

III. Appendices

E. Water Appendix

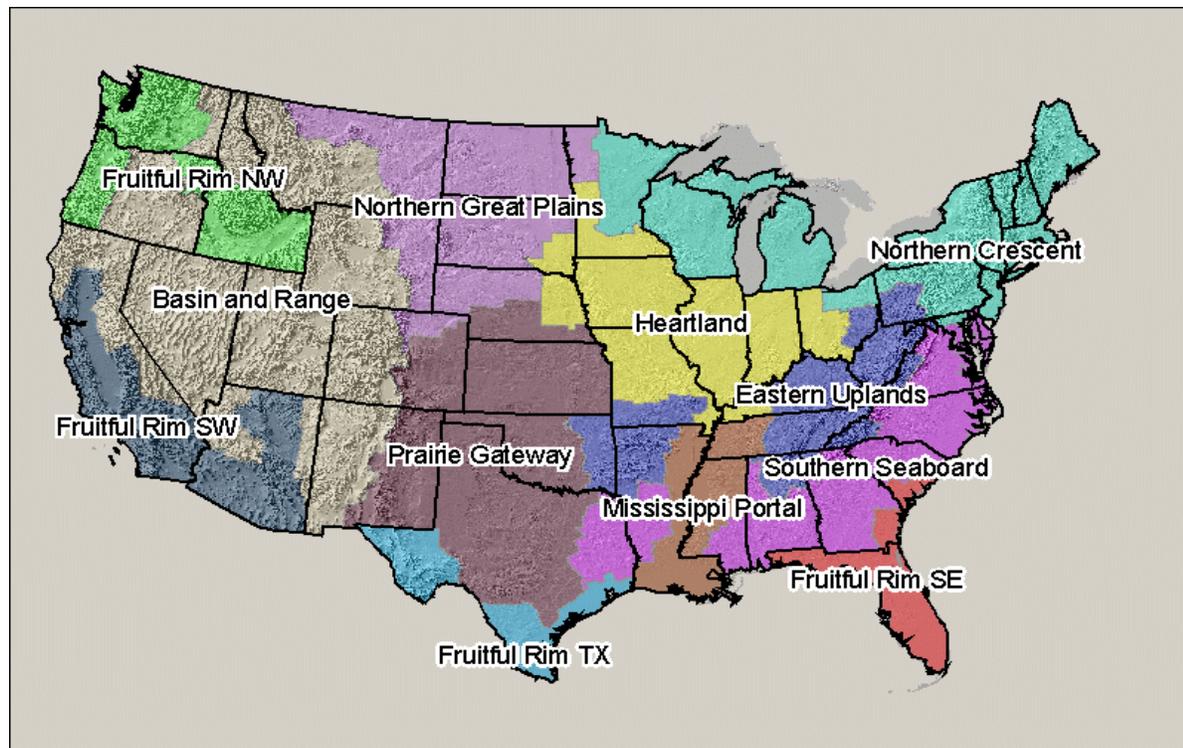
10. Regional Framework Used in the Cumulative Assessment

It is not feasible to conduct assessments for every watershed in the US. Therefore, locations were selected for areas where OPs in surface water and/or ground water are likely to be of concern. The farm resource regions facilitate the selection of locations by making it easier to rank the locations according to concerns regarding drinking water exposure. By design, there are many similarities within a particular region, such as crops grown, application timing (use season), percent of area treated, and application rates. There are also many similarities in key environmental factors affecting runoff, such as precipitation, irrigation practices, soil types, and average slopes. If a region is too large such that agronomic practices differ considerably across the alternative locations, then it would be much more difficult to identify one location as having greater concern or priority over another location. These farm resource regions provide a framework for identifying one or more locations which represent an area of the greatest concern for drinking water exposure in each region. In this way, the Agency can choose a set of locations which will represent drinking water exposure throughout the US.

