Chemical Use

PF Olsen Group Scheme FSC NC-FM/COC-000190

During 2004/05, PF Olsen Limited developed a monitoring system that captures active ingredient by area for the chemicals used within the managed estate.

Since then, PF Olsen have fine-tuned the monitoring system to deal with the complexities of different chemical concentrations of similar chemical products to get an accurate active ingredient used by affected area. The records system also enables separation of data for FSC (aggregated and certificate-specific) and non-FSC forests.

In 2004/05 the information collected represented only part of the estate and less than a full year. In 2005/06, the data covered total herbicide usage, and saw the introduction of fertilisers. In 2006/07 the addition of vertebrate pesticides used in the control of animal pests such as possums and wallabies was implemented, and in 2013/14 the categories were further separated out to include surfactants and insecticides.

The comparable areas treated in **all** forests (both FSC certificates and non-FSC forests) since 2004 (in hectares) are tabulated below:

Period	Fertiliser	Fungicide	Herbicide	Insecticide	Pesticide	Surfactant	Total Area (ha)
2004		5,025.80	6,967.50			7,643.10	19,636.40
2005	648.20	4,842.20	9,335.70		1,747.80	9,174.30	25,748.20
2006	229.10	6,377.50	9,969.70		2,744.00	9,616.60	28,936.90
2007	390.30	7,847.90	15,133.70		2,708.90	12,286.80	38,367.60
2008	2,500.50	5,495.90	12,788.30		2,464.40	9,262.40	32,511.50
2009	472.00	10,186.40	10,944.40		11,120.30	13,849.20	46,572.30
2010	3,192.60	8,215.00	11,971.50		10,257.60	13,689.10	47,325.80
2011	4,253.00	4,193.30	21,765.20		8,618.30	11,991.10	50,820.90
2012	3,107.60	7,807.30	22,206.70	325.20	5,264.20	14,027.70	52,738.70
2013	2,688.10	6,739.70	15,658.50	3.30	562.40	12,579.80	38,231.80
2014	1,737.60	4,118.40	14,092.10		1,532.00	9,420.60	30,900.70
2015	2,417.50	6,439.20	12,825.50	1,082.10	6,162.00	12,263.00	41,189.30
2016	377.70	12,086.90	13,867.50	987.00	877.20	17,723.10	45,919.40
2017	47.10	12,192.80	15,221.30	2,496.80		16,564.80	46,522.80
2018	253.40	11,486.60	20,397.10	3,247.40		16,349.10	51,733.60
2019		6,999.20	12,161.00	3,300.50		10,676.20	33,136.90
2020	33.00	18.40	8,070.30	16.00		2,431.20	10,568.90

In 2011/12 the areas treated by herbicides climbed significantly as client planting goals were reassessed in the light of the Emissions Trading Scheme encouraging both more replanting of old heavily weed infested cutovers as well as new afforestation, over and above the standard replanting programmes. Most of that boost in area was treated during that year and in 2012/13. Subsequent years have seen planting and replanting rates dropping back in response to low ETS prices and a continuation in conversions to pastoral use. Due to the warm wet conditions prevalent for most of the

2018/19 year, there was an increase in the use of fungicides and surfactants to try to minimise the effects from Dothistroma.

The tabular and graphical breakdown of the chemical usage over the year ending June 2019 is set out below. This includes not only the total quantities of active ingredient used but also the averaged application rate per hectare.

