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The distribution of leafy spurge (*Euphorbia esula*) and other weedy *Euphorbia* spp. in the United States[1]

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Abstract:

A survey was made in the United States to determine the extent of the infestations of leafy spurge *(Euphorbia esula L.)* and other weeds of economic importance in the Euphorbiaceae. From introductions about 100 years ago, leafy spurge is now found in 458 counties in 26 states from coast to coast. The infestations are out of control in some states, and biological control is mentioned as a possible solution to the problem.

Introduction

In the United States, *Euphorbia esula* L., commonly called leafy spurge, is by far the most important of the weedy spurges. The author is aware of the considerable taxonomic confusion that exists in the genus *Euphorbia*; for this reason the classification used by Fernald in Gray's Manual of Botany, 8th Edition (5) has been followed, even though it is at odds with some recent works. The common names used are in accordance with the Report of Terminology Committee, Weed Society of America 1962 (19).

The problem of the taxonomy of *E. esula* is particularly acute, the species having been lumped and split under a series of synonyms. The most prominent recent American synonym for *E. esula* includes *E. intercedens, E. virgata,* and *E. podperae*. The problem is complex, and the plant obviously has phenotypes which do not lend themselves to clear-cut taxonomic division. To further complicate the situation, a hybrid of leafy spurge with its morphologically separable relative, cypress spurge (*Euphorbia cyparissias L.*), was collected in Ontario, Canada, in 1962 (11).

For the Rocky Mountain State area, Bohmont (2) placed leafy spurge in fourth place among the top ten problem weeds; only Canada thistle [*Cirsium arvense* (L.) Scop.], field

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bindweed (*Convolvulus arvensis* L.), and kochia [*Kochia scoparia* (L.) Schrad.] preceded it.

According to Croizat (4), leafy spurge originated east of the Caucasus Mountains and that from there the plant spread east and west. The Eurasian distribution now extends from Norway, England, and Portugal in Western Europe, east to central and southern Russia. North America and China, according to Bakke (1), represent the extremes of its distribution.

It is an aggressive, tenacious perennial with a vigorous spreading root system, and can propagate sexually from seeds and asexually from root buds. Also, the extensive root system is an efficient storage organ. These characteristics make the plant difficult to kill by cultural, mechanical or chemical means or combinations of these. In addition, since it is not indigenous to North America, it has few natural enemies here.

In several north-central states, leafy spurge has become a serious problem in pastures, ranges, rights-of-way, and other non-cropland areas. The weed not only displaces useful forage plants, but also produces an irritant that causes dermatitis to man and animals. Sheep will graze small plants with no ill effect, but large plants are toxic to them (9). Cattle will refuse to eat leafy spurge unless forage is scarce or they are fed weedy hay. If small amounts are eaten, irritations of the mouth and digestive tract result; large amounts cause death (10). Since leafy spurge cannot be easily or cheaply eradicated, and since it has not yet occupied all the available niches, it will probably continue to spread until other pressures can be brought to bear on it.

One of the reasons why leafy spurge cannot be abated by traditional control methods is its wide distribution and dispersed populations, which make applications of chemicals difficult. However, the fact that the weed is dispersed is not a deterrent to biological control. In fact, the alien origin of the weed, its wide dispersion and the lack of domestic natural enemies make leafy spurge a suitable target plant for a biological control program. To start a biological control program against a weed, it is mandatory to know as precisely as possible the identity of the weed as well as locations, densities and climatic situations in which that weed are found in the country where it is a problem. A survey was therefore made to obtain specific information on the distribution of leafy spurge and its close relative, cypress spurge, as well as the distribution and density of other spurges that can be problem weeds in the United States.

History of leafy spurge in the United States

The first record of leafy spurge in the United States was from Newbury, Massachusetts, in 1827, according to Britton (3). He also remarked that the plant was not reported from any other site until 1876 when it was collected from Groton, New York and was annotated as being a rare plant. By 1881 the recorded range of leafy spurge was extended west to Michigan where the plant was found infrequently, and by 1913 the known range included Ontario, Canada, and New Jersey. By 1921, the weediness of the plant, the difficulty of eradication, and its threat to pastures were apparent enough to give rise to an editorial in the New York Herald (13).

