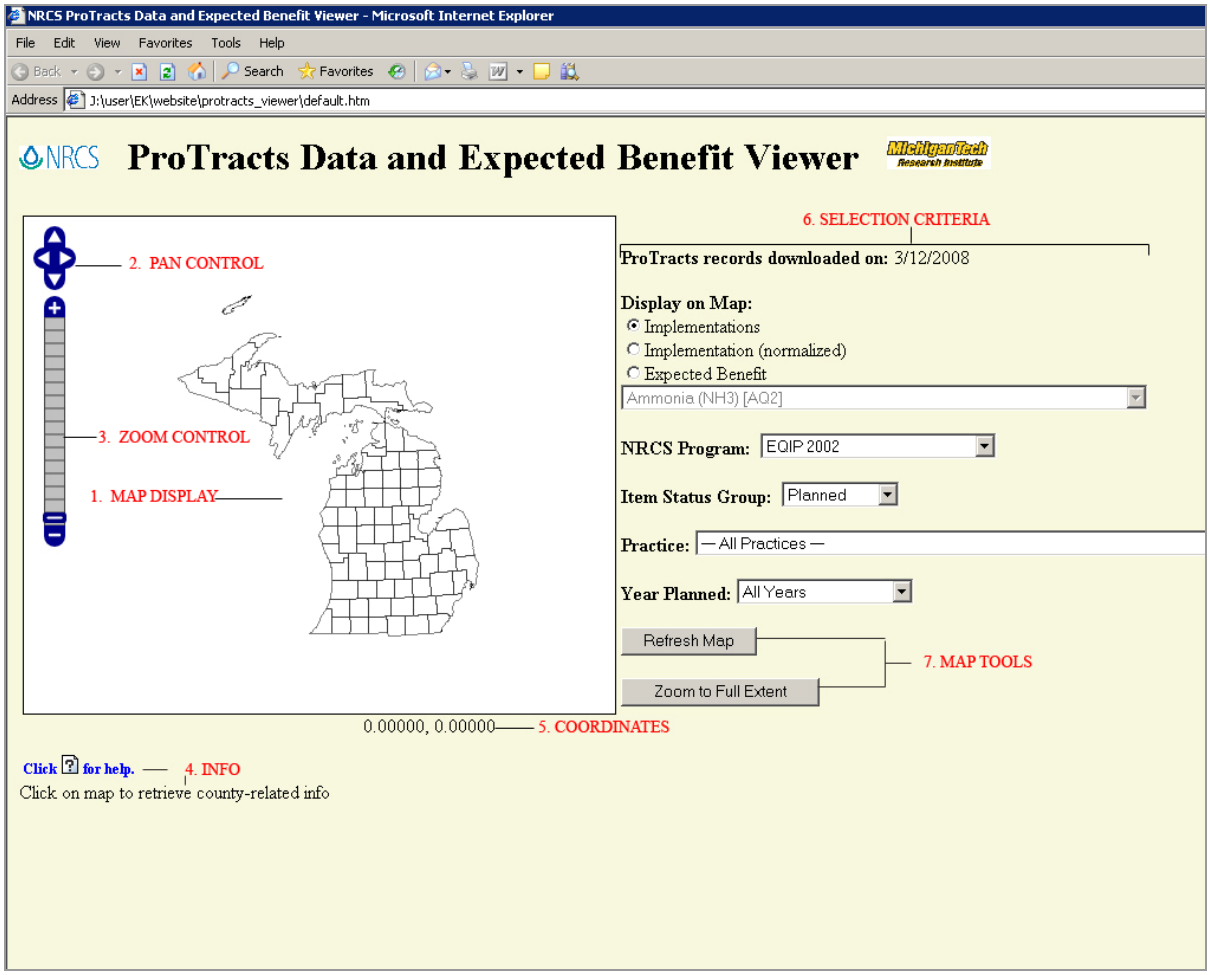

Figure 8: ProTracts Data and Expected Benefit Viewer Screen Capture.

The ProTracts Data and Expected Benefit Viewer can be accessed using the following URL.

http://apache.mtri.org/protracts_data_viewer/

The data viewer is best viewed using Firefox or Internet Explorer web browsers.

Apache

The Apache Web Server is is used to serve the web pages used for the ProTracts Data and Expected Benefit Data Viewer. The Apache web server was chosen because it is an industry standard open-source web server that is available at no cost.

User authentication an authorization is represented in a two-tiered security implementation. Basic Authentication is employed at the IIS level utilizing a username and password. A second tier of security is in place at the GeoServer level to protect the NRCS data sets from being viewed by unauthorized individuals.