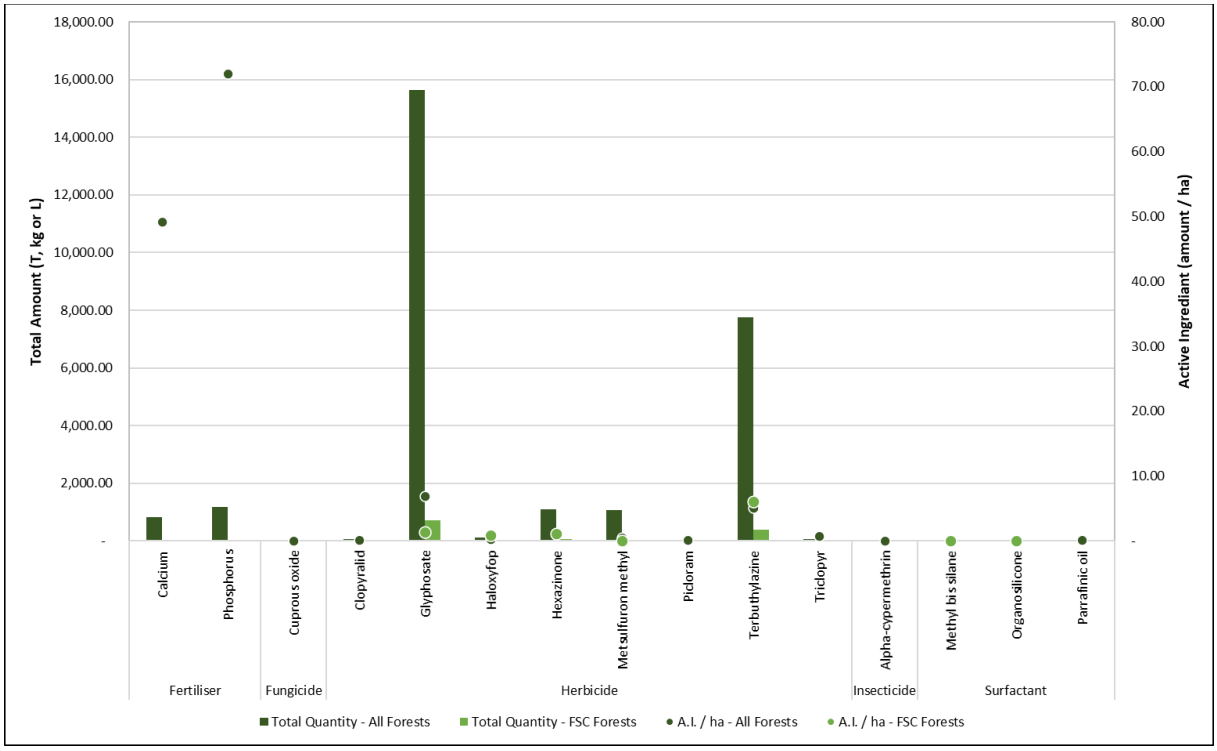
Active ingredient applied to treated areas within all forests (both FSC certificates and non-FSC) Y.E June 2020

Active Ingredient	Qty Total	Unit	Area (ha)	Qty/Ha	Application
Calcium	812.00	T	16.5	49.21	Fertiliser
Phosphorus	1,189.00	T	16.5	72.06	Fertiliser
Cuprous oxide	1.12	Kg	18.4	0.06	Fungicide
Clopyralid	71.46	Kg	437.8	0.16	Herbicide
Glyphosate	15,627.58	Kg	2,248.7	6.95	Herbicide
Haloxyfop	119.76	Kg	369.4	0.32	Herbicide
Hexazinone	1,094.00	Kg	1,043.3	1.05	Herbicide
Metsulfuron methyl	1,058.64	Kg	2,148.8	0.49	Herbicide
Picloram	31.05	Kg	241.8	0.13	Herbicide
Terbuthylazine	7,747.05	Kg	1,503.9	5.15	Herbicide
Triclopyr	61.76	Kg	76.6	0.81	Herbicide
Alpha-cypermethrin	0.03	Ltr	16.0	-	Insecticide
Methyl bis silane	1.35	Kg	14.7	0.09	Surfactant
Organosilicone	1.29	Kg	2,398.1	-	Surfactant
Parrafinic oil	2.08	Kg	18.4	0.11	Surfactant

