

**Changes in
cultivated
cropland land
in Iowa**

Andreea L.
Erciulescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions

STAT 585X - Final Project

Changes in cultivated cropland in CEAP

Andreea L. Erciulescu

April 30, 2014

Why cropland / Why Iowa ?

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdilescu

NRI - CEAP

Data

CEAP sample

Crop
codes / classes

Results

Conclusions



Why cropland / Why Iowa ?

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes / classes

Results

Conclusions

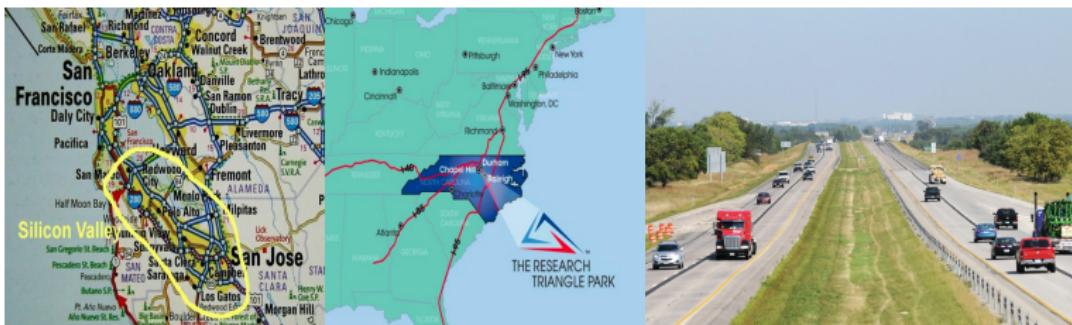


Why cropland / Why Iowa ?

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdilescu

NRI - CEAP
Data
CEAP sample
Crop
codes / classes
Results
Conclusions



<http://www.cultivationcorridor.org/>

National Resources Inventory (NRI)

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions

- Annual survey conducted collaboratively by USDA NRCS (Natural Resources Conservation Services) and ISU Center for Survey Statistics and Methodology (CSSM)
- To provide status and trend estimates for natural resources on nonfederal lands in US
 - Example of such estimates are soil erosion estimates in relation to land characteristics and programs.

Conservation Effects Assessment Project (CEAP)

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdilescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions

- Series of surveys intended to quantify environmental effects of conservation practices and programs by hydrologic unit codes (HUCs)
- CEAP sample is a subset of the NRI points classified as cultivated cropland

United States territory division into HUCs

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erculescu

NRI - CEAP

Data

CEAP sample

Crop
codes / classes

Results

Conclusions



Upper Mississippi River Basin

- Rivers
- HUC 4 Boundary
- HUC 8 Boundary
- Upper Mississippi HUCs
- 0701 - Mississippi Headwaters
- 0702 - Minnesota River Basin
- 0703 - St. Croix River Basin
- 0704 - Upper Mississippi-Black-Rio
- 0705 - Chippewa River Basin
- 0706 - Upper Mississippi-Maquoketa-Plum
- 0707 - Wisconsin River Basin
- 0708 - Upper Mississippi-Iowa-Skunk-Wapsipinico
- 0709 - Rock River Basin
- 0710 - Des Moines River Basin
- 0711 - Upper Mississippi-Salt
- 0712 - Upper Illinois River Basin
- 0713 - Lower Illinois River Basin
- 0714 - Upper Mississippi-Kaskaskia-Meramec



Local concerns regarding the existence of nitrates in drinking water,
particularly in Des Moines

