

Groundwater depletion embedded in domestic transfers and international exports of the United States

Supplementary Information

Sajani Gumidyala¹, Paul J. Ruess¹, Megan Konar^{*1},
Landon Marston², Carole Dalin³, and Yoshihide Wada⁴

*Author to whom correspondence should be addressed, mkonar@illinois.edu

¹Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, 205 North Mathews Avenue, Urbana, IL 61801, USA

²Department of Civil and Environmental Engineering, Kansas State University, 2118 Fiedler Hall, Manhattan, KS 66506, USA

³Institute for Sustainable Resources, Bartlett School of Environment, Energy and Resources, University College London, Central House, 14 Upper Woburn Place, London, WC1H 0NN, UK

⁴International Institute for Applied Systems Analysis (IIASA), Schlossplatz 1, A-2361, Laxenburg, Austria

This document includes supporting tables and figures.
Terms, abbreviations and symbols are the same as in the main text.

The county-scale Groundwater Depletion estimates are provided as:
“GroundwaterDepletion.csv”

A readme file to accompany this spreadsheet is provided as:
“GroundwaterDepletionReadme.txt”

The Depletion Water Flows estimated in this study are provided as:
“DepletionWaterFlows.csv”

A readme file to accompany this spreadsheet is provided as:
“DepletionWaterFlowsReadme.txt”

S1 Tables

Table S1: List of 132 FAF zones.

Rest of HI
Arkansas
North Dakota
Rest of NY
New Mexico
Montana
New York NY-NJ-CT-PA (NY Part)
South Dakota
Rest of OR
Rest of UT
Rest of WA
Seattle WA
Idaho
New York NY-NJ-CT-PA (NJ Part)
Rest of OK
Salt Lake City UT
Buffalo NY CFS Area
Boston MA-RI-NH-CT (RI Part)
Oklahoma City OK
Tulsa OK
Portland OR-WA (OR Part)
Rochester NY
Rest of LA
New York NY-NJ-CT-PA (CT Part)
Baton Rouge LA
Philadelphia PA-NJ-DE-MD (NJ Part)
Hartford CT
Portland OR-WA (WA Part)
Albany NY CFS Area
New Orleans LA-MS (LA Part)
Lake Charles LA
Rest of CT
West Virginia
Columbus OH

Rest of OH
Cincinnati OH-KY-IN (OH Part)
Cleveland OH
Dayton OH
Rest of KY
Louisville KY-IN (KY Part)
Rest of GA
Cincinnati OH-KY-IN (KY Part)
Savannah GA
Atlanta GA
Mississippi
Rest of MA
Boston MA-RI-NH-CT (MA Part)
Vermont
Philadelphia PA-NJ-DE-MD (DE Part)
Rest of PA
Pittsburgh PA-OH-WV (PA Part)
New York NY-NJ-CT-PA (PA Part)
Philadelphia PA-NJ-DE-MD (PA Part)
Rest of MD
Knoxville TN
Rest of TN
Nashville TN
Baltimore MD
Memphis TN-MS-AR (TN Part)
Washington DC-VA-MD-WV (MD Part)
Rest of AL
Birmingham AL
Mobile AL
Rest of VA
Washington DC-VA-MD-WV (VA Part)
Virginia Beach-Norfolk VA-NC (VA Part)
Richmond VA
Rest of MO
Kansas City MO-KS (MO Part)
St. Louis MO-IL (MO Part)
Rest of NH

Boston MA-RI-NH-CT (NH Part)
Maine
Rest of SC
Greenville SC
Charleston SC
Iowa
Rest of NC
Charlotte NC-SC (NC Part)
Raleigh-Durham NC
Greensboro-Winston-Salem-High Point NC
Rest of KS
Omaha NE-IA (NE Part)
Rest of NE
Kansas City MO-KS (KS Part)
Wyoming
Wichita KS
Rest of CO
Denver CO
Rest of MN
Minneapolis-St. Paul MN-WI (MN Part)
Rest of WI
Milwaukee WI
Rest of IN
Indianapolis IN
Fort Wayne IN
Chicago IL-IN-WI (IN Part)
Rest of MI
Grand Rapids MI
Detroit MI
Alaska
Rest of TX
Beaumont TX
San Antonio TX
Corpus Christi TX
Houston TX
Dallas-Fort Worth TX-OK (TX Part)
Austin TX

El Paso TX-NM (TX Part)
Tampa FL
Rest of FL
Miami FL
Orlando FL
Jacksonville FL-GA CFS Area (FL Part)
Laredo TX
Rest of IL
Chicago IL-IN-WI (IL Part)
St. Louis MO-IL (IL Part)
Rest of DE
Washington DC-VA-MD-WV (DC Part)
Honolulu HI
Rest of NV
Rest of AZ
Rest of CA
Tucson AZ
Phoenix AZ
Sacramento CA
San Francisco CA
Las Vegas NV-AZ (NV Part)
San Diego CA
Fresno CA
Los Angeles CA

Table S2: List of FAF4 international world regions.

Canada
Mexico
Rest of the Americas
Europe
Africa
Southwest and Central Asia
Southeast Asia and Oceania

Table S3: List of crop classes considered in this study. The MIRCA crop category is provided with its corresponding SCTG commodity match. SCTG 2 is cereal grains. SCTG 3 is all other agricultural products excluding animal feed, cereal grains, and forage products. SCTG 4 is animal feed, eggs, honey, and other products of animal origin. Note that not all MIRCA crop classes are considering in this study as they are not produced in the United States (e.g. coffee, cocoa, cassava, etc.)