Active ingredient applied to FSC Group Scheme forests Y.E. June 2020

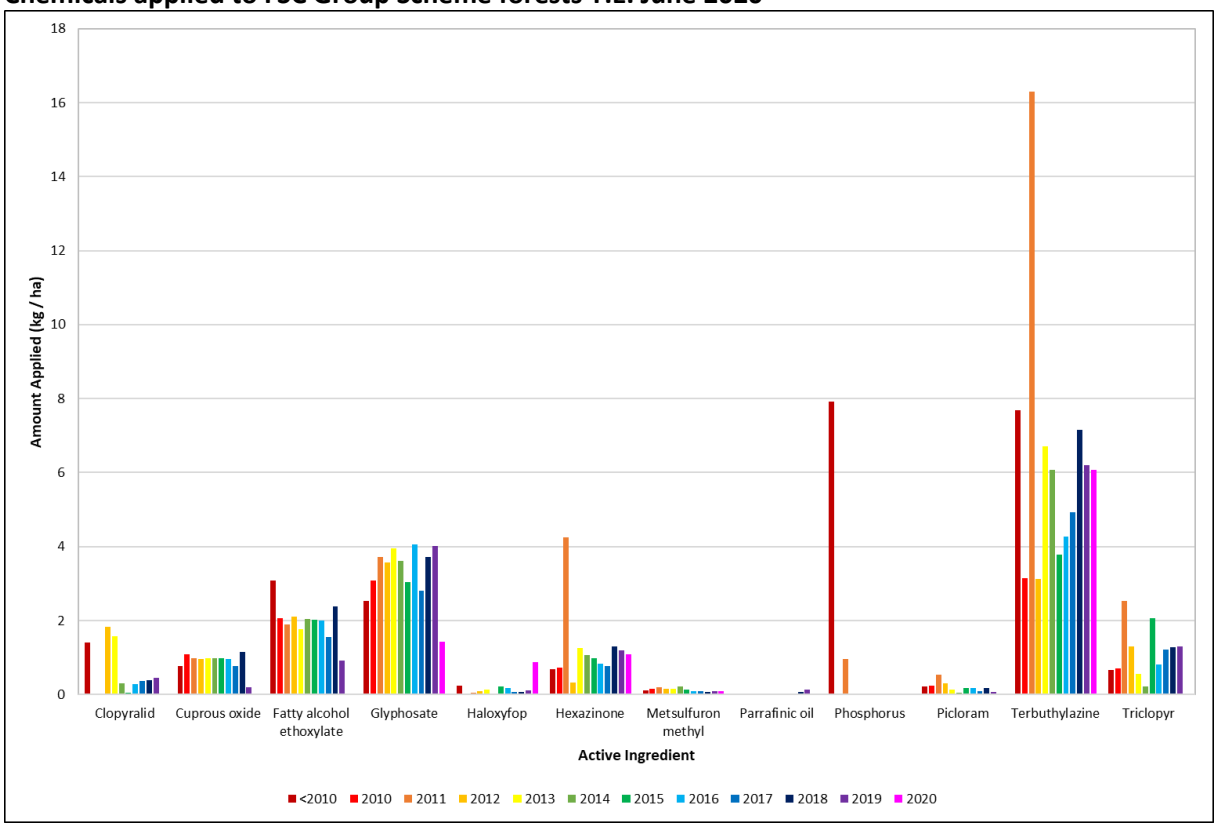
Active Ingredient	Qty Total	Unit	Area (ha)	Qty/Ha	Application
Glyphosate	728.00	Kg	508.9	1.43	Herbicide
Haloxyfop	5.80	Kg	6.6	0.88	Herbicide
Hexazinone	69.98	Kg	64.7	1.08	Herbicide
Metsulfuron methyl	40.61	Kg	521.9	0.08	Herbicide
Terbuthylazine	403.57	Kg	66.4	6.08	Herbicide
Methyl bis silane	1.35	Kg	14.7	0.09	Surfactant
Organosilicone	0.15	Kg	521.9	0.00	Surfactant

Active ingredient usage and rate/hectare treated Y.E. June 2020



For the FSC Group Scheme specifically, results of the main active ingredient usage by treated area over the measurement periods, where comparisons are possible between chemicals, are as follows:

Chemicals applied to FSC Group Scheme forests Y.E. June 2020



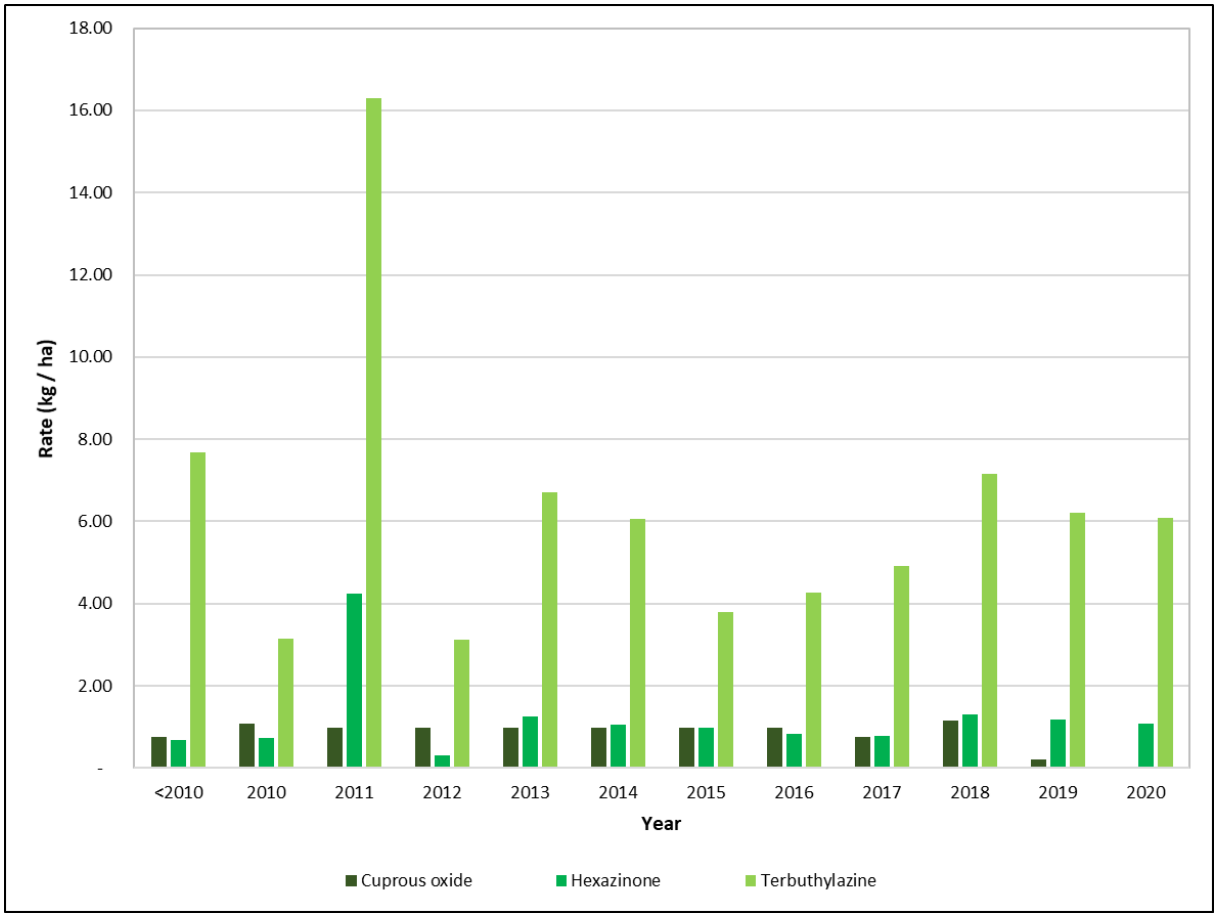
Some additional chemicals, have been used on occasion, but either the unit rates of application per hectare for these chemicals are too low to be represented in the graph above (e.g. pindone, spray maximiser or organosilicone), or their usage is so sporadic as to make their inclusion in the graph unhelpful (e.g. borate, magnesium, or sulphur).