a. USDA Farm Resource Regions

The U.S. Department of Agriculture, Economic Research Service (ERS) has divided the 48 contiguous states into twelve Farm Resource Regions (Figure III.E.10.1). These twelve regions depict geographic specialization in the production of U.S. farm commodities (Heimlich, 2000). In constructing these regions, USDA identified areas with similar types of farms, intersected with areas of similar physiographic, soil, and climatic traits, as reflected in the USDA Land Resource Regions (Kellogg, 1998). A cluster analysis of U.S. farm characteristics indicate that a few commodities tend to dominate farm production in specific geographic areas that cut across state boundaries. The climate, soil, water, topography, pest problems, and economic factors in localized geographic areas tend to constrain the types of crops and livestock that will thrive there. USDA conformed these intersecting areas to follow the boundaries of USDA Crop Reporting Districts, which are aggregates of counties (Sommer and Hines, 1991). The USDA ERS intends to utilize the twelve Farm Resource Regions in their future publications, and we intend to utilize the Farm Resource Regions to help in defining, characterizing, and conducting the EPA organophosphorous (OP) pesticide cumulative drinking water assessments. These Farm Resource Regions also may be applicable to future cumulative and aggregate assessments.

Figure III.E.10.1. Map of the USDA Farm Resource Regions



Unlike the old ten Farm Production Regions, which had to follow state boundaries, these twelve Farm Resource Regions cut across state boundaries. The USDA has been able to use these new regions to display statistical information on agricultural production, since there are more specific data available at the county level. Since Crop Reporting Districts are generally composed of several counties, Geographical Information Systems (GIS) capability is not required to conduct data analyses using these regional statistics.

i. Consistency with US Environmental Protection Agency Residue Crop Production Regions

EPA has extensively utilized Agricultural regions in developing the US EPA Crop Production Residue Crop Field Trials (EPA, 1995, Subdivision O: Residue Chemistry Test Guidelines. OPPTS 860.1500). Crop field trials need to be conducted to determine the magnitude of the pesticide on raw agricultural commodities in order to establish a tolerance level that reflects the specific application rates and timing, crop growth stages, use season, irrigation, cultural practices such as tillage, agronomic and horticultural practices, climatic (temperature and rainfall) and soil differences, and specific use directions to control pests in a food and/or feed crops. These regional crop field trials are used to establish tolerances for specific food and/or feed commodities as well as for Crop Group tolerances (40 CFR 180.41). The EPA Crop Production Regions are established in thirteen specific regions and are based on natural geography, climatic boundaries, and crop acreage within each region, and their borders are defined by either state boundaries or by major Interstate highways intersecting a state. Generally, the USDA

Farm Resource Regions are in most cases consistent with the established US EPA Crop Production Regions. For example, EPA Crop production Region IV is fairly consistent with the Mississippi Portal Farm Resource Region, as well as EPA Region III (FL) is consistent with the SE Fruitful Rim (FL). The advantage of the USDA Farm Resource Regions is the ability to construct an agricultural region to specific county borders.

b. General Region Descriptions

Table III.E.10.1 depicts the total acres planted for selected crops in each of the 12 regions. Overall, there are approximately 309 million acres of cropland in the US. The Heartland, Region 1, accounts for almost one third of that cropland, or nearly 100 million acres, with corn (43.5 million acres) and soybeans (42 million acres, not shown) being the principal crops in terms of acres planted. A brief description of the twelve Farm Resource Regions follows and includes a list of major commodities and livestock in the region, with references to previous names utilized by researchers in describing these regions.

- ❑ **Region 1. Heartland:** The primary crops in the Heartland region are corn, soybeans, alfalfa, and winter wheat. In addition to corn and soybeans, hog and beef cattle production is widespread in this region. This region is the classical Corn Belt Region, and the Land Resource Region called Central Feed Grains and Livestock Region.
- ❑ **Region 2. Northern Crescent:** Dairy cattle producers are widespread throughout this region. Apples are produced in Michigan and New York. Cherries are produced in Michigan. There is a concentration of snap beans production in southern Michigan, small vegetable farms and nurseries are scattered along the mid-Atlantic and northeastern states. The region also grows significant amounts of soft winter wheat, potatoes, grapes, forage crops, sugar beets, and sweet corn. This region is also known as the Hay and Dairy Region, and includes the Land Resource Regions called Northern Lake States Forest and Forage Region, Lake State Fruit Truck and Dairy Region, and the Northeast Forage and Forest Region.
- ❑ **Region 3. Northern Great Plains:** The Northern Great Plains contains a considerable amount of wheat, and small grains, and oilseeds including sunflower and canola. Potatoes and sugar beets are also grown along the Red River Valley area in both Minnesota and North Dakota. Beef cattle and sheep are also raised in this region. Dry beans and peas are also produced. This region is also known as the Spring Wheat Region, and includes the Land Resource Regions called Northern Great Plains Range and Irrigated Region and Western Great Plains Spring Wheat Region.
- ❑ **Region 4. Prairie Gateway:** The Prairie Gateway has a considerable amount of wheat and grain sorghum in north Texas, Oklahoma and Kansas. There is a concentration of cotton production in west Texas, with cattle and