Publicly available data

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions



Publicly available data

Changes in cultivated cropland land in Iowa

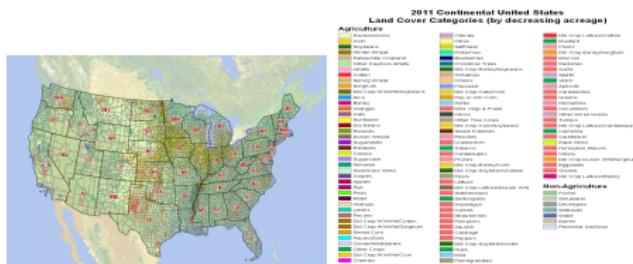
Andreea L.
Erculescu

NRI - CEAP

Data

CEAP sample

Conclusions



Publicly available data

Changes in cultivated cropland land in Iowa

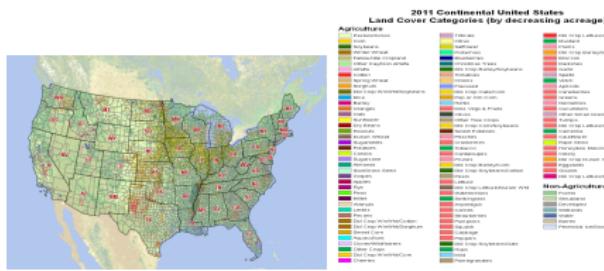
Andreea L.
Erculescu

NRI - CEAP

Data

CEAP sample

Results



State of Iowa Census Tracts - Current ACS13 - Data as of January 1, 2013

Publicly available data

Changes in cultivated cropland land in Iowa

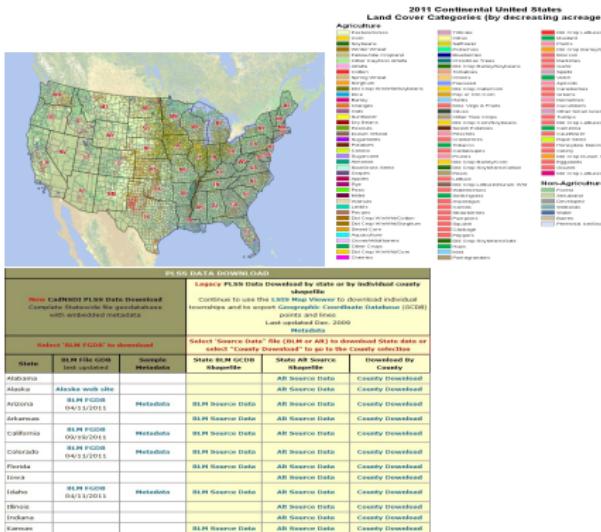
Andreea L.
Erculescu

NRI - CEAP

Data

CEAP sample

Results



State of Iowa Census Tracts - Current ACS13 - Data as of January 1, 2013

Publicly available data

Changes in cultivated cropland land in Iowa

Andreea L.
Erculescu

NRI - CEAP

Data

CEAP sample

Results



IPSIS Data Exchange			
Home		CARBON PLSS Data Download	
Complete statewide GIS geodatabase with embedded metadata		Legacy PLSS Data	
Select "BLM PLSS" for download			
State:	BLM PLSS	Sample	Legacy PLSS Data
Alabama	BLM PLSS	Metadata	Historical BLM PLSS Data
Alaska	Alaska Statewide	Metadata	Historical BLM PLSS Data
Arizona	BLM PLSS 04/3/2011	Metadata	BLM Resource Data
Arkansas	BLM PLSS	Metadata	BLM Resource Data
California	BLM PLSS 09/9/2011	Metadata	BLM Resource Data
Colorado	BLM PLSS 04/7/2011	Metadata	BLM Resource Data
Florida	BLM PLSS	Metadata	BLM Resource Data
Idaho	BLM PLSS 04/3/2011	Metadata	BLM Resource Data
Illinois	BLM PLSS 04/3/2011	Metadata	BLM Resource Data
Illinois	BLM PLSS 04/3/2011	Metadata	BLM Resource Data
Kansas	BLM PLSS	Metadata	BLM Resource Data

Index of /gis_1
Name
[parent directory]
Apple_Plan/
Blank_Wall/
Big_Bagel-Monkey/
Big_Snow_Lovers/
Blacklisted-Soldier/
Blue_Earth/
Bosone/
Cat/
Cedar_Lower/
Cedar_Middle/
Cedar_Upper/
Chausset_Upper/
Coon-Yellow/
Dash/
Dex_Monster_Lower/
Dex_Monster_Middle/
Dex_Monster_Upper/
East_Fish_Dex_Monster/
East_Nation/
Fly-Horrendous/
Frog/
Grand_Lovers/

