5. PRODUCTION, IMPORT/EXPORT, USE, AND DISPOSAL

5.1 PRODUCTION

1,3-Dichloropropene is produced by either high-temperature chlorination of propylene or from 1,3-dichloro-2-propanol by dehydration with $POCl_3$ or P_2O_5 in benzene (Hartwig et al. 2005; Krahling et al. 2005; Yang 1986). All commercial preparations of 1,3-dichloropropene are mixtures of the cis- and trans- isomers. Before 1978, approximately 25 million kilograms (25,000 metric tons) of 1,3-dichloropropene were produced annually in the United States (Yang 1986). Over 1 million kilograms (1,000 metric tons) of pesticides containing 1,3-dichloropropene were used in California alone in 1978. The production volume of 1,3-dichloropropene reported by U.S. manufacturers in 1986, 1990, 1994, 1998, and 2002 was within the range of >1 million pounds to 10 million pounds (>450–4,500 metric tons) (IUR 2002).

2,3-Dichloropropene is produced during the chlorination of propylene as a byproduct in allyl chloride synthesis (Krijgsheld and Vandergen 1986). It can also be formed by treating 1,2,3-trichloropropane with alkali or by chlorination of 2-chloro-1-propene. Production methods for 1,1-, 1,2-, and 3,3-dichloropropene were not located. Based on the International Update Rule data, the production volume of 2,3-dichloropropene reported by U.S. manufacturers was within the range of >1 million pounds to 10 million pounds (>450–4,500 metric tons) in 1986 and <10,000 pounds (4.5 metric tons) in 1990, 1994, 1998, and 2002 (IUR 2002). 1,1-, 1,2-, and 3,3-Dichloropropene were not listed as high production volume chemicals (>10,000 pounds or 4.5 metric tons produced per year) in 1986, 1990, 1994, 1998, or 2002 (IUR 2002).

According to SRI (2005), Dow AgroSciences LLC (Freeport, Texas) is the only current manufacturer of 1,3-dichloropropene. Active registrants of 1,3-dichloropropene pesticide formulations include Dow AgroSciences LLC (Indianapolis, Indiana), Soil Chemicals Corporation (Hollister, California), and Trical (Hollister, California). Current manufacturers of 1,1-, 1,2-, 2,3-, and 3,3-dichloropropene were not located in the literature.

After the use of ethylene dibromide (EDB) was suspended by EPA, 1,3-dichloropropene and methyl bromide became the major substitutes for EDB (Yang 1986). Now that the use of methyl bromide is scheduled to be phased out by EPA in 2006, 1,3-dichloropropene is expected to become a substitute for

this pesticide as well (Cryer and van Wesenbeeck 2001; El Hadiri et al. 2003; EPA 2006k; Kim et al. 2003a, 2003b). 1,3-Dichloropropene use permits were suspended in California during 1990 after high concentrations of this pesticide were detected in air samples (Baker et al. 1996; EPA 1998b; Roby and Melichar 1997). Reintroduction of limited use was approved by the California Department of Pesticide Regulation in 1994.

Tables 5-1 and 5-2 list the facilities in each state that manufacture or process 1,3-dichloropropene and 2,3-dichloropropene, respectively. These tables give the intended use and the range of the amounts of 1,3- and 2,3-dichloropropene stored on site. The data listed in Tables 5-1 and 5-2 are derived from the Toxics Release Inventory (TRI04 2006). Only certain types of facilities were required to report (EPA 1997). Therefore, this is not an exhaustive list. TRI data are not available for 1,1-, 1,2-, and 3,3-dichloropropene.

5.2 IMPORT/EXPORT

Import and export data for 1,1-, 1,2-, 1,3-, 2,3-, and 3,3-dichloropropene were not located in the literature.

5.3 USE

1,3-Dichloropropene is the predominant component of several formulations used in agriculture as soil fumigants for parasitic nematodes (Hartwig et al. 2005; Krijgsheld and Van der Gen 1986). Currently, there are 14 registered commercial preparations of fumigants that contain 1,3-dichloropropene (EPA 2006i). The trade names of these preparations are listed in Chapter 4. Table 5-3 contains the reported chemical compositions of these mixtures. Some variation may exist in the composition of these products. Most of these fumigants are not diluted and are applied directly to the soil of vegetable and tobacco crops (Yang 1986). Much smaller quantities of 1,3-dichloropropene are used as solvents and chemical intermediates (Krijgsheld and Van der Gen 1986; Lewis 2001).

2,3-Dichloropropene is used as a chemical intermediate (Krigsheld and Vandergen 1986). It was formerly used as an active ingredient along with ethylene dichloride in a pesticide formulation (EPA 2006i). However, the registration of this pesticide was cancelled in 1985. Uses for 1,1-, 1,2-, and 3,3-dichloropropene were not located in the available literature.