Tiffin River Study Area Viewer

Target User Group: Area and State Office Conservationists
Functionality:

- Provides secure access to NRCS geospatial data sets via the internet.
- Provides method of creating simple dynamic maps related of water quality data.
- Provide basic set of GIS tools for analyzing NRCS data
- Provide a comparison water quality dataset for evaluating the AnnAGNPS model outputs run on the Tiffin River watershed

Overview

Over the past four years, Michigan Tech Research Institute has been working with the Michigan office of the USDA Natural Resources Conservation Service (MI-NRCS) through a cooperative agreement to help evaluate the impacts of NRCS programs and improve program management and communication. Information on the collection and analysis of the water quality data collected for the Tiffin River Watershed study is given in the Year 4 report: *Report on In-situ Water Quality Monitoring over Three Years in the Upper Tiffin River, Michigan.* In Year 2, the MTRI/MI-NRCS Cooperative Agreement included a number of program elements, one of which included building a prototype Internet Map Server (IMS) sites to support NRCS activities at both the statewide level, and for the Tiffin River Watershed project. Year 3 focused more on the creation of a more user friendly interface as well as the creation of geo-spatial data sets related to NRCS operations. By customizing a user friendly interface and placing NRCS data in an IMS application, any NRCS employee with Internet access and the appropriate login and password can view and map the relevant data through a normal web browser. The NRCS could also offer the information to its clients and other members of the public as it deemed appropriate.

Software and Hardware Architecture

The Tiffin River Study Area viewer was developed for the NRCS using ESRI ArcIMS software (version 9.1) utilizing Windows Server 2003 server running the Apache web server version 2.0.48 and the Tomcat 4.1 "servlet" software. The site was built using ESRI's HTML viewer that utilizes a JavaScript code base, where additional software installations on the client side would not be necessary. In addition, this programming environment allows for customization of the viewer to provide for a more user-friendly interface providing visualization and analysis of NRCS data.

Website

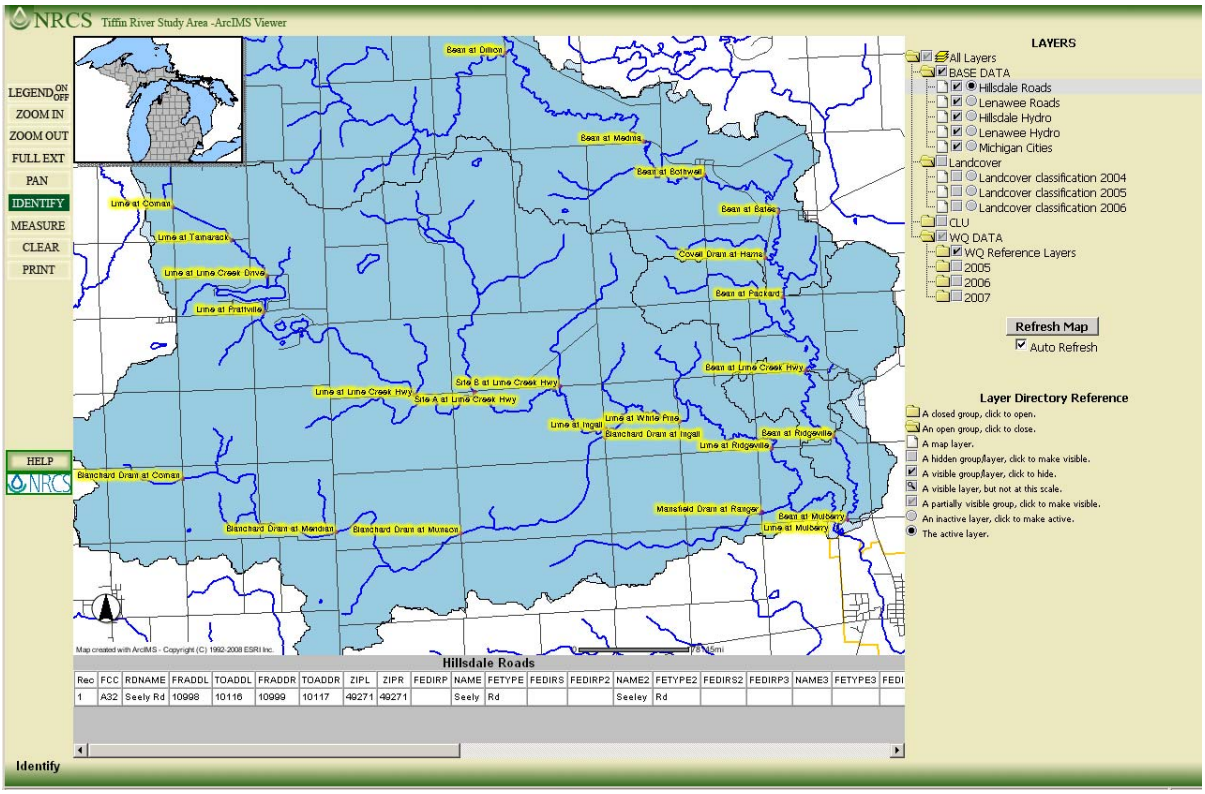

Figure 9: Screen capture of the Tiffin River Study Area Viewer

The Tiffin River Study Area Viewer can be accessed using the following URL.