Site	Date Modified
12/09/09 4:10:00 PM	
12/09/09 4:09:00 PM	
12/09/09 4:06:00 PM	
12/09/09 4:04:00 PM	
12/09/09 4:02:00 PM	
12/09/09 3:58:00 PM	
12/09/09 3:56:00 PM	
12/09/09 3:54:00 PM	
12/09/09 3:53:00 PM	
12/09/09 3:51:00 PM	
12/09/09 3:49:00 PM	
12/09/09 3:47:00 PM	
12/09/09 3:45:00 PM	
12/09/09 3:43:00 PM	
12/09/09 3:41:00 PM	
12/09/09 3:39:00 PM	
12/09/09 3:37:00 PM	
12/09/09 3:35:00 PM	
12/09/09 3:33:00 PM	
12/09/09 3:31:00 PM	
12/09/09 3:29:00 PM	
12/09/09 3:27:00 PM	
12/09/09 3:25:00 PM	
12/09/09 3:23:00 PM	
12/09/09 3:21:00 PM	
12/09/09 3:19:00 PM	
12/09/09 3:17:00 PM	
12/09/09 3:15:00 PM	
12/09/09 3:13:00 PM	
12/09/09 3:11:00 PM	
12/09/09 3:09:00 PM	
12/09/09 3:07:00 PM	
12/09/09 3:05:00 PM	
12/09/09 3:03:00 PM	
12/09/09 3:01:00 PM	
12/09/09 2:59:00 PM	
12/09/09 2:57:00 PM	
12/09/09 2:55:00 PM	
12/09/09 2:53:00 PM	
12/09/09 2:51:00 PM	
12/09/09 2:49:00 PM	
12/09/09 2:47:00 PM	
12/09/09 2:45:00 PM	
12/09/09 2:43:00 PM	
12/09/09 2:41:00 PM	
12/09/09 2:39:00 PM	
12/09/09 2:37:00 PM	
12/09/09 2:35:00 PM	
12/09/09 2:33:00 PM	
12/09/09 2:31:00 PM	
12/09/09 2:29:00 PM	
12/09/09 2:27:00 PM	
12/09/09 2:25:00 PM	
12/09/09 2:23:00 PM	
12/09/09 2:21:00 PM	
12/09/09 2:19:00 PM	
12/09/09 2:17:00 PM	
12/09/09 2:15:00 PM	
12/09/09 2:13:00 PM	
12/09/09 2:11:00 PM	
12/09/09 2:09:00 PM	
12/09/09 2:07:00 PM	
12/09/09 2:05:00 PM	
12/09/09 2:03:00 PM	
12/09/09 2:01:00 PM	
12/09/09 1:59:00 PM	
12/09/09 1:57:00 PM	
12/09/09 1:55:00 PM	
12/09/09 1:53:00 PM	
12/09/09 1:51:00 PM	
12/09/09 1:49:00 PM	
12/09/09 1:47:00 PM	
12/09/09 1:45:00 PM	
12/09/09 1:43:00 PM	
12/09/09 1:41:00 PM	
12/09/09 1:39:00 PM	
12/09/09 1:37:00 PM	
12/09/09 1:35:00 PM	
12/09/09 1:33:00 PM	
12/09/09 1:31:00 PM	
12/09/09 1:29:00 PM	
12/09/09 1:27:00 PM	
12/09/09 1:25:00 PM	
12/09/09 1:23:00 PM	
12/09/09 1:21:00 PM	
12/09/09 1:19:00 PM	
12/09/09 1:17:00 PM	
12/09/09 1:15:00 PM	
12/09/09 1:13:00 PM	
12/09/09 1:11:00 PM	
12/09/09 1:09:00 PM	
12/09/09 1:07:00 PM	
12/09/09 1:05:00 PM	
12/09/09 1:03:00 PM	
12/09/09 1:01:00 PM	
12/09/09 1:00:00 PM	
12/09/09 12:59:00 PM	
12/09/09 12:58:00 PM	
12/09/09 12:57:00 PM	
12/09/09 12:56:00 PM	
12/09/09 12:55:00 PM	
12/09/09 12:54:00 PM	
12/09/09 12:53:00 PM	
12/09/09 12:52:00 PM	
12/09/09 12:51:00 PM	
12/09/09 12:50:00 PM	
12/09/09 12:49:00 PM	
12/09/09 12:48:00 PM	
12/09/09 12:47:00 PM	
12/09/09 12:46:00 PM	
12/09/09 12:45:00 PM	
12/09/09 12:44:00 PM	
12/09/09 12:43:00 PM	
12/09/09 12:42:00 PM	
12/09/09 12:41:00 PM	
12/09/09 12:40:00 PM	
12/09/09 12:39:00 PM	
12/09/09 12:38:00 PM	
12/09/09 12:37:00 PM	
12/09/09 12:36:00 PM	
12/09/09 12:35:00 PM	
12/09/09 12:34:00 PM	
12/09/09 12:33:00 PM	
12/09/09 12:32:00 PM	
12/09/09 12:31:00 PM	
12/09/09 12:30:00 PM	
12/09/09 12:29:00 PM	
12/09/09 12:28:00 PM	
12/09/09 12:27:00 PM	
12/09/09 12:26:00 PM	
12/09/09 12:25:00 PM	
12/09/09 12:24:00 PM	
12/09/09 12:23:00 PM	
12/09/09 12:22:00 PM	
12/09/09 12:21:00 PM	
12/09/09 12:20:00 PM	
12/09/09 12:19:00 PM	
12/09/09 12:18:00 PM	
12/09/09 12:17:00 PM	
12/09/09 12:16:00 PM	
12/09/09 12:15:00 PM	
12/09/09 12:14:00 PM	
12/09/09 12:13:00 PM	
12/09/09 12:12:00 PM	
12/09/09 12:11:00 PM	
12/09/09 12:10:00 PM	
12/09/09 12:09:00 PM	
12/09/09 12:08:00 PM	
12/09/09 12:07:00 PM	
12/09/09 12:06:00 PM	
12/09/09 12:05:00 PM	
12/09/09 12:04:00 PM	
12/09/09 12:03:00 PM	
12/09/09 12:02:00 PM	
12/09/09 12:01:00 PM	
12/09/09 12:00:00 PM	