In 1933 Hanson and Rudd (7) published a map (Figure 1) showing that leafy spurge could be found in Maine, New Hampshire, Massachusetts, Connecticut, New York (including Long Island), Pennsylvania, Maryland, Michigan, Illinois, Wisconsin, Iowa, Minnesota, North Dakota, South Dakota, Nebraska, Colorado, Montana, Idaho, and Washington. Thus, in the twelve years, from 1921 to 1933, the known range of leafy spurge had spread from coast to coast across the northern tier of states. Hanson and Rudd also predicted that sooner or later leafy spurge would be found in the central and western states adjoining those showing infestations in 1933.

In 1970 Reed and Hughes (14) published a leafy spurge distribution map (Figure 2), showing that Hanson and Rudd's prediction had partially been fulfilled, i.e., leafy spurge moved westward, but there was no appreciable southward migration in any of the central states. Also, according to Harris and Alex (8), in 1970 leafy spurge was found in every province in Canada, except Newfoundland.

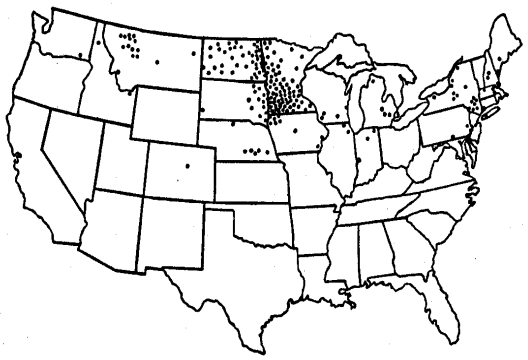

Figure 1. 1933 distribution of *E. esula* in the United States (after Hanson and Rudd).

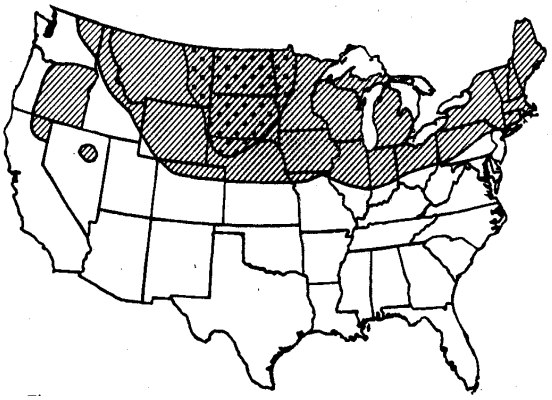

Figure 2. 1970 distribution of *E. esula* in the United States (after Reed and Hughes).

Survey method

For the present survey, which began in 1975 and was completed in 1978, workers in weed science, botany and agronomy were asked to report on the distribution and abundance of leafy and cypress spurge in their states and also to report information on distribution and density for any other spurges that were regarded as weedy, e.g., "As a part of this survey, we would like to have information about species of *Euphorbia* (other than *E. esula* and *E. cyparissias*) that may be regarded as economically important weeds in your state and for which control measures are recommended." The cooperators were then asked to rate all spurge infestations in their state, county by county, on the following scale: 1=500+ infested acres/county; 2=25 to 500 acres; 3=1 to 25 acres; counties with no

known spurge were not rated. Accompanying each questionnaire were maps of the cooperator's particular state with the counties delineated[2].

The survey maps were returned from cooperators in the 48 contiguous states, the information for each species named was recorded on a master map. Each county was color-coded according to the intensity of the infestation reported. In some of the western states the larger counties were divided into quarters to make the distributional information more precise.

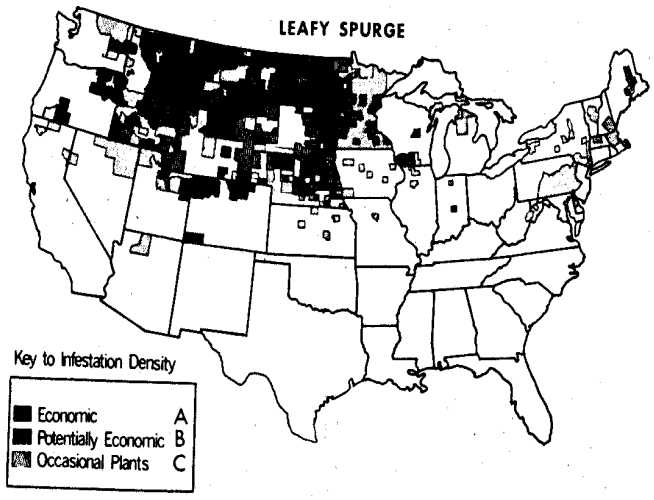

Figure 3. Leafy spurge distribution and density by counties in the mainland United States, 1975.