http://maps.mtri.org/website/NRCS_UTM/viewer.htm

The data viewer is best viewed using Firefox or Internet Explorer web browsers.

Customizations and Geo-spatial Data

Customizations

As part of the year three activities MTRI made efforts to customize the utility, look and feel of the out-of-the-box standard ArcIMS interface to one that is more intuitive and user-friendly. This was accomplished in three major customization efforts; Toolbar Enhancements , increased Data Directory organization, and the creation of an online user help guide.

Toolbar - First, the toolbar has been enhanced with a larger set of labeled buttons to make it clear the functionality of each tool. This enhancement creates a toolbar that is easier to employ with users having a more clear idea of the functionality available to them, as seen in Figure 10.

Figure 10: Toolbar screen capture.

Table of Contents (data) - A second major customization is the development of a more organized and efficient method of geo-spatial data organization. This data table of contents functions as a series of nested folders that reflects the system employed in Microsoft's window explorer. This lends to easy access and navigation to the all the spatial data that is available.

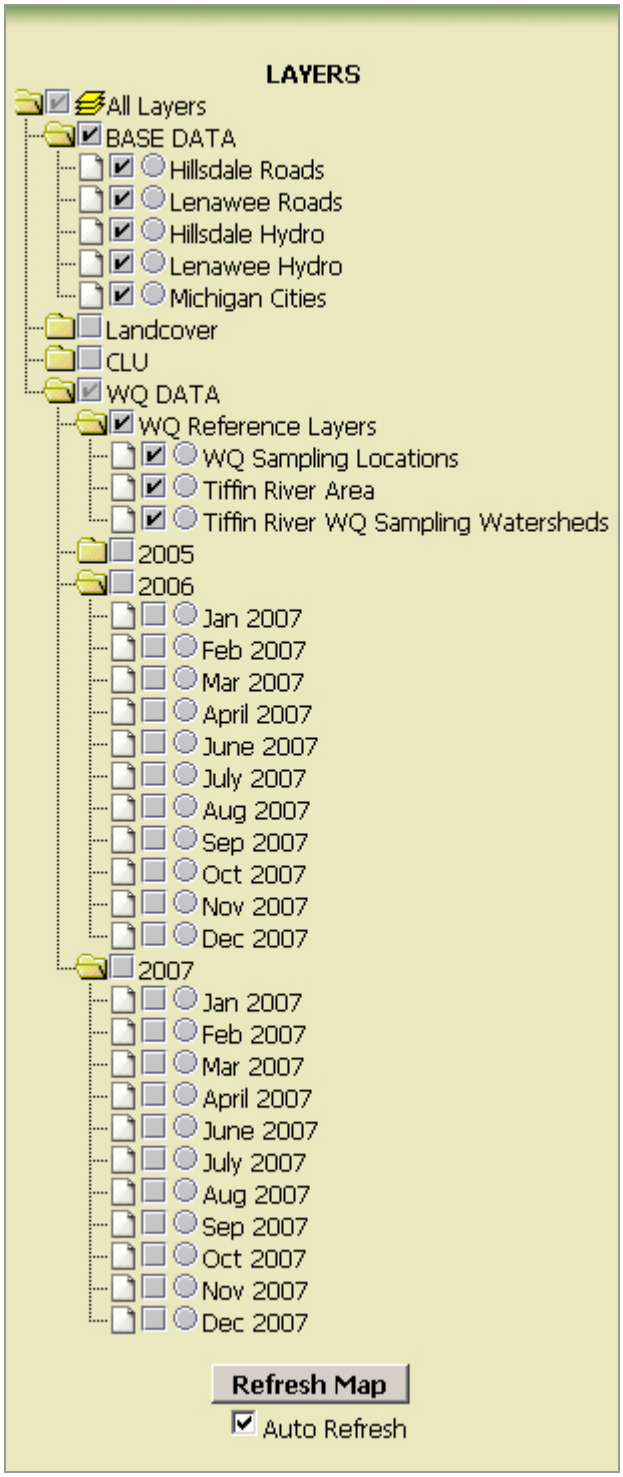

Figure 11: Table of Contents screen capture.