State of Iowa Census Tracts - Current ACS13 - Data as of January 1, 2013

Publicly available data

Changes in cultivated cropland land in Iowa

Andreea L.
Erculescu

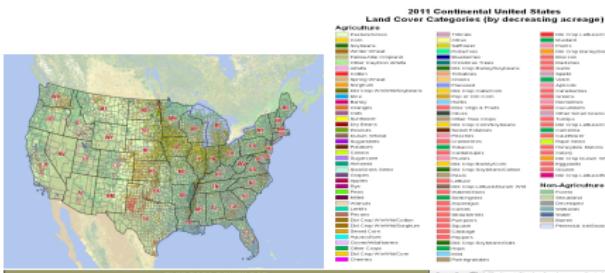
NRI - CEAP

Data

CEAP sample

Results

Conclusions



New CADDIS Plus Data Download		Legacy 5.00 Data Download by state or individual county snapshot		
Complete Statewide or per watershed with embedded metadata		Continue to use the links below to download individual watersheds and its exports Geographic Coverage Database (GCD) and County Coverage Database (CCD)		
		Last updated: Dec 2009		
State	File Name / Last updated	Sample Metadata	State DB Name	County DB Snapshot
Alabama	ALBIM_Summary.xls		ALBIM_Summary	All Source Data County Individual
Alaska	AK_Summary.xls		AK_Summary	All Source Data County Individual
Arizona	ALBIM_Flood_01/01/2010	Metadata	ALBIM_Summary	All Source Data County Individual
Arkansas	ALBIM_Flood_05/15/2010	Metadata	ALBIM_Summary	All Source Data County Individual
Colorado	DN3_02/2010	Metadata	ALBIM_Summary	All Source Data County Individual
Florida			ALBIM_Summary	All Source Data County Individual
Iowa			ALBIM_Summary	All Source Data County Individual
Idaho	ALBIM_Flood_03/15/2011	Metadata	ALBIM_Summary	All Source Data County Individual
Illinois			ALBIM_Summary	All Source Data County Individual
Kansas			ALBIM_Summary	All Source Data County Individual

Name	Size	Date Modified
[parent directory]		12/09/99 7:41:00
Apple_Plan		12/09/99 7:41:00
Book_Wyndham		12/09/99 7:41:00
Buildings_Magnus		12/09/99 7:41:00
Big_Snow_Lower		12/09/99 7:41:00
Big_Snow_Soldier		12/09/99 7:41:00
Blue_Earth		12/09/99 7:41:00
Brown		12/09/99 7:41:00
Circles		12/09/99 7:41:00
Color_Lower		12/09/99 8:03:00
Color_Middle		12/09/99 8:03:00
Color_Upper		12/09/99 8:03:00
Chanson_Upper		12/09/99 8:11:00
Copperas_Dock		12/09/99 8:14:00
Dirt_Motor_Lower		12/09/99 8:18:00
Dirt_Motor_Upper		12/09/99 8:22:00
East_Fire_Momes		12/09/99 8:24:00
East_Fire_Plants		12/09/99 8:25:00
Fire_Housework		12/09/99 8:26:00
Floyd		12/09/99 8:26:00
Giant_Lower		12/09/99 8:26:00