Results

The most significant result of the research survey was the tabulation of the states and counties infested with weedy spurges, and the updating and refining of the leafy spurge surveys of Hanson and Rudd (7) and Reed and Hughes (14).

The new data for leafy spurge (Table 1 and Figure 3) point out the serious occurrence and spreading of this weed in the United States. The ratings of 1 and 3 are the most important, because any county with a 1 rating (500+ acres) already has a serious spurge problem, and those counties with a 3 rating (1 to 25 acres) are useful in defining the frontier of the migration of the introduced spurges.

[2] U.S. Dep. Commerce. 1971. Boundaries of counties and county equivalents as of January 1970. U.S. Dept. Commerce, Bur. Census Stock No. 0301-1896. U.S. Govt. Printing Office, Washington, DC. 1p.

Table 1. Distribution of leafy and cypress spurge in the 48 contiguous states.

State and no. counties infested	Level of infestation[a], County name
	Leafy spurge
Arizona - 1	C - Coconino[b]:
California - 2	C - Lassen[c], Siskiyou[d];
Colorado - 8	A - La Plata, Larimer, Moffat, Rio Blanco, Routt, Weld;
	B - Boulder, Montezuma;
Connecticut - 8	A - Fairfield, Hartford, Litchfield, Middlesex, New Haven, New London, Tolland, Windham;
Delaware - 2	B - New Castle;
	C - Kent;
Idaho - 28	A - Custer, Elmore, Fremont, Madison, Washington;
	B - Bannock, Butte, Caribou, Cassia, Clark, Franklin, Jefferson, Kootenai, Lemhi, Oneida, Owyhee, Teton;
	C - Ada, Adams, Bear Lake, Bingham, Bonneville, Boundary, Latah, Lewis, Lincoln, Twin Falls, Valley;
Illinois - 4	C - Bureau, Kane, Ogle, Stephenson;
Iowa - 11	C - Buena Vista, Cherokee, Delaware, Fremont, Iowa, Mills, Montgomery, Page, Sioux, Story, Webster;
Kansas - 4	C - Ellis, Jewell, Marion, Pottawatomie;
Maine - 2	B - Penobscot, York;
Massachusetts - 5	A - Essex, Franklin, Middlesex, Norfolk, Suffolk;
Michigan - 11	C - Antrim, Cheboygan, Chippewa, Crawford, Delta, Kalkaska, Menominee, Missaukee, Otsego, Presque Isle, Roscommon;
Minnesota - 80	A - Becker, Clay, Crow Wing, Hennepin, Polk;
	B - Big Stone, Carlton, Douglas, Grant, Chippewa, Clearwater, Dakota, Kanabec, Kandiyohi, Kittson, Lac qui Parle, Lincoln, Lyon, Marshall, Norman, Otter Tail, Pine, Pope, Ramsey, Rice, Roseau, Scott, Stearns, Stevens, Traverse, Wilkin, Winona, Yellow Medicine;
	C - Aitkin, Anoka, Beltrami, Benton, Blue Earth, Brown, Carver, Cass, Chisago, Cottonwood, Faribault, Fillmore, Freeborn, Goodhue, Houston, Hubbard, Isanti, Itasca, Jackson, Le Sueur, Mahnomen, Martin, McLeod, Meeker, Mille Lacs, Morrison, Mower, Murray, Nicollet, Nobles, Olmsted, Pennington, Pipestone, Red Lake, Redwood, Renville, Rock, Sherburne, Sibley, Steele, Stevens, St. Louis, Todd, Wabasha, Waseca, Washington, Wright.
Missouri - 1	C – Chariton
Montana - 54	A - Carbon, Cascade, Chouteau, Deer Lodge, Fallon, Fergus, Gallatin, Hill, Jefferson, Judith Basin, Lewis and Clark, Madison, Mineral, Missoula, Park, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Teton, Silver Bow, Stillwater, Sweet Grass, Valley;
	B - Beaverhead, Big Horn, Blaine, Broadwater, Carter, Custer, Dawson, Flathead, Glacier, Granite, Hill, Lincoln, Rosebud, Sanders, Sheridan, Toole, Wheatland, Wibaux, Yellowstone;
	C - Daniels, Garfield, Golden Valley, Liberty, McCone, Musselshell, Treasure;

