



## Ozone Layer Protection - Science

You are here: [EPA Home](#) [Ozone Layer Protection](#) [Ozone Science](#) [Class I Ozone-depleting Substances](#)

[ODS Home](#)

[Class I Substances](#)

[Class II Substances](#)

[Substitutes](#)

### Class I Ozone-depleting Substances

Chemical Name	Lifetime, in years	ODP2 (WMO 2011)	ODP1 (Montreal Protocol)	GWP5 (AR4)	CAS Number
<b>Group I (from section 602 of the CAA)</b>					
CFC-11 (CCl <sub>3</sub> F) Trichlorofluoromethane	45	1	1	4750	75-69-4
CFC-12 (CCl <sub>2</sub> F <sub>2</sub> ) Dichlorodifluoromethane	100	0.82	1	10900	75-71-8
CFC-113 (C <sub>2</sub> F <sub>3</sub> Cl <sub>3</sub> ) 1,1,2- Trichlorotrifluoroethane	85	0.85	0.8	6130	76-13-1
CFC-114 (C <sub>2</sub> F <sub>4</sub> Cl <sub>2</sub> ) Dichlorotetrafluoroethane	190	0.58	1	10000	76-14-2
CFC-115 (C <sub>2</sub> F <sub>5</sub> Cl) Monochloropentafluoroethane	1020	0.5	0.6	7370	76-15-3
<b>Group II (from section 602 of the CAA)</b>					
Halon 1211 (CF <sub>2</sub> ClBr) Bromochlorodifluoromethane	16	7.9	3	1890	353-59-3
Halon 1301 (CF <sub>3</sub> Br) Bromotrifluoromethane	65	15.9	10	7140	75-63-8
Halon 2402 (C <sub>2</sub> F <sub>4</sub> Br <sub>2</sub> ) Dibromotetrafluoroethane	20	13.0	6	1640	124-73-2
<b>Group III (from section 602 of the CAA)</b>					
CFC-13 (CF <sub>3</sub> Cl) Chlorotrifluoromethane	640	1	1	14420	75-72-9
CFC-111 (C <sub>2</sub> FCl <sub>5</sub> ) Pentachlorofluoroethane		1	1		354-56-3
CFC-112 (C <sub>2</sub> F <sub>2</sub> Cl <sub>4</sub> ) Tetrachlorodifluoroethane		1	1		76-12-0
CFC-211 (C <sub>3</sub> FCl <sub>7</sub> ) Heptachlorofluoropropane		1	1		422-78-6
CFC-212 (C <sub>3</sub> F <sub>2</sub> Cl <sub>6</sub> ) Hexachlorodifluoropropane		1	1		3182-26-1
CFC-213 (C <sub>3</sub> F <sub>3</sub> Cl <sub>5</sub> ) Pentachlorotrifluoropropane		1	1		2354-06-5
CFC-214 (C <sub>3</sub> F <sub>4</sub> Cl <sub>4</sub> ) Tetrachlorotetrafluoropropane		1	1		29255-31-0
CFC-215 (C <sub>3</sub> F <sub>5</sub> Cl <sub>3</sub> ) Trichloropentafluoropropane		1	1		4259-43-2
CFC-216 (C <sub>3</sub> F <sub>6</sub> Cl <sub>2</sub> ) Dichlorohexafluoropropane		1	1		661-97-2

CFC-217 (C3F7Cl) Chloroheptafluoropropane		1	1		422-86-6
<b>Group IV (from section 602 of the CAA)</b>					
CCl4 Carbon tetrachloride	26	0.82	1.1	1400	56-23-5
<b>Group V (from section 602 of the CAA)</b>					
Methyl Chloroform (C2H3Cl3) 1,1,1-trichloroethane	5	0.16	0.1	146	71-55-6
<b>Group VI (listed in the Accelerated Phaseout Final Rule)</b>					
Methyl Bromide (CH3Br)	0.8	0.66	0.7	5	74-83-9
<b>Group VII (listed in the Accelerated Phaseout Final Rule)</b>					
CH2FBr		1	1		
HBFC-12B1(CHF2Br)			0.74		
CH2FBr		0.73	0.73		
C2HFBr4		0.3-0.8	0.3-0.8		
C2HF2Br3		0.5 - 1.8	0.5-1.8		
C2HF3Br2		0.4 - 1.6	0.4-1.6		
C2HF4Br		0.7 - 1.2	0.7-1.2		
C2H2FBr3		0.1-1.1	0.1 - 1.1		
C2H2F2Br2		0.2-1.5	0.2 - 1.5		
C2H2F3Br		0.7-1.6	0.7 - 1.6		
C2H3FBr2		0.1-1.7	0.1 - 1.7		
C2H3F2Br		0.2-1.1	0.2 - 1.1		
C2H4FBr		0.07-0.1	0.07-0.1		
C3HFBr6		0.3-1.5	0.3 - 1.5		
C3HF2Br5		0.2-1.9	0.2 - 1.9		
C3HF3Br4		0.3-1.8	0.3 - 1.8		
C3HF4Br3		0.5-2.2	0.5 - 2.2		
C3HF5Br2		0.9-2.0	0.9 - 2.0		
C3HF6Br		0.7-3.3	0.7 - 3.3		
C3H2FBr5			0.1 - 1.9		
C3H2F2Br4		0.2-2.1	0.2 - 2.1		
C3H2F3Br3		0.2-5.6	0.2 - 5.6		
C3H2F4Br2		0.3-7.5	0.3 - 7.5		
C3H2F5Br		0.9-14	0.9 - 1.4		
C3H3FBr4		0.08-1.9	0.08-1.9		
C3H3F2Br3		0.1-3.1	0.1 - 3.1		
C3H3F3Br2		0.1-2.5	0.1 - 2.5		
C3H3F4Br		0.3-4.4	0.3 - 4.4		
C3H4FBr3		0.03-0.3	0.03-0.3		
C3H4F2Br2		0.1-1.0	0.1 - 1.0		

C3H4F3Br		0.07-0.8	0.07-0.8		
C3H5FBr2		0.04-0.4	0.04-0.4		
C3H5F2Br		0.07-0.8	0.07-0.8		
C3H6FBr		0.02-0.7	0.02-0.7		
<b><u>Group VIII (from the Chlorobromomethane Phaseout Final Rule)</u></b>					
CH2BrCl Chlorobromomethane	0.37	0.12	0.12		

Why are there multiple values given for the ODPs and GWPs?

The numbers in the "ODP1" column are from the Montreal Protocol. Some numbers have been updated as per amendments to the protocol. Data in the "ODP2" column come from WMO's Scientific Assessment of Ozone Depletion: 2010. ODP values listed are semi-empirical and can be found in Table 5-1 of the document. All GWP values represent global warming potential over a 100-year time horizon. The numbers are from the IPCC Fourth Assessment Report: Climate Change 2007. The values listed are for direct radiative forcing and can be found in Table 2.14 of the document.

## References

- WMO (World Meteorological Organization), Scientific Assessment of Ozone Depletion: 2010, Global Ozone Research and Monitoring Project—Report No. 52, 516 pp., Geneva, Switzerland, 2011.
- IPCC (Intergovernmental Panel on Climate Change). *Special Report on Safeguarding the Ozone Layer and the Global Climate System: Issues Related to Hydrofluorocarbons and Perfluorocarbons*, Special Report of the Intergovernmental Panel on Climate Change, Cambridge, England, 2005.
- IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.