Online Help - To ensure that all users are well informed with the IMS, MTRI placed a link to a descriptive guide relating to the general functionality and overall utility of the viewer, as seen in Figure 12.

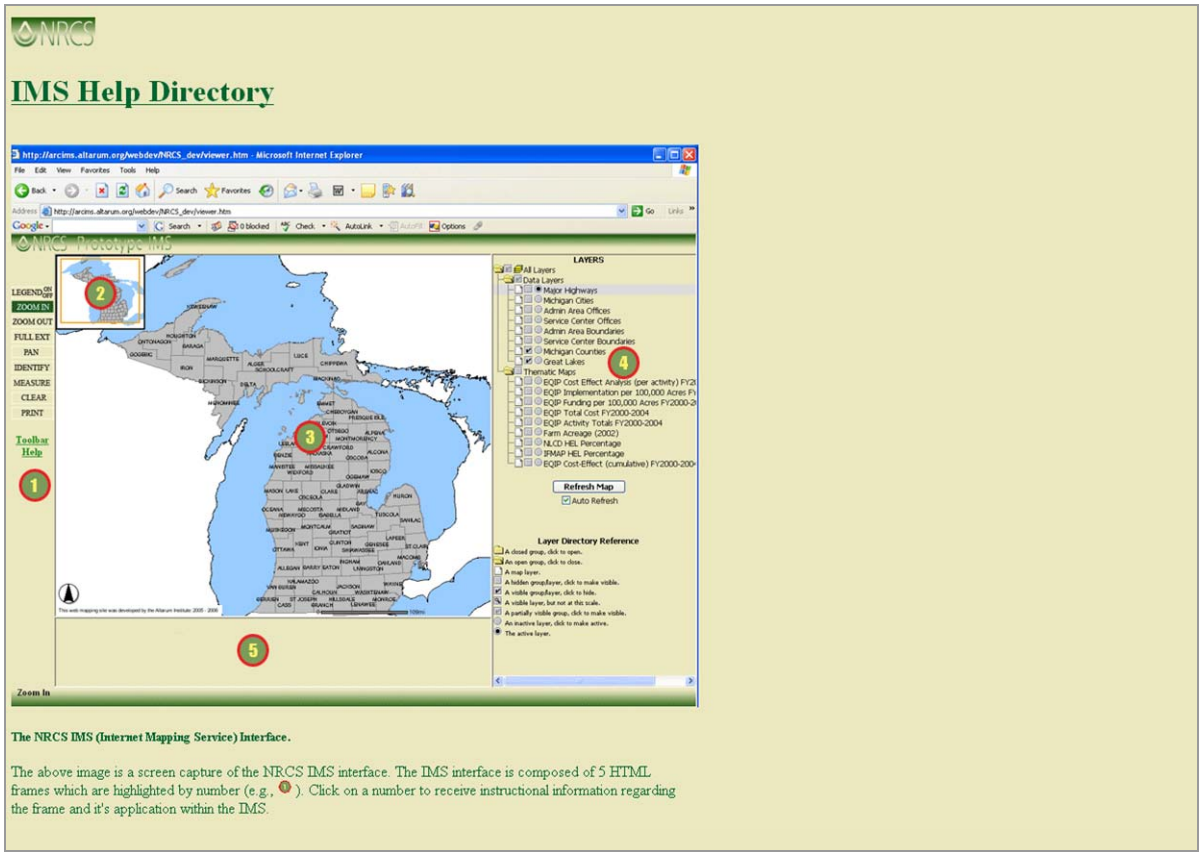

Figure 12: Online Help screen capture.

Geo-spatial Data

Base Layer Data
Hillsdale and Lenawee County Roads Layers
Hillsdale and Lenawee County Hydrology layers
Michigan Cities Layer

Land cover data
Land cover classification data sets for the years 2004, 2005 2006 are available.

Water Quality data
Data that MTRI has collected from the various sampling locations within the Tiffin River watershed. The data sampling dates range from April 2005 to December 2007. This data is arranged in its own folder "WQ DATA". Within this directory, the data is further organized by the year the data was collected (e.g., 2005, 2006, and 2007).

Next Steps - Open Source Technology

During the development stages of the Environmental Quality Index (EQI) Data and ProTracts Data and Expected Benefit viewers, MTRI has come to realize the potential of leveraging open source geo-spatial technology. Incorporating software applications and components that utilize open standards (such as GeoServer and OpenLayers) to create powerful yet easy-to-use internet applications has led to innovative and efficient methods of understanding NRCS related data as well as sharing study results. Additionally, the technology becomes more appealing when combined with robust open source relational databases technologies like PostgreSQL and its GIS enabling counterpart - PostGIS. These database tools show a great deal of promise when integrated with "virtual globe" viewer software such as Google Earth in providing unique methods of accessing and visualizing large datasets in a three dimensional environment.