Iowa Census Tracts - Current ACS13 - Data as of January 1, 2013

MTC	ID	SEQ	NAME	DESCRIPTION	TYPE	LOCATION	REGIONS	LEVEL	CONT	EXTRA	POPUL	POPUP
IND	IND000001	001	IND000001	Cave	Tech	3	70783	1200	-14248	-45780/-11247	61.74%	
IND	IND000002	001	IND000002	Cave	Tech	3	89883	1200	-14248	-45780/-11247	61.74%	
IND	IND000003	001	IND000003	Cave	Tech	3	70447	714	-14276	63220/-12872	57.52%	
IND	IND000004	001	IND000004	Cave	Tech	3	71593	967	-14276	63220/-12872	57.52%	
IND	IND000005	001	IND000005	Cave	Tech	3	72763	483	-14250	-45647/-11247	61.75%	
IND	IND000006	001	IND000006	Cave	Tech	3	87678	710	-14142	-45274/-13869	61.26%	
IND	IND000007	001	IND000007	Cave	Tech	3	55571	171	-14248	-45780/-11247	61.74%	
IND	IND000008	001	IND000008	Cave	Tech	3	54825	171	-14248	-45780/-11247	61.74%	
IND	IND000009	001	IND000009	Cave	Tech	3	54825	171	-14248	-45780/-11247	61.74%	
IND	IND000010	001	IND000010	Cave	Tech	3	61768	3464	-14142	-45489/-11247	61.25%	
IND	IND000011	001	IND000011	Cave	Tech	3	20204	171	-14179	-45988/-11247	59.16%	
IND	IND000012	001	IND000012	Cave	Tech	3	85707	171	-14179	-45988/-11247	59.16%	
IND	IND000013	001	IND000013	Cave	Tech	3	85707	171	-14179	-45988/-11247	59.16%	
IND	IND000014	001	IND000014	Cave	Tech	3	52871	4402	-14142	-45274/-13869	61.26%	



Crop Data Layer (CDL)



Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes / classes

Results

Conclusions

- Tagged Image File (.tif) Format
- pixel counts for different categories of cropland - codes

www.nass.usda.gov/research/Cropland/docs/CDL_2013_crosswalk.htm

USDA NA3S Cropland Data Layer - category codes, class names, and colors. Consistent and standardized for all states and all years.

The 1987-2010 CDLs were recoded and re-released in January 2014 to better represent pasture and grass-related categories. A new category named Grass/Pasture (code 176) collapses the following historical CDL categories: Pasture/Grass (code 62), Grassland/Hetaceous (code 171), and Pasture/Hay (code 181). This was done to eliminate confusion among these similar land cover types which were not always classified definitively consistent from state to state or year to year and frequently had poor classifier accuracies. This follows the recoding of the entire CDL archive in January 2012 to better align the historical CDLs with the current product. For a detailed list of the category name and code changes, please visit the Frequently Asked Questions (FAQs) section at <http://www.nass.usda.gov/research/Cropland/faqs.htm>.

Crop Data Layer (CDL)



Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erculescu

NRI - CEAP

Data

CEAP sample

Crop
codes / classes

Results

Conclusions

- download Iowa and years 2003-2007, approx. 750,000 KB

[CyFiles] Your CyFiles is 96% Full Mac x



IT Services <its@iastate.edu>

to me ▾

Mar 15

This is an automated notification to inform you that you are nearing your CyFiles quota. You are currently using 4.83 GB of 5.00 GB or 96% of your total space. If your usage reaches 100% you will no longer be able to save new files or modify existing files until you increase your quota or delete files.

You can increase your quota by visiting the following site:
<https://aws.iastate.edu/cgi-bin/acropolis/user/cyquota>

You can also change your notification settings by visiting this site:
<https://aws.iastate.edu/cgi-bin/acropolis/user/cynotify>

Or you can also manage your CyFiles sharing access by visiting this site:
<https://aws.iastate.edu/cgi-bin/acropolis/user/cyaccess>

Your CyFiles Information:

Current Usage: 4.83 GB

Current Quota: 5.00 GB

Current Usage Percent: 96%

CyFiles Windows Path: cyfiles.iastate.edu/24/28/andreeae

CyFiles Mac SMB Path: <smb://cyfiles.iastate.edu/24/28/andreeae>

For more information regarding CyFiles go to <http://it.iastate.edu/services/storage/cyfiles>

For any questions or comments, please contact the IT Services Solution Center at [515-294-4000](tel:515-294-4000) or solution@iastate.edu.