MIRCA number	MIRCA Crop	SCTG code
1	Wheat	2
2	Maize	2
3	Rice	2
4	Barley	2
5	Rye	2
6	Millet	2
7	Sorghum	2
8	Soybeans	3
9	Sunflower	3
10	Potatoes	3
11	Cassava	Not included
12	Sugarcane	3
13	Sugar beets	3
14	Oil palm fruit	Not included
15	Rapeseed/Canola	3
16	Groundnuts/Peanuts	3
17	Pulses	3
18	Citrus	3
19	Date palm	Not included
20	Grapes/Vine	Not included
21	Cotton	3
22	Cocoa	Not included
23	Coffee	Not included
24	Others perennial	3
25	Managed grassland/Pasture	4
26	Others annual	3

Table S4: List of SCTG commodity categories used in this study.

SCTG2:
Cereal Grains (includes seed)
Wheat
Corn
Rye
Barley
Oats
Grain sorghum
Other cereal grains
SCTG3: Agricultural Products
(excludes Animal Feed, Cereal Grains, and Forage Products)
Potatoes
Tomatoes
Onions, shallots, garlic, leeks, and onion sets, fresh or chilled
Lettuce, fresh or chilled
Leguminous vegetables such as peas and beans, fresh or chilled
Other fresh or chilled vegetables
Leguminous vegetables, dried, such as peas, lentils, beans
Other dried vegetables, such as potatoes, mushrooms, and onions
Oranges, fresh or chilled
Grapefruit, fresh or chilled
Other citrus fruit, fresh or chilled
Bananas and plantains, fresh or chilled
Grapes, fresh or chilled
Melons, fresh or chilled
Apples, fresh or chilled
Other fresh or chilled fruit
Dried grapes
Other dried fruit
Nuts in the shell
Shelled nuts

Soy beans
Peanuts, unroasted
Linseed (flaxseed)
Colza (rape) or canola seeds
Sunflower seeds
Cotton seeds
Mustard seeds
Other oil seeds and nuts
Bulbs and roots and similar products, live trees and other plants, and mushroom spawn
Other seeds for sowing
Fresh-cut flowers
Tobacco, not stemmed or stripped
Stemmed and partially stemmed tobacco
Raw cotton
Unprocessed coffee and unfermented tea
Sugar beet and sugar cane
Other agricultural products
SCTG 4: Animal Feed, Eggs, Honey, and Other Products of Animal Origin
Cereal straw or husks and forage products
Inedible flours, meals, and pellets of meat, fish, or seafood, and greaves
Bran, sharps, and other residues of cereals or leguminous plants
Oil cake and other solid residues from the manufacture of vegetable fats or oils
Eggs in the shell
Raw hides and skins
Shorn or pulled greasy wool, animal hair not carded or combed, silk-worm cocoons suitable for reeling, and raw silk
Other products of animal origin, and residues and waste from the food industries used in animal feeding, not elsewhere classified
Dog or cat food put up for retail sale
Other animal feed preparations

S2 Figures

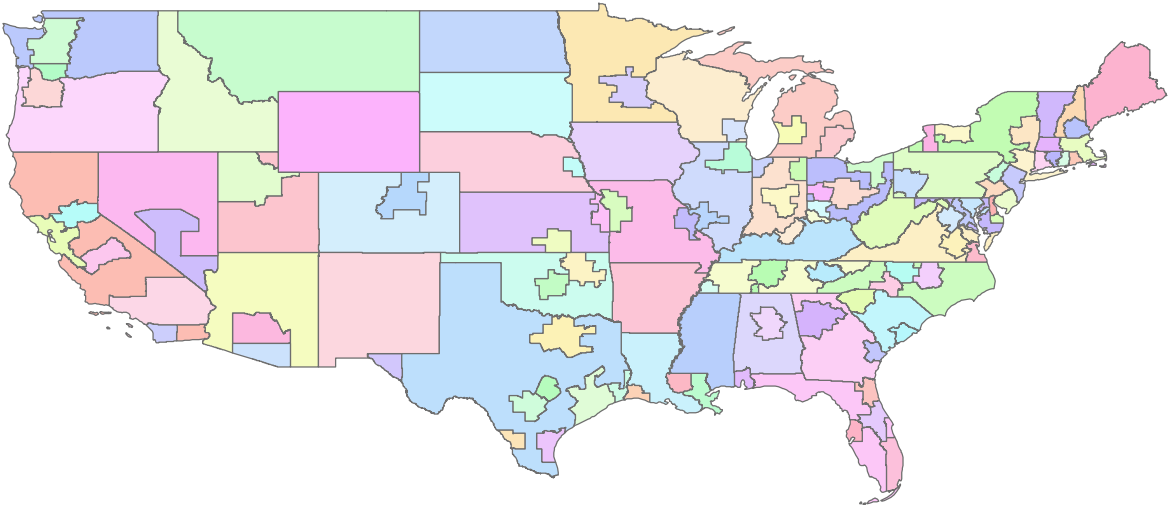


Figure S1: Map of the 132 FAF zones of the Continental United States (CONUS).