MTRI sees great promise for the NRCS in continuing in the direction of employing open source technology to meet its geo-spatial visualization needs. The utility and power of the GeoServer/OpenLayers combination along with the power of open source relational database management systems allows for a variety of new ways in exploiting data stores to desktop mapping applications. The Tiffin Water Quality data that MTRI has collected for the NRCS from April 2005 thru January 2008 serves as a case in point. The data, having already been imported into PostgreSQL as a 30,000 plus record database, is a prime example of large data store ready for application development. MTRI supports continuing development efforts related to improvements to the EQI Data and ProTracts Data viewers. NRCS requested items (such as developing KML export and interface-based printing operations) that could not be completed due to time constraints could be further pursued as well as investigating other potential functionality geared toward helping NRCS visualize and interpret large data sets.

MTRI shares the NRCS vision of investigating new open source technologies for exploring new ways to visualize, analyze and share geo-spatial data via the internet. With this new direction, new open source applications can be examined and developed with a focus targeted on providing desktop mapping applications and toolsets that meet NRCS data access and program evaluation needs.

Acronym List

EQI	Environmental Quality Index
GIS	Geographic Information System
IIS	Internet Information Server
IMS	Internet Map Server
MTRI	Michigan Tech Research Institute
NRCS	Natural Resource Conservation Service
URL	Uniform Resource Locator
USDA	United States Department of Agriculture

References

OpenLayers: Home. OpenLayers Project Website. OpenLayers Open Source Project. viewed 17 Apr. 2008 <http://openlayers.org>

Welcome - GeoServer. GeoServer Project Website. The Open Planning Project. viewed 17 Apr. 2008 <http://geoserver.org>

PostGIS Home. PostGIS Project Website. Refractions Research. viewed 17 Apr. 2008 <http://www.postgis.org>

PostgreSQL: The world's most advanced open source database. PostgreSQL Project Website. PostgreSQL Global Development Group.viewed 17 Apr. 2008 <http://www.postgresql.org>

Welcome! - The Apache HTTP Server Project. Apache Software Foundation. viewed 24 Apr. 2008 <http://httpd.apache.org/>

Internet Information Services. Microsoft. viewed 24 Apr. 2008 <http://www.microsoft.com/windowsserver2003/iis/default.mspx>

Appendix - Database Data Dictionary

Overview

This appendix contains the data dictionary information for the PostgreSQL/PostGIS database used by the Environmental Quality Index (EQI) Viewer and the ProTracts Data and Expected Benefit Viewer.

Tables list report

Generated: Fri 11 Apr 2008 01:48:33 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql

Tables

Schema	Table	Comment
public	geometry_columns	lists the columns that have a geometry datatype (table required by PostGIS)
public	spatial_ref_sys	lists the EPSG codes and definitions of spatial reference systems (table required by PostGIS)
public	t_admin_areas	contains information on NRCS adminstrative areas within a state
public	t_geographic_unit	information on geographic areas
public	t_input	Contains information on input datasets
public	t_input_data	contains data on a scale of 0 to 1
public	t_time_interval	contains information on time intervals
public	t_weight	contains information on weights that are applied to a dataset
public	t_weight_scheme	contains information on distinct weighting schemes
cppe	d_measurement_unit	This table is used to store the NRCS measurement unit defitions.
cppe	d_practice	This table is used to store the NRCS practice definitions.
cppe	t_practice_weight	This table is used to store the CPPE weights for NRCS practices.
cppe	t_protracts_data_import	This table contains all the ProTracts implementation records that have been loaded into the database.
cppe	t_resource_concern	This table is used to store the list of NRCS resource concerns.
cppe	t_resource_concern_group	This table is used to store the groups of NRCS resource concerns.
cppe	t_temp_expected_benefits	A temporary table used to store expected benefit data that is accessed by geoserver.
cppe	t_temp_imps_for_geoserver	A temporary table used to store implementation data that is accessed by geoserver.
cppe	t_temp_protracts_practice_records	A temporary table used to store filtered protracts practice data that is accessed by geoserver.