State and no. counties infested	Level of infestation[a], County name
Nebraska - 54	A - Antelope, Butler, Cedar, Cherry, Cuming, Custer, Dakota, Dixon, Garfield, Greeley, Hall, Holt, Knox, Loup, Madison, Nance, Pierce, Platte, Stanton, Sherman, Rock, Wayne;
	B - Boyd, Buffalo, Burt, Cheyenne, Clay, Colfax, Dawson, Dodge, Howard, Jefferson, Keya Paha, Lancaster, McPherson, Merrick, Otoe, Polk, Sarpy, Saunders, Sheridan, Sioux, Thurston;
	C - Adams, Banner, Garden, Hooker, Lincoln, Phelps, Richardson, Saline, Thayer, Thomas, Washington;
Nevada - 3	C - Elko, Humboldt[e], Washoe[f]
New Hampshire - 4	C - Belknap, Merrimack, Rockingham, Strafford;
New Mexico - 1	C - Colfax;
New York[g] - 12	C - Albany, Bronx, Columbia, Dutchess, Erie, Genesee, Herkimer, Jefferson, Madison, Orange, Sullivan, Tompkins;
North Dakota - 52	A - Adams, Barnes, Benson, Bottineau, Bowman, Burke, Cavalier, Cass, Divide, Dickey, Eddy, Foster, Golden Valley, Grand Forks, Grant, Griggs, Hettinger, Kidder, LaMoure, McIntosh, McHenry, Mercer, Morton, Mountrail, Oliver, Ramsey, Richland, Rolette, Nelson, Pierce, Ransom, Renville, Sargent, Sioux, Stark, Steele, Stutsman, Traill, Walsh, Ward, Williams;
	B - Burleigh, Dunn, Emmons, Logan, McLean, Pembina, Sheridan, Slope, Towner, Wells;
	C - Billings;
Oregon - 6	B - Baker, Grant[h], Klamath, Umatilla, Wallowa;
	C - Union;
Pennsylvania - 27	C - Adams, Bedford, Berks, Blair, Bucks, Carbon, Centre, Chester, Columbia, Cumberlahd, Delaware, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Lehigh, Luzerne, Mifflin, Monroe, Montgomery, Montour, Perry, Pike, Union, York;
South Dakota - 49	A - Bon Homme, Brule, Brown, Clark, Clay, Codington, Custer, Day, Deuel, Douglas, Grant, Hamlin, Kingsbury, Lake, Lincoln, McCook, Minnehaha, Moody, Roberts, Sanborn, Spink, Turner, Union, Yankton;
	B - Aurora, Beadle, Brookings, Campbell, Charles Mix, Davison, Faulk, Gregory, Hand, Harding, Hutchinson, Lawrence, Miner, Pennington, Perkins, Tripp;
	C - Bennett, Butte, Fall River, Hanson, Jerauld, Meade, Todd;
Utah - 10	A - Uintah;
	B - Cache, Morgan, Rich, Salt Lake, Wasatch, Weber;
	C - Box Elder, Duchesne, Utah;
Vermont - 2	C - Orange, Washington;
Washington - 6	A - Lincoln;
	B - Spokane;
	C - Adams, Ferry, Okanogan, Stevens;
West Virginia - 2	C - Randolph, Grant;
Wisconsin - 8	A - Iowa;