Information Technology Services
195 Durham Center
Iowa State University
solution@iastate.edu
[515-294-4000](tel:515-294-4000)

Processing CDL data

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions

- *Raster* package in R, S4 methods
- coordinate reference system (CRS)

```
cdl.ia03 <- raster("data/CDL_2003_19.tif")
cdl.ia04 <- raster("data/CDL_2004_19.tif")
cdl.ia05 <- raster("data/CDL_2005_19.tif")
cdl.ia06 <- raster("data/CDL_2006_19.tif")
cdl.ia07 <- raster("data/CDL_2007_19.tif")
cdl.ia03

## class       : RasterLayer
## dimensions : 11672, 17796, 207714912 (nrow, ncol, ncell)
## resolution : 30, 30  (x, y)
## extent     : -52065, 481815, 1938165, 2288325 (xmin, xmax, ymin, ymax)
## coord. ref. : +proj=aea +lat_1=29.5 +lat_2=45.5 +lat_0=23 +lon_0=-96
## data source : U:\stat585\STAT585X-Project\data\CDL_2003_19.tif
## names       : CDL_2003_19
## values      : 0, 255 (min, max)
```

GIS, PLSS, AtlasHCB

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP
Data

CEAP sample

Crop
codes/classes

Results

Conclusions

- smaller dimensions, except for Public Land Survey System (PLSS)
- polygons information, shapefiles
- different territory coverages, not applicable for our problem
 - GIS: full river basin, universal transverse mercador (UTM) format
 - PLSS: state and county level, no hydrologic level
 - AtlasHCB: historical records, county level
- *maptools* in *R*

Census Tigerweb

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions

- big data, storage not a problem because web scrapping
- national, regional and hydrologic levels
- extract Iowa and Des Moines River data from hydrologic data