Table Data dictionary report - geometry_columns

Generated: Mon 14 Apr 2008 02:46:13 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: public

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
f_table_catalog	character varying(256)	Yes	Yes		
f_table_schema	character varying(256)	Yes	Yes		
f_table_name	character varying(256)	Yes	Yes		
f_geometry_column	character varying(256)	Yes	Yes		
coord_dimension	integer	Yes	No		
srid	integer	Yes	No		
type	character varying(30)	Yes	No		

Constraints

Name	Type	Definition	Comment
geometry_columns_pk	Primary key	(f_table_catalog, f_table_schema, f_table_name, f_geometry_column)	

Table Data dictionary report - spatial_ref_sys

Generated: Mon 14 Apr 2008 02:52:05 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: public

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
srid	integer	Yes	Yes		
auth_name	character varying(256)	No	No		
auth_srid	integer	No	No		
srtext	character varying(2048)	No	No		
proj4text	character varying(2048)	No	No		

Constraints

Name	Type	Definition	Comment
spatial_ref_sys_pkey	Primary key	(srid)	

Table Data dictionary report - t_admin_areas

Generated: Mon 14 Apr 2008 02:52:30 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: public

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
gid	integer	Yes	Yes	nextval('t_admin_areas_gid_seq'::regclass)	unique identifier of the adminstrative area
admin_area	smallint	No	No		number of the adminstrative area
asststcons	character varying(30)	No	No		Assistant State Conservationist
admincoord	character varying(30)	No	No		
phone	character varying(30)	No	No		
the_geom	geometry	No	No		geometry field

Constraints

Name	Type	Definition	Comment
t_admin_areas_pkey	Primary key	(gid)	
enforce_dims_the_geom	Check	(ndims(the_geom) = 2)	
enforce_geotype_the_geom	Check	(geometrytype(the_geom) = 'MULTIPOLYGON'::text OR the_geom IS NULL)	
enforce_srid_the_geom	Check	(srid(the_geom) = 4326)	

Table Data dictionary report - t_geographic_unit

Generated: Mon 14 Apr 2008 02:54:22 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: public

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
id	integer	Yes	Yes		unique identifier for the geographic unit (county)
code	character varying(5)	No	No		three character FIPS county code
name	character varying(32)	Yes	No		name of the geographic unit (ex: Washtenaw)
geom	geometry	No	No		geometry data

Constraints

Name	Type	Definition	Comment
pk_geographic_unit	Primary key	(id)	
enforce_dims_geom	Check	(ndims(geom) = 2)	
enforce_geotype_geom	Check	(geometrytype(geom) = 'MULTIPOLYGON'::text OR geom IS NULL)	
enforce_srid_geom	Check	(srid(geom) = 4326)	

Table Data dictionary report - t_input

Generated: Thu 24 Apr 2008 10:58:54 AM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: public

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
input_no	integer	Yes	Yes		unique number for the EQI input
name	character varying(63)	Yes	No		the name of the input dataset
description	character varying(255)	Yes	No		description of the input dataset
parent_input_no	integer	No	No		foreign key reference to the parent input number
doc_file	character varying(255)	No	No		the relative path to a documentation file that describes the input

Constraints

Name	Type	Definition	Comment
pk_input	Primary key	(input_no)	

Table Data dictionary report - t_input_data

Generated: Thu 24 Apr 2008 11:01:21 AM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: public

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
data_id	integer	Yes	Yes	nextval('q_data_id_seq'::regclass)	unique identifier for the data record
value	real	Yes	No		Value between 0 and 1
input_no	integer	Yes	No		FK to the input dataset
geographic_unit_id	integer	Yes	No		foreign key reference to the geographic unit that the data appies to
time_interval_id	integer	Yes	No		FK to the time interval that the data corresponds to

Constraints

Name	Type	Definition	Comment
pk_qdata	Primary key	(data_id)	
fk_input_data_input_id	Foreign key	(input_no) REFERENCES t_input (input_no) MATCH SIMPLE ON UPDATE NO ACTION ON DELETE NO ACTION	

Table Data dictionary report - t_time_interval

Generated: Thu 24 Apr 2008 11:03:13 AM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: public

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
time_interval_id	integer	Yes	Yes		unique identifier for the time interval
desc	character varying(255)	Yes	No		description of the time interval
start_datetime	timestamp with time zone	Yes	No		start of the time interval
end_datetime	timestamp with time zone	Yes	No		end of the time interval

Constraints

Name	Type	Definition	Comment
pk_time_interval	Primary key	(time_interval_id)	

Table Data dictionary report - t_weight

Generated: Thu 24 Apr 2008 11:05:28 AM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: public

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
weight_id	integer	Yes	Yes		unique identifier of the weight record
weight_scheme_id	integer	Yes	No		foreign key reference to the weighting scheme
input_no	integer	Yes	No		foreign key reference to the dataset input
value	real	Yes	No		value of the weight (between 0 and 1)
value_default	real	Yes	No		stores the default value of the weight