other livestock (sheep) in the southwestern area of Texas. Peanuts are grown in Oklahoma, and Texas is a major watermelon producing state. This region is also known as the Central Great Plains Region, and includes the Land Resource Regions called Central Great Plains Winter Wheat and Range Region and Southwestern Prairie Cotton Rangeland and Forage Region.

- ❑ **Region 5. Eastern Uplands:** There is a considerable amount of tobacco production in Kentucky, and parts of northeastern Tennessee, and bordering counties in Virginia and North Carolina. There are some poultry farms in West Virginia, Tennessee, Alabama and in Arkansas. Small general farms are characteristic of this region. Other crops important to this region are winter wheat, corn, and alfalfa. This region is also known as the Corn and Winter Wheat Belt Region, and includes the Land Resource Region called East and Central Farming and Forest Region.
- ❑ **Region 6. Southern Seaboard:** There are poultry farms in DelMarva peninsula (Delaware, Maryland, Virginia), and south including North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Arkansas and Texas. Blueberries are important in New Jersey. This region is a mix of small and large farms with corn, soybean, sweet potato, wheat, tobacco, cotton, pecans, peaches, and peanuts being important crops. This region is also known as the Cotton Belt Region and includes the Mid-Atlantic Fruit and Truck Crop Region; and includes the Land Resource Regions called South Atlantic and Gulf Slope Cash Crops Forest and Livestock Region and part of the Atlantic and Gulf Coast Lowland Forest and Crop Region.
- ❑ **Region 7. Southeast Fruitful Rim, CAIAZ:** There is a considerable amount of cotton, rice, and alfalfa production in California. A considerable amount of citrus and subtropical fruits and tree nuts (almond and walnut) also are produced throughout the Central Valley. Other important crops include apricots, plums, sugar beets, grapes, and ornamental crops. There is considerable degree of vegetable production throughout California and Arizona, including broccoli, lettuce, onions, tomatoes, and peppers. Extensive dairy and beef cattle production exists in this region. This region is also known as the Pacific Subtropical Crop Region and includes the Land Resource Regions called California Subtropical Fruit Truck and Speciality Crop Region and parts of the Western Range and Irrigation Region.
- ❑ **Region 8. Basin & Range:** There is a considerable amount of land area used for grazing and irrigated crops. Major commodities in this region are wheat and grain sorghum and cattle. This region is also known as the Grazing and Irrigated Crops Region and includes the Land Resource Regions called Western Range and Irrigated Region.
- ❑ **Region 9. Mississippi Portal:** Cotton, soybeans, and rice are the major crops in this region. Sugarcane production is important in Louisiana. Poultry

and hogs are important. This region is also known as the Mississippi Delta and Delta Region and includes the Land Resource Regions called South Atlantic and Gulf Slope Cash Crops Forest and Livestock Region, Mississippi Delta Cotton Feed Grains, and part of the Gulf Coast Prairie Region.

- ❑ **Region 10. Northwest Fruitful Rim:** There is a considerable amount of apples and pears produced in central Washington. Several grass, legume, and vegetable seed crops are grown in Willamette Valley, Oregon. In western Washington, there is a considerable amount of bushberries grown. Potatoes, sugar beets, dry peas and dry beans are major crops in Idaho. This region is also known as the Northwestern Pome Fruit and Wheat and includes the Land Resource Regions called Northwestern Wheat and Range Region and the Northwestern Forest Forage and Speciality Crop Region.
- ❑ **Region 11. Southwest Fruitful Rim (Texas):** A considerable amount of vegetables are produced in the Lower Rio Grande Valley (LRGV) area of Texas. Cotton and grain sorghum are major crops, and land is grazed by beef cattle. This region is also known as the Southwestern Plateau and Plains Region and includes the Land Resource Regions called Western Range and Irrigated Region and Southwestern Plateaus and Plain Range and Cotton Region.
- ❑ **Region 12. Southeast Fruitful Rim (Florida):** There is a considerable amount of citrus (oranges, grapefruits, limes, etc.) and tropical and subtropical fruit grown in Florida. Sugarcane is a major crop in southern Florida. Fresh tomatoes and other vegetables are grown in Florida. Various vegetable farms are located along the Georgia and South Carolina coast. This region is also known as the Humid Subtropical Crop Belt and the Florida Specialty Crop Region and includes the Land Resource Regions called Florida Subtropical Fruit Truck Crop and Range Region and parts of the Atlantic and Gulf Coast Lowland Forest and Crop Region.