Table 5-1. Facilities that Produce, Process, or Use 1,3-Dichloropropene

State[a]	Number of facilities	Minimum amount on site in pounds[b]	Maximum amount on site in pounds[b]	Activities and uses[c]
AR	2	1,000	99,999	12
CA	10	1,000	9,999,999	6, 7, 9
DE	4	10,000	9,999,999	6, 10
FL	1	1,000,000	9,999,999	7, 9
GA	2	10,000	999,999	9
HI	1	1,000	9,999	10
IL	2	1,000	99,999	7, 12
LA	18	0	9,999,999	1, 3, 4, 5, 6, 12, 13
MI	7	100,000	9,999,999	1, 3, 4, 5, 7, 9, 12
MS	1	1,000	9,999	10
NC	2	100,000	9,999,999	9
NJ	2	1,000	99,999	12
OH	3	1,000	9,999,999	1, 4, 7, 12
SC	1	10,000	99,999	6
TX	19	1,000	99,999,999	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14
WA	1	1,000,000	9,999,999	9

[a]Post office state abbreviations used
[b]Amounts on site reported by facilities in each state
[c]Activities/Uses:

1. Produce
2. Import
3. Onsite use/processing
4. Sale/Distribution
5. Byproduct
6. Impurity
7. Reactant
8. Formulation Component
9. Article Component
10. Repackaging
11. Chemical Processing Aid
12. Manufacturing Aid
13. Ancillary/Other Uses
14. Process Impurity

Source: TRI04 2006 (Data are from 2004)

Table 5-2. Facilities that Produce, Process, or Use 2,3-Dichloropropene

State[a]	Number of facilities	Minimum amount on site in pounds[b]	Maximum amount on site in pounds[b]	Activities and uses[c]
IA	2	100	9,999	1, 5, 13
IN	1	10,000	99,999	6
LA	5	10,000	999,999	1, 4, 5, 12, 13
TX	17	0	49,999,999	1, 2, 3, 5, 6, 7, 8, 12, 13, 14

[a]Post office state abbreviations used
[b]Amounts on site reported by facilities in each state
[c]Activities/Uses:

1. Produce
2. Import
3. Onsite use/processing
4. Sale/Distribution
5. Byproduct
6. Impurity
7. Reactant
8. Formulation Component
9. Article Component
10. Repackaging
11. Chemical Processing Aid
12. Manufacturing Aid
13. Ancillary/Other Uses
14. Process Impurity

Source: TRI04 2006 (Data are from 2004)

Table 5-3. Compositions of Actively Registered Commercial Products Containing 1,3-Dichloropropene

Name	Composition	Manufacturer
Pic Clor 60	39% 1,3-dichloropropene 59.4% chloropicrin	Soil Chemicals Corporation
Pic-Chlor 15	82.9% 1,3-dichloropropene 14.8% chloropicrin	Soil Chemicals Corporation
Pic-Chlor 30	68.2% 1,3-dichloropropene 29.7% chloropicrin	Soil Chemicals Corporation
Tri-Cal Trilone II Soil Fumigant	94% 1,3-dichloropropene	Trical
Tri-Form 40/60	37.6% 1,3-dichloropropene 60% chloropicrin	Trical
Telone C-15	82.9% 1,3-dichloropropene 14.8% chloropicrin	Trical
Tri-Form 30	68.2% 1,3-dichloropropene 29.7% chloropicrin	Trical
Tri-Form 35	63.4% 1,3-dichloropropene 34.6% chloropicrin	Trical
Telone C-17	81.2% 1,3-dichloropropene 16.5% chloropicrin	Dow Agrosciences LLC
Telone II	97.5% 1,3-Dichloropropene	Dow Agrosciences LLC
Telone C-35	63.4% 1,3-dichloropropene 34.7% chloropicrin	Dow Agrosciences LLC
Telone EC	93.6% 1,3-dichloropropene	Dow Agrosciences LLC
Telone Technical	97.5% 1,3-dichloropropene	Dow Agrosciences LLC
Inline	60.8% 1,3-dichloropropene 33.3% chloropicrin	Dow Agrosciences LLC

Source: EPA 2006i

5.4 DISPOSAL

1,3-Dichloropropene may be disposed of by using a sorbent media that is packaged in an epoxy-lined drum and placed in a Resource Conservation and Recovery Act (RCRA)-approved landfill. 1,3-Dichloropropene may also be disposed of in a high-temperature incinerator with an acid scrubber and a temperature/dwell time that will completely destroy the pesticide (HSDB 2006). Disposal methods specific to 1,1-, 1,2-, 2,3-, and 3,3-dichloropropene were not located in the literature; however, disposal methods designed for 1,3-dichloropropene are expected to apply to these isomers as well based on the similarities in physical and chemical properties.