Constraints

Name	Type	Definition	Comment
pk_weight	Primary key	(weight_id)	
t_weight_input_id	Foreign key	(input_no) REFERENCES t_input (input_no) MATCH SIMPLE ON UPDATE NO ACTION ON DELETE NO ACTION	

Table Data dictionary report - t_weight_scheme

Generated: Thu 24 Apr 2008 11:06:36 AM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: public

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
weight_scheme_id	integer	Yes	Yes		unique identifier of the weighting scheme
name	character varying(32)	No	No		name of the weighing scheme

Constraints

Name	Type	Definition	Comment
pk_weight_scheme	Primary key	(weight_scheme_id)	

Table Data dictionary report - d_measurement_unit

Generated: Fri 11 Apr 2008 02:15:49 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: cppe

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
measurement_unit_id	integer	Yes	Yes		unique identifier for the measurement unit
decimal_places	integer	Yes	No		
numeric_ind	character(1)	Yes	No		
measurement_unit_name	character varying(30)	Yes	No		full name of the measurement unit
measurement_unit_display	character varying(30)	Yes	No		short name of the measurement unit, used for display purposes
start_date	timestamp with time zone	Yes	No		
end_date	timestamp with time zone	No	No		
last_change_date	timestamp with time zone	Yes	No		

Constraints

Name	Type	Definition	Comment
pk_measurement_unit	Primary key	(measurement_unit_id)	

Table Data dictionary report - d_practice

Generated: Fri 11 Apr 2008 02:21:32 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: cppe

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
practice_id	integer	Yes	Yes		unique identifier of the conservation practice
measurement_unit_id	integer	Yes	No		foreign key to the default measurement unit used by the conservation practice
alternate_measurement_unit_id	integer	No	No		
current_practice_id	integer	Yes	No		
reporting_measurement_unit_id	integer	No	No		
installed_practice_lifespan_years	integer	No	No		
replacement_practice_id	integer	No	No		
reporting_practice_id	integer	No	No		
national_indicator	character(1)	Yes	No		
practice_code	character varying(10)	Yes	No		The short character code for the conservation practice
practice_name	character varying(100)	No	No		full name of the practice
practice_display	character varying(40)	No	No		name of the practice, used for display purposes
practice_definition	character varying(2000)	No	No		definition of the practice
start_date	timestamp with time zone	No	No		
end_date	timestamp with time zone	No	No		
last_change_date	timestamp with time zone	Yes	No		

Constraints

Name	Type	Definition	Comment
pk_practice	Primary key	(practice_id)	

Table Data dictionary report - t_practice_weight

Generated: Fri 11 Apr 2008 02:25:24 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: cppe

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
practice_code	character varying(10)	Yes	Yes		foreign key reference to the conservation practice
resource_concern_code	character varying(4)	Yes	Yes		foreign key reference to the resource concern
weight	double precision	Yes	No		CPPE weight that describes the benefit expected from a typical application for a specific resource concern

Constraints

Name	Type	Definition	Comment
pk_practice_weight	Primary key	(practice_code, resource_concern_code)	

Table Data dictionary report - t_protracts_data_import

Generated: Fri 11 Apr 2008 03:02:34 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: cppe

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
id	integer	Yes	Yes	nextval('cppe.t_protracts_data_import_id_seq'::regclass)	unique ID of the implementation item record (autoassigned during import)
program_code	character varying(10)	Yes	No		foreign key reference to the NRCS program
state_name	character(2)	Yes	No		two character code for the state
county_name	character varying(32)	Yes	No		name of the county where the implementation occurred or is planned to occur
field_office	character varying(50)	Yes	No		name of the field office
participant	character varying(50)	Yes	No		name of the contract participant
contract_no	character varying(32)	Yes	No		contract number
contract_status	character varying(16)	Yes	No		status of the contract
contract_obligation	money	Yes	No		amount obligated by the contract
contract_payments	money	Yes	No		
contract_acres	numeric	Yes	No		number of acres contracted
contract_item	integer	No	No		contract item number for the implementation
practice_code	character	No	No		foreign key

Name	Data type	Not Null?	Primary key?	Default	Comment
	varying(16)				reference to the NRCS practice
practice	character varying(64)	No	No		name of the NRCS practice
units	character varying(16)	No	No		units used to report the item amount
item_amount	numeric	No	No		amount of the practice implemented
year_planned	integer	No	No		year the implementation is planned for
item_status	character varying(32)	No	No		status of the contract item
item_obligation	money	No	No		amount obligated for the contract item
item_payment_status	character varying(16)	No	No		status of the contract item payment
item_payment	money	No	No		

Constraints

Name	Type	Definition	Comment
pk_protracts_data_import	Primary key	(id)	