State and no. counties infested	Level of infestation[a], County name
	B - Dane, Grant, Green, Lafayette, Waupaca;
	C - Marinette, Rock;
Wyoming - 21	A - Big Horn, Carbon[i], Crook, Hot Springs, Johnson, Laramie, Sheridan, Washakie;
	B - Campbell, Converse[j], Goshen, Lincoln, Natrona[k], Niobrara, Park[l], Platte, Teton, Uinta, Weston;
	C - Albany[m], Freemont[n].
	Cypress spurge
Arkansas - 3	B - Benton, Washington, Sharp;
California - 4	C - Modoc, Placer, Plumas, Siskiyou;
Colorado - 2	C - Larimer, Weld;
Connecticut - 8	A - Fairfield, Hartford, Litchfield, Middlesex, New Haven, New London, T-lland, Windham;
Delaware - 1	C - New Castel;
Indiana - 22	C - Clark, Decatur, Hancock, Henry, Howard, Jasper, Lagrange, Lawrence, Marion, Montgomery, Morgan, Newton, Noble, Porter, Putnam, Randolph, Ripley, St. Joseph, Steuben, Tippecanoe, Tipton, Wells;
Kansas - 13	C - Atchison, Ellis, Geary, Hamilton, Linn, Lyon, Marshall, Pottawatomie, Riley, Shawnee, Sheridan, Wabaunsee, Washington;
Maryland - 3	A - Garrett, Howard, Prince Georges;
Massachusetts - 14	A - Barnstable, Berkshire, Bristol, Dukes, Essex, Franklin, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester;
Minnesota - 61	B - Carver, Dakota, Hennepin, Scott, Washington, Winona;
	C - Aitkin, Anoka, Becker, Beltrami, Benton, Big Stone, Blue Earth, Brown, Carlton, Cass, Chippewa, Chisago, Clearwater, Crow Wing, Dodge, Douglas, Faribault, Fillmore, Freeborn, Goodhue, Grant, Houston, Hubbard, Isanti, Itasca, Kanabec, Kandiyohi, Koochiching, Le Sueur, Mahnomen, McLeod, Meeker, Mille Lacs, Morrison, Mower, Nicollet, Olmsted, Otter Tail, Pine, Pope, Ramsey, Renville, Rice, St. Louis, Sherburne, Stearns, Steele, Swift, Todd, Traverse, Wabasha, Wadena, Waseca, Wright;
Missouri - 7	C - Boone, Cole, Franklin, Howard, Jackson, Marion, St. Charles;
Montana - 4	C - Beaverhead, Carter, Custer, Flathead
Nebraska - 7	C - Dodge, Douglas, Hall, Holt, Lancaster, Saline, Webster;
New Hampshire - 10	C - Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, Sullivan;
New York - 14	C - Allegany, Chenango, Franklin, Genesee, Hamilton, Herkimer, Jefferson, Orange, Monroe, Niagara, Oneida, Saint Lawrence, Tompkins, Westchester;
North Carolina - 12	C - Alarnance, Buncombe, Cabarrus, Haywood, Madison, Mitchell, Rockingham, Rowan, Stokes, Wake, Watauga, Yancey;
North Dakota - 2	C - Eddy, Kidder;
Ohio - 29	C - Auglaize, Ashland, Ashtabula, Clinton, Columbiana, Coshocton, Cuyahoga, Darke, Erie, Franklin, Fulton, Gallia, Hardin, Highland, Huron, Jefferson, Lake, Licking, Lorain, Madison, Mercer, Miami, Monroe,

State and no. counties infested	Level of infestation[a], County name
	Montgomery, Ottowa, Richland, Shelby, Wayne, Wyandot;
Pennsylvania - 67	C - Berks, Bucks, Carbon, Centre, Lehigh, Monroe, Montgomery, Northampton, Schuylkill;
Rhode Island - 3	C - Kent, Newport, Washington;
Tennessee - 1	C – Montgomer;
Vermont - 5	B - Bennington, Chittenden, Rutland, Windsor;
	C - Windham;
Virginia 1	B - Bland;
Washington - 1	C - Spokane;
West Virginia - 12	C - Barbour, Fayette, Grant, Jefferson, Kanawha, Mineral, Monongalia, Nicholas, Ritchie, Tucker, Upshur, Wyoming;
Wyoming - 8	C - Albany, Big Horn, Converse, Goshen, Laramie, Park, Platte, Washakie.