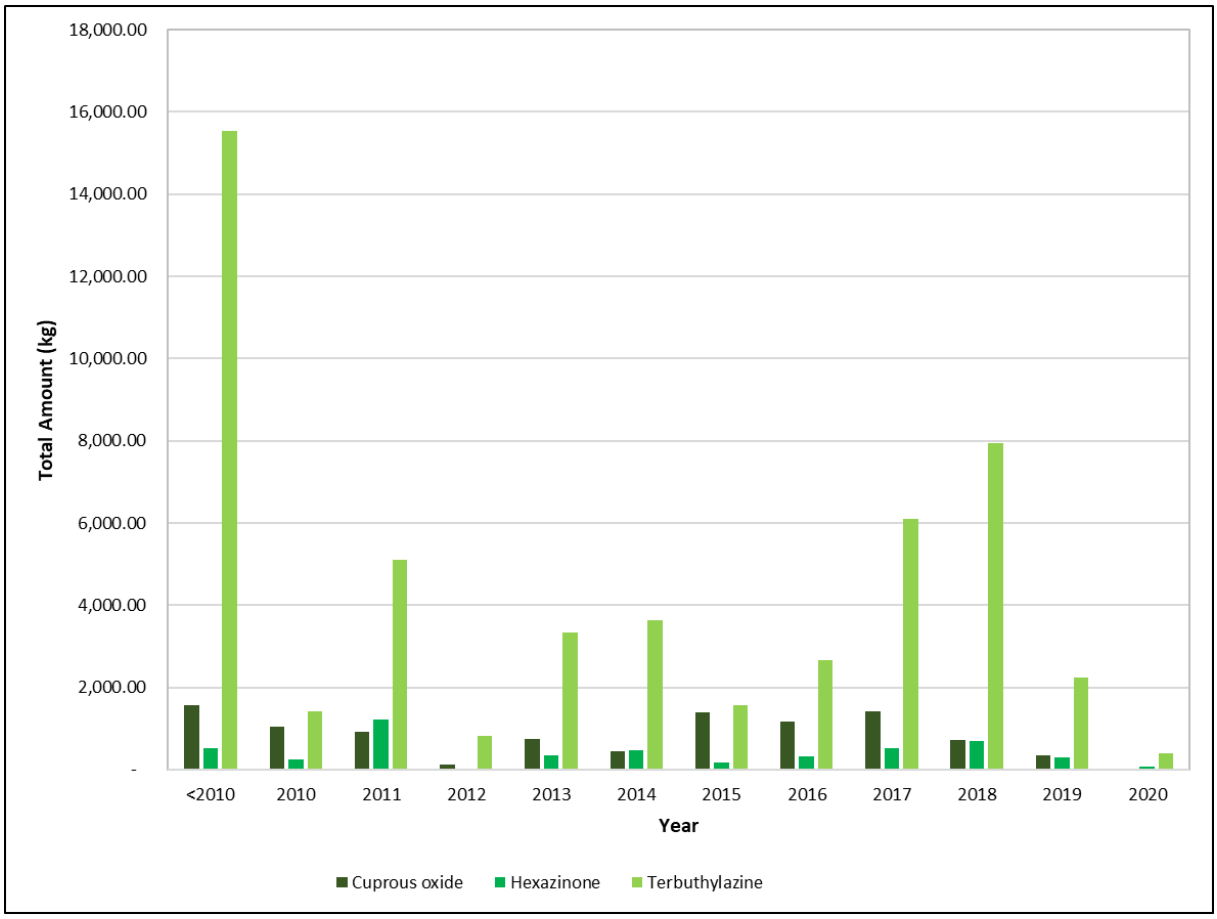
Derogated Chemicals

Up until recently derogations are required for the continued use of chemicals that are potentially hazardous as defined by FSC policies. Derogations were issued or renewed subject to controls when amongst other matters, other alternative methods are not socially, environmentally or economically satisfactory and there is a programme in place to reduce, minimise or find alternatives to the derogated chemicals. However, in the past year FSC has revised its policy and now requires forestry companies to carry out environmental and social risk analysis (ESRA) before using any substances that it deems to be hazardous.

Up until 2015, the PF Olsen Group Scheme had operated under derogations for the field use of hexazinone, terbuthylazine and 1080. Terbuthylazine and hexazinone were removed from FSC's highly hazardous list in 2015, but the same re-evaluation saw picloram, copper products and some formulations of haloxyfop, as well as all vertebrate pesticides, added to the list.

Time series tracking is enabling a watch to be kept on the use of various chemicals, as illustrated by the graphs below:





Research into Alternatives

In past years PF Olsen Ltd provided financial support to industry cooperative research programmes aiming to advance vegetation weed management efficacy and reduced chemical reliance including biological control. The aim was to develop a significant multifaceted strategy for long-term research into chemical use reduction and minimisation.

Key focus of this work was:

- Chemical safety characteristics
- Alternative FSC compliant formulations and treatment
- 'Best Practice' tools

A number of alternative FSC compliant active ingredients have been tested against the main forest establishment weeds resulting in a shortlist of alternatives with potential for further investigation that formed part of the first year's field trial testing as part of an Industry / Sustainable Farming Fund (SFF) three-year programme (project 12/038) started in 2012.

The project tested a range of chemicals in operational field trials based on the most promising options determined from the earlier research. Mixes includes those free from either terbuthylazine or hexazinone, mixes with some terbuthylazine and a baseline standard practice control of Valzine (a terbuthylazine-hexazinone mix).

The project, now completed, found that the industry standards using terbuthylazine and hexazinone remained the most effective, though there were some alternative actives offering efficacy under

limited conditions and other that may yet have potential subject to further research. The information has been published and may be accessed from the Sustainable Farming Fund website, Scion Research Website and NZ Forest Owners Association Website.

The published reports can be accessed via the links below:

- Minimising the environmental impact of weed management in New Zealand's planted forests
- Final report on field trials

More recently research has been restructured and is funded by way of a national levy on all forest growers with research programmes directed through a Board.

Work has subsequently focussed on environmental fate aspects of herbicide use with the environmental fate of hexazinone and terbuthylazine tested in two of the soil groups most likely prone to leaching followed in 2015 by similar trials for copper fungicide, recognising the new "highly hazardous" classification attributed to that active ingredient.

In all cases, the trials reflected standard operational procedure and, in all cases, while there was an initial detectable spike in water in the hours immediately after application, rates degraded very quickly. The results concluded that health risks were very low as were the risk of impacts on aquatic fauna. Specifically, for Copper, the report conclusions were:

- Copper was only detected for a few hours on the day of application;
- NZ drinking water standards (2,000 ug L-1) not exceeded;
- FSC standard (LC50 18.9 ug L-1 for 48 hours) – concentrations exceeded the level but for less than 2 hours; and
- ANZECC interim sediment quality guideline trigger values not exceeded.