Table Data dictionary report - t_resource_concern

Generated: Fri 11 Apr 2008 03:04:50 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: cppe

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
resource_concern_code	character varying(4)	Yes	Yes		unique code for the resource concern
resource_concern_group_code	character(2)	Yes	No		foreign key reference to the resource concern group
resource_concern_desc	character varying(255)	Yes	No		description of the resource concern

Constraints

Name	Type	Definition	Comment
pk_resource_concern	Primary key	(resource_concern_code)	
resource_concern_group	Foreign key	(resource_concern_group_code) REFERENCES cppe.t_resource_concern_group (resource_concern_group_code) MATCH SIMPLE ON UPDATE NO ACTION ON DELETE NO ACTION	

Table Data dictionary report - t_resource_concern_group

Generated: Fri 11 Apr 2008 04:17:52 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: cppe

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
resource_concern_group_code	character(2)	Yes	Yes		unique code for the resource concern group
resource_concern_group_description	character varying(255)	Yes	No		description of the resource concern group

Constraints

Name	Type	Definition	Comment
pk_resource_concern_group	Primary key	(resource_concern_group_code)	

Table Data dictionary report - t_temp_expected_benefits

Generated: Fri 11 Apr 2008 04:23:08 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: cppe

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
program_code	character varying(10)	No	No		foreign key reference to the NRCS program
resource_concern_code	character varying(4)	No	No		foreign key reference to the resource concern
practice_code	character varying(16)	No	No		foreign key reference to the NRCS conservation practice code
year_planned	character varying(32)	No	No		
item_status_group	character varying(9)	No	No		high level status of the contract item (i.e. applied vs. planned)
county_code	character(3)	No	No		FIPS county code
count_of_implementations	bigint	No	No		
sum_of_implementations	numeric	No	No		
sum_of_normalized_implementations	numeric	No	No		
sum_of_weighted_implementations	numeric	No	No		

Table Data dictionary report - t_temp_expected_benefits

Generated: Mon 14 Apr 2008 02:47:23 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: cppe

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
program_code	character varying(10)	No	No		foreign key reference to the NRCS program
resource_concern_code	character varying(4)	No	No		foreign key reference to the resource concern
practice_code	character varying(16)	No	No		NRCS practice code or 'All Practices'
year_planned	character varying(32)	No	No		year the implementation is planned for
item_status_group	character varying(9)	No	No		high level status of the contract item (i.e. applied vs. planned)
county_code	character(3)	No	No		FIPS county code
count_of_implementations	bigint	No	No		
sum_of_implementations	numeric	No	No		
sum_of_normalized_implementations	numeric	No	No		
sum_of_weighted_implementations	numeric	No	No		

Table Data dictionary report - t_temp_imps_for_geoserver

Generated: Mon 14 Apr 2008 02:47:43 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: cppe

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
program_code	character varying(10)	No	No		foreign key referece to the program
practice	character varying(16)	No	No		NRCS practice code or 'All Practices'
item_status_group	character varying(9)	No	No		high level status of the contract item (i.e. applied vs. planned)
year_planned	character varying(32)	No	No		year the implementation is planned for
county_code	character(3)	No	No		FIPS county code
count_of_implementations	bigint	No	No		
sum_of_implementations	numeric	No	No		
sum_of_normalized_implementations	numeric	No	No		

Table Data dictionary report - t_temp_protracts_practice_records

Generated: Mon 14 Apr 2008 02:48:06 PM EDT
Server: sql1 - postgres (sql1:5432)
Database: weighted_index_sql
Schema: cppe

Columns

Name	Data type	Not Null?	Primary key?	Default	Comment
program_code	character varying(10)	Yes	No		foreign key reference to the NRCS program
state_name	character(2)	No	No		two character code for the state
county_code	character(3)	Yes	No		FIPS county code
field_office	character varying(50)	Yes	No		name of the field office
contract_no	character varying(32)	Yes	No		contract number
contractyear	integer	No	No		year of the contract
contract_item	integer	Yes	No		contract item number for the implementation
practice_code	character varying(16)	Yes	No		foreign key reference to the NRCS practice
item_amount	numeric(10,2)	Yes	No		amount of the practice implemented
year_planned	integer	Yes	No		year the implementation is planned for
item_status	character varying(32)	Yes	No		status of the contract item
item_status_group	character varying(9)	Yes	No		high level status of the contract item (i.e. applied vs. planned)
item_obligation	numeric(10,2)	Yes	No		amount obligated for the contract item
item_payment_status	character varying(16)	Yes	No		status of the contract item payment
item_payment	numeric(10,2)	Yes	No		
norm_implementations	numeric(10,2)	Yes	No		normalized implementation amount

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