[a] Counties are classified as: A - 500+ acres; B - 25 to 500 acres; C - up to 25 acres.
[b] NW ¼ of county only.
[c] SE ¼ of county.
[d] NE ¼ and SW ¼ .
[e] NE ¼ of county.
[f] Central ¼ of county.
[g] infestations not classified.
[h] N ½ of county.
[i] SE ¼ of county.
[j] SE ¼ of county.
[k] SE ¼ of county.
[l] E ¼ of county.
[m] SE ¼ of county.
[n] E ½ of county.

Cypress or graveyard spurge is a low growing perennial that is native to Europe and was brought to this country as an ornamental and usually planted in cemeteries. It escaped and has now become naturalized (17). Its distribution is presented in Table 1 and Figure 4. The common ornamental is a diploid, male sterile form, but, like leafy spurge, it can propagate vegetatively through an efficient root system that sends out many rhizomes. There is also a fertile tetraploid form that can propagate by seeds and hybridize with leafy spurge (11). Because of the existence of the fertile tetraploid phenotype of this plant in several places in New York State and at Pittsfield, Massachusetts, and the difficulty of eradication, it has the potential to become a serious weed (12). In fact, in 1952 at Braeside, near Ottawa, Canada, a 9-square mile infestation of this fertile tetraploid form was reported (8); it has by now no doubt increased in size. Despite the fact that cypress spurge is widely distributed, it was named as a problem weed in the present survey only in Bland County, Virginia, where there is a severe 300-acre infestation.

In addition to leafy and cypress spurge, several native spurges were identified as weedy by the survey cooperators. Their weediness is the result of favorable conditions created for them in the culture of certain crop and lawn plants.

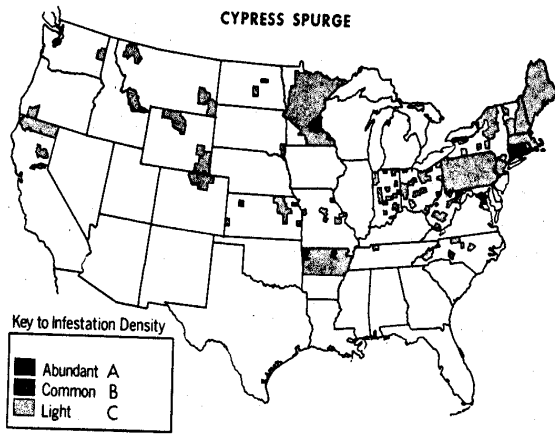

Figure 4. Cypress spurge distribution and density by counties in the mainland United States, 1975.

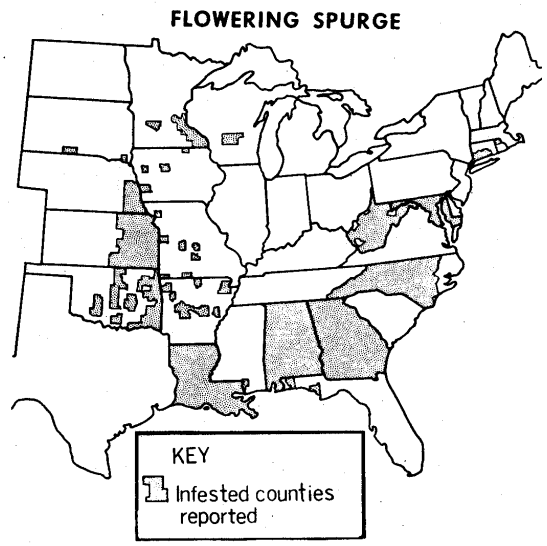

Figure 5. Flowering spurge, approximate distribution in the United States, 1975.