Processing Census Tigerweb

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erculescu

NRI - CEAP

Data

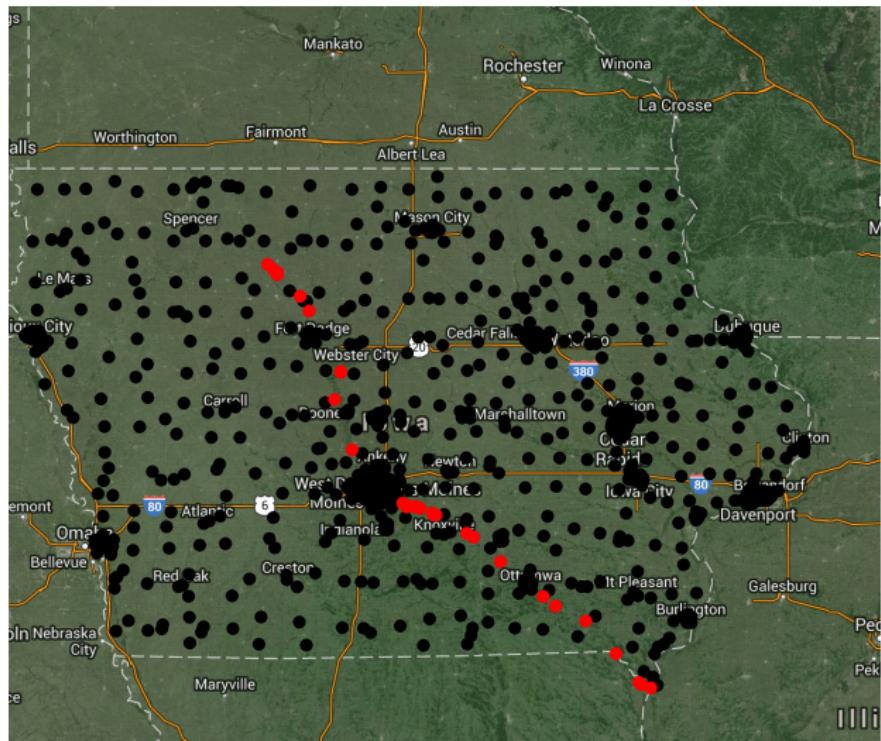
CEAP sample

Crop
codes / classes

Results

Conclusions

- XML library in *R*
- pull point coordinates for Iowa and for Des Moines river



Constructing the sample for the Des Moines river watershed

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erculescu

NRI - CEAP

Data

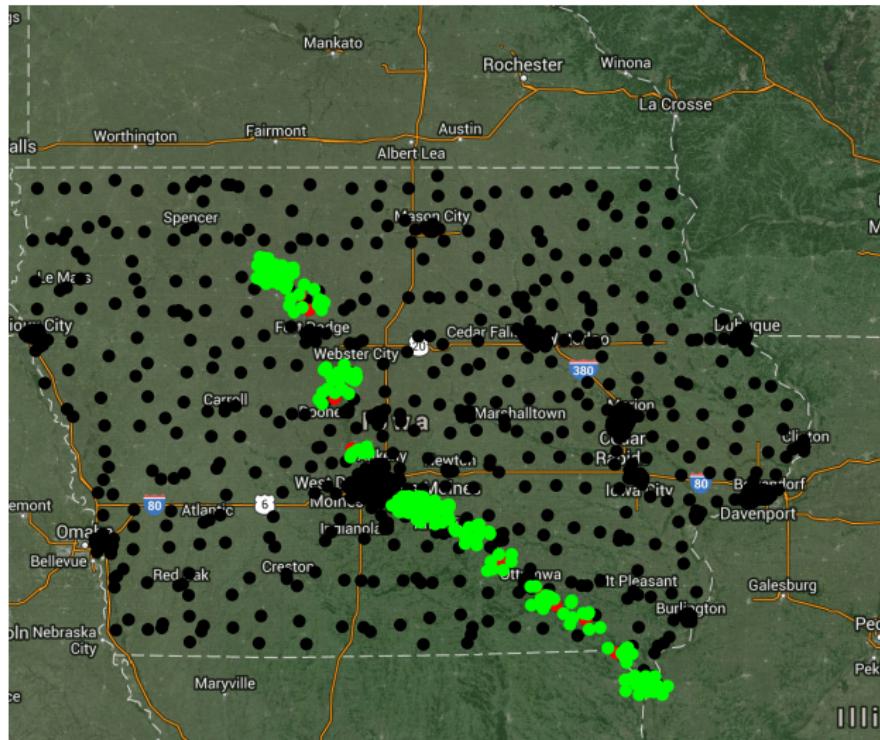
CEAP sample

Crop
codes / classes

Results

Conclusions

- add noise to each point using *jitter* to mimic CEAP sample
- *plyr* package



Extract CDL data for the region

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions

- *cellFromXY* function to extract the pixel count information from CDL, overlapping the region of interest

```
# get the coordinates in CRS
loc.newcoords <- project(cbind(add.poly.coords[, 2], add.poly.coord
    proj = "+proj=aea +lat_1=29.5 +lat_2=45.5 +lat_0=23 +lon_0=-96

# gets the values of the pixels
cdl.pts3 <- cdl.ia03[cellFromXY(cdl.ia03, loc.newcoords)]
cdl.pts4 <- cdl.ia04[cellFromXY(cdl.ia04, loc.newcoords)]
cdl.pts5 <- cdl.ia05[cellFromXY(cdl.ia05, loc.newcoords)]
cdl.pts6 <- cdl.ia06[cellFromXY(cdl.ia06, loc.newcoords)]
cdl.pts7 <- cdl.ia07[cellFromXY(cdl.ia07, loc.newcoords)]
table(cdl.pts3)/length(cdl.pts3[-which(is.na(cdl.pts3))]) * 100

## cdl.pts3
##      1      5     25     28     36     61     63     82
## 23.9024 30.7317  1.4634  0.4878  2.4390  6.3415  4.3902  2.4390
##      176
## 23.9024
```