Table III.E.10.2 Total Acres Planted for Selected Crops, by USDA Farm Resource Region

Selected Crops	Total Acres Planted Selected Crops, By USDA/ERS Farm Resource Regions (1,000)												Grand Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Alfalfa Hay	3,641	4,445	4,779	2,024	819	110	979	3,061	11	1,350	26	2	21,248
Field seed/grass seed	72	11	38	15	48	6	12	117	4	492	<1	11	825
Corn for grain or seed	43,517	8,713	3,250	8,614	991	2,315	291	80	1,358	107	280	195	69,712
Cotton	388	<1	<1	4,734	130	2,679	1,360	13	2,958	<1	688	216	13,166
Peanuts	<1	<1	<1	319	6	894	<1	<1	2	<1	30	84	1,336
Potatoes	25	244	138	11	7	26	32	148	<1	550	9	37	1,227
Sugar beets	104	227	668	28	<1	<1	97	99	<1	210	<1	<1	1,433
Tobacco	53	14	<1	<1	288	448	<1	<1	14	<1	<1	19	836
Sugarcane	<1	<1	<1	<1	<1	<1	<1	<1	26	<1	<1	15	41
Dry edible beans	43	387	855	104	<1	<1	63	72	<1	119	<1	<1	1,643
Wheat	4,430	1,312	21,524	21,206	492	1,733	669	3,279	1,173	2,841	41	61	58,760
Land in orchards	37	355	<1	212	87	253	2,610	90	22	373	63	990	5,091
Almonds	<1	<1	<1	<1	<1	<1	539	<1	<1	<1	<1	<1	540
Apples	17	196	<1	2	28	28	46	20	<1	213	<1	<1	551
Pears	<1	4	<1	<1	<1	<1	16	17	<1	37	<1	<1	74
Cherries	<1	55	<1	<1	<1	<1	20	14	<1	30	<1	<1	119
Peaches	3	24	<1	5	8	35	76	5	2	4	<1	<1	163
Plums and prunes	<1	2	<1	<1	<1	<1	148	1	<1	4	<1	<1	154
Lemons	<1	<1	<1	<1	<1	<1	72	<1	<1	<1	<1	<1	72
Oranges	<1	<1	<1	<1	<1	<1	234	<1	<1	<1	8	755	997
Berries	2	63	<1	<1	2	5	23	<1	<1	20	<1	2	117
Grapes	<1	62	<1	1	2	2	853	21	<1	47	<1	<1	989
Land used for Vegetables	277	800	20	87	59	271	1,169	96	16	338	75	253	3,463
Asparagus	<1	19	<1	<1	<1	<1	31	2	<1	20	<1	<1	72
Lettuce	<1	4	<1	2	<1	<1	292	2	<1	<1	<1	2	303
Snap beans	15	118	<1	4	14	24	7	<1	<1	28	<1	28	237
Cantaloups	4	3	<1	2	<1	6	75	<1	<1	<1	4	2	99
Sweet corn	121	288	4	2	10	38	26	18	<1	140	<1	38	685
Tomatoes	13	22	<1	<1	6	8	307	<1	1	<1	<1	40	399
Mint	30	14	<1	<1	<1	<1	<1	19	<1	86	<1	<1	149
Total (all crops) Cropland	99,715	30,856	46,014	53,525	11,845	15,495	9,071	11,312	16,341	8,572	3,274	2,937	308,956
Pct of Total Cropland	32%	10%	15%	17%	4%	5%	3%	4%	5%	3%	1%	1%	100%