Flowering spurge (*Euphorbia corollata L.*) is a native plant with several varieties (15). The general area reported by Fernald (5) is Florida west to Texas, northward to New York, southern Ontario, Michigan, Wisconsin, Minnesota and Nebraska. He also reports the varieties *mollis* Millsp. and *paniculta* (Ell.) Boiss. As occurring in Alabama, Virginia, North Carolina, Indiana, and Georgia. The distribution reported in this survey (Figure 5) named the plant as a weed in the following states: Kansas, nine infested counties (Author marked one additional county (Renville) reported in Great Plains Flora Association Map (6).); Louisiana, "widespread"; Maryland, "throughout state" (no counties marked in these two states); Minnesota, nine counties; North Carolina, "throughout state except lower coastal plain"; West Virginia, "in all counties but two"; Wisconsin, "fairly common in the central portion of the state, more of a novelty in shelter belts and waste places than a problem". Cooperators marked insted counties in Arkansas, Iowa, Missouri, Nebraska, Oklahoma, South Dakota and Vermont, but the plant was not mentioned as a problem.

Toothed spurge (*Euphorbia dentata* Michx.) is an erect native annual, mentioned by contributors to this survey as a weed (but not important) in California, Colorado, Iowa, Kansas, and Tennessee (Figure 6). Fernald (5) records its distribution as "New York west to Wyoming and south to Louisiana and Mexico". The Great Plains Flora Association (6) also recorded it in Colorado and New Mexico, and Fuller stated it is first recorded in California in 1962 in San Joaquin County, and subsequently in Humboldt County in 1963, and Alameda County in 1970 (Fuller, T. C. 1971. Correction of plant identification, Plate 22-5, Nebraska Weeds. Memo to County Agricultural Commissioners (Calinia), December 13, 1971). Other cooperators in the survey noted that *E. dentata* was found in Missouri, Nebraska, Oklahoma, and Vermont. All of the other spurges, except *E. dentata*,

have been the targets of weed control measures in one or more states, but apparently no control measures are being taken against this plant.

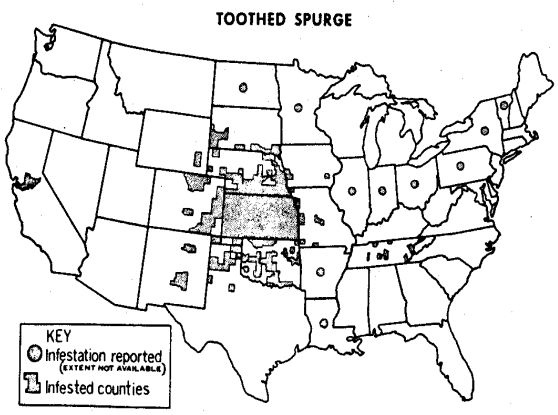

Figure 6. Toothed spurge, approximate distribution in the United States, 1975.

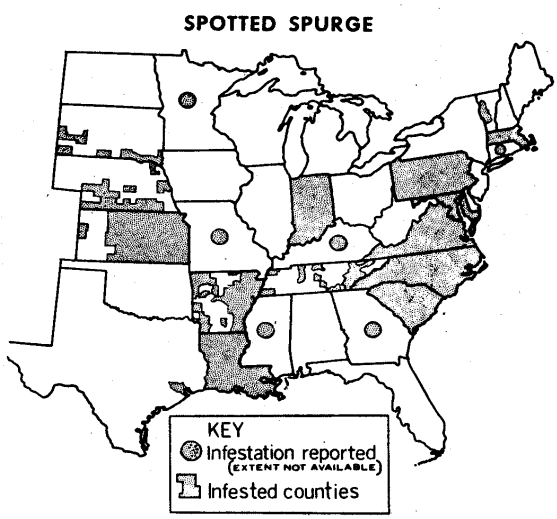

Figure 7. Spotted spurge, approximate distribution in the United States, 1975.

Spotted spurge (*Euphorbia maculata* L.), a more or less erect native annual species, is surrounded by considerable taxonomic confusion and is presented here in the sense found in Gray's Manual of Botany, 8th ed. (5). This weed does not cause extensive problems anywhere in its range, but it is subject to control measures in some areas. It is distributed as follows: Arkansas, "problem in cotton and soybeans"; Massachusetts, "economic in lawn and turf"; South Carolina, "bad weeds in fields, gardens and waste places". In Indiana, Kansas, Louisiana, Maryland, Pennsylvania, Rhode Island, Tennessee, Vermont, Virginia, West Virginia, Texas, and Minnesota its distribution ranges from "common" to "known to be present", and it is not regarded as noxious. Because it is an annual of minor importance, the distribution presented in Figure 7 is only approximate.