- web scrape code/class data from NASS website
- merge codes and classes

The *CODES* challenge

Changes in cultivated cropland land in Iowa

Andreea L.
Erculescu

NRI - CEAP

Data

CEAP sample

Crop codes / classes

Results

Conclusions

- unstructured source code

```
cd C:\view-source\www.nasa.usda.gov\research\copland\docs\CDL_2013_crosswalk.htm
1000 <td>
1001 class="x11111111715" style="border:none; width:300px; value="" for="EIR_Arc015</td>
1002 </tr>
1003 <tr>
1004 <td>
1005 class="x11111111715" style="height:15.75px;"><br></td>
1006 <td>
1007 class="x11111111715" style="height:15.75px;"><br></td>
1008 <td>
1009 class="x11111111715" style="border-left:none;">Old Class Name</td>
1010 <td>
1011 class="x11111111715" style="border-left:none;">Summary of Revisions</td>
1012 </tr>
1013 <tr>
1014 <td>
1015 class="x11111111715" style="border-left:none;">For: </td>
1016 <td>
1017 class="x11111111715" style="border-left:none;">XData Screen</td>
1018 <td>
1019 class="x11111111715" style="border-left:none;">XData Blue</td>
1020 <td>
1021 class="x11111111715" style="border-left:none;">XERI Green</td>
1022 <td>
1023 class="x11111111715" style="border-left:none;">XERI Blue</td>
1024 </tr>
1025 <tr>
1026 <td>
1027 class="x11111111715" style="height:15.0px;">
1028 <td>
1029 class="x11111111715" style="height:15.0px;"><br></td>
1030 <td>
1031 class="x11111111715" style="border-left:none;">Background</td>
1032 <td>
1033 class="x11111111715" style="border-left:none;">Background</td>
1034 <td>
1035 class="x11111111715" style="border-left:none;">Background</td>
1036 </tr>
1037 <tr>
1038 <td>
1039 class="x11111111715" align="right" style="border-left:none; width:0.000px;"><br></td>
1040 <td>
1041 class="x11111111715" align="right" style="border-left:none; width:0.000px;"><br></td>
1042 <td>
1043 class="x11111111715" align="right" style="border-left:none;"><br></td>
1044 <td>
1045 class="x11111111715" align="right" style="border-left:none;"><br></td>
1046 <td>
1047 class="x11111111715" align="right" style="border-left:none;"><br></td>
1048 </tr>
1049 <tr>
1050 <td>
1051 class="x11111111715" style="height:15.75px;"><br></td>
1052 <td>
1053 class="x11111111715" style="border-top:none; border-left:none;">XData</td>
1054 <td>
```

- list of unequal length elements

Total	2003	2004	2005	2006	2007
21	10	13	11	13	8

Table: Number of crop classes by year

- similar crop classes, *Developed* and *Developed/Low Intensity* or *Developed/Open Space*

The CODES challenge defeated

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions

- matching the existent crop classes and adding the missing ones for each year
- using regular expressions: *grep*, *identical*
- debugging
- sorting by crop classes

Results

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes / classes

Results

Conclusions

Crop Class	2003	2004	2005	2006	2007
Alfalfa	2.439	2.9268	1.4634	2.439	NA
Christmas Trees	NA	0.4878	0.4878	NA	NA
Clouds/No Data	NA	0.9756	NA	NA	NA
Corn	23.9024	28.7805	25.3659	27.3171	27.8049
Deciduous Forest	NA	NA	NA	14.6341	12.6829
Developed	2.439	2.9268	1.9512	NA	NA
Developed/Low Intensity	NA	NA	NA	0.4878	NA
Developed/Open Space	NA	NA	NA	3.9024	9.7561
Fallow/Idle Cropland	6.3415	2.9268	2.9268	1.9512	NA
Forest	4.3902	11.2195	13.6585	NA	NA
Grass/Pasture	23.9024	19.5122	21.4634	16.0976	22.439
Herbaceous Wetlands	NA	NA	NA	0.9756	0.9756
Mixed Forest	NA	NA	NA	0.4878	NA
Nonag/Undefined	NA	0.4878	1.4634	NA	NA
Oats	0.4878	0.4878	NA	0.4878	NA
Open Water	NA	NA	NA	4.3902	5.3659
Other Crops	NA	NA	0.4878	NA	NA
Other Small Grains	1.4634	1.9512	NA	NA	NA
Soybeans	30.7317	22.439	26.3415	25.3659	18.0488
Water	3.9024	4.878	4.3902	NA	NA
Woody Wetlands	NA	NA	NA	1.4634	2.9268

Table: Proportion of land by crop class, by year.

Conclusions

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions

The following conclusions hold only for the region we have described in the previous section. Whether they still hold for the real CEAP data needs future investigation.

- different data types/sources
- large spatial, image data
- coordinates in different measurement systems
- regular expressions
- missing crop classes for all/some the years
- missing records in some years
- changes in crops over the years
- possible frame coverage problem

Future work

Changes in
cultivated
cropland land
in Iowa

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions

- analyze changes in the real CEAP data
- investigate CDL data as source of covariates
- shiny application

The end...

**Changes in
cultivated
cropland land
in Iowa**

Andreea L.
Erdulescu

NRI - CEAP

Data

CEAP sample

Crop
codes/classes

Results

Conclusions

Thank you for your attention!