Prostrate spurge (*Euphorbia supina* Raf.) has considerable taxonomic confusion surrounding it, so the nomenclature of Gray's Manual of Botany, 8th ed. (5) is used here. This prostrate native herbaceous annual is innocuous over most of its range, but does cause problems locally; e.g., it is a major problem in the Elba muck area of western New York state (18). Other problem states are: Georgia, "a common and troublesome weed"; Massachusetts, "economic in lawns and turf"; North Carolina, "a lawn weed"; Oklahoma, "problem in cotton"; South Carolina, "weed in field, gardens and waste places". It was noted as common in lawns and a minor problem throughout Delaware, Indiana, Illinois, Mississippi, Maryland, and Tennessee. Its presence was acknowledged also in Arkansas, New Mexico, Minnesota, Wisconsin as well as Louisiana, Pennsylvania, Rhode Island, Texas, Wyoming, West Virginia, Kansas, Missouri, and Vermont. This is not a serious spreading pest; therefore, it has not had as much attention as the introduced weeds, so the distribution shown in Figure 8 is only approximate.

Snow on the mountain (*Euphorbia marginata* Pursh.) is an erect native annual and is not regarded as a major problem even though it is common from South Dakota south to the Texas Gulf Coast. In addition, it has been recorded from Vermont as a rare plant. The approximate distribution is shown on Figure 9.

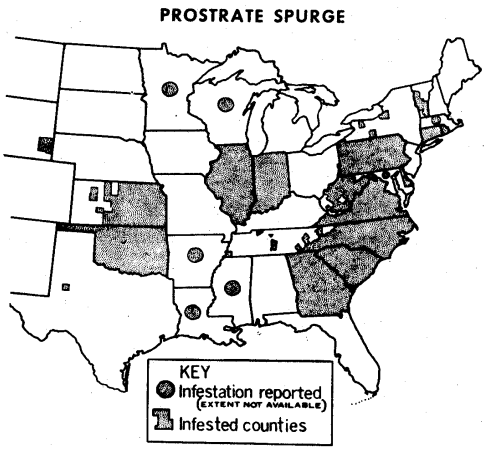

Figure 8. Prostrate spurge, approximate distribution in the United States, 1975.

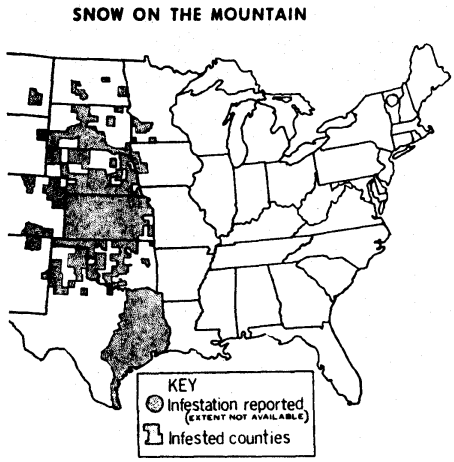

Figure 9. Snow on the mountain, approximate distribution in the United States, 1975.

Oblong spurge (*Euphorbia oblongata* Griseb.) is a deep-rooted, tenacious, shade-loving, perennial weed introduced from the southern Balkan Peninsula and Aegean Region (16). It is presently found only in California where it is restricted to fifteen counties around San Francisco and west of the Sierra Nevada mountains. Eradication programs are underway in all but three (Contra Costa, Santa Clara and San Mateo).

Serrate spurge (*Euphorbia serrata* L.), a slender, woody perennial, was introduced from Western Europe (16) and is found only in California (Alameda County) where an eradication is being attempted.

While a variety of spurges may be regarded as serious pests locally, only one, leafy spurge, is a serious national pest. This survey shows that leafy spurge is out of control in some states, which leads one to believe that attempted suppression by biological means is the logical next step in these areas. On the other hand, infestations such as those in Kansas (27 acres, net), and California (1/5 acre, net), which are not out of control, should continue to be subjected to a vigorous program of chemical abatement.

The potential pest cypress spurge is not currently a threat because most infestations consist of the male sterile, diploid phenotype. However, wherever the fertile tetraploid phenotype is found, it should be held in check by chemical abatement until other control measures are developed.

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