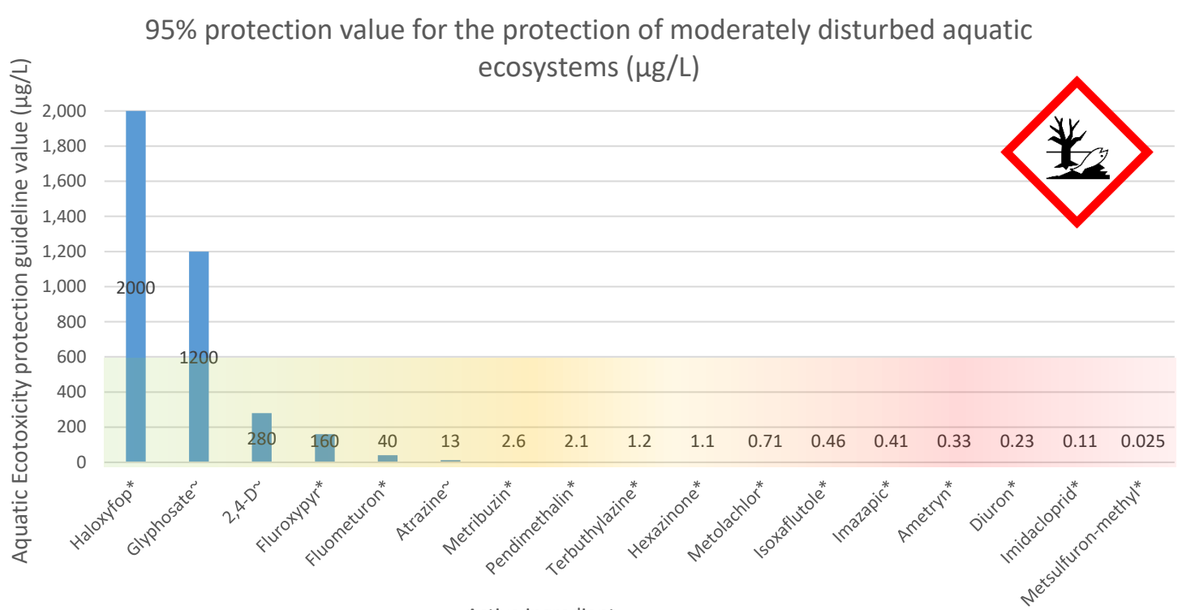
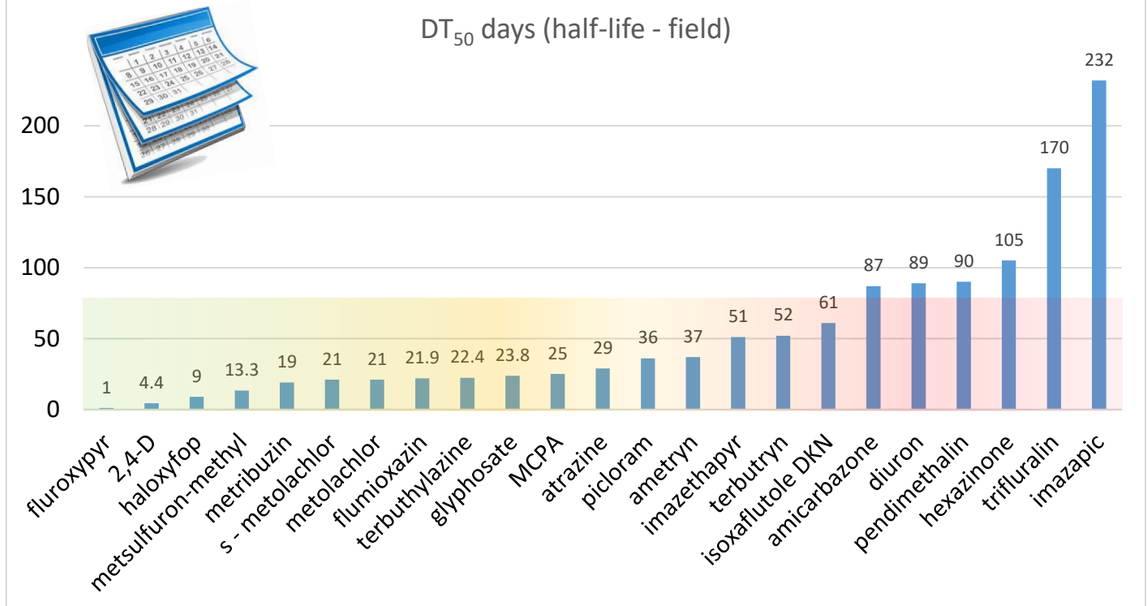
The Pesticide Risk Matrix

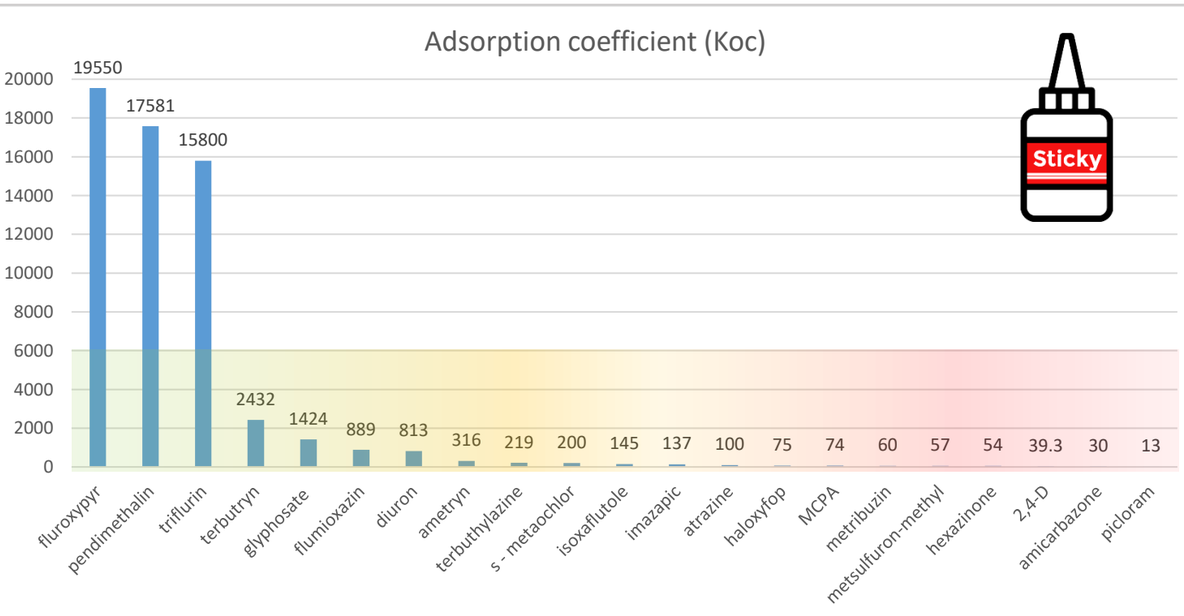
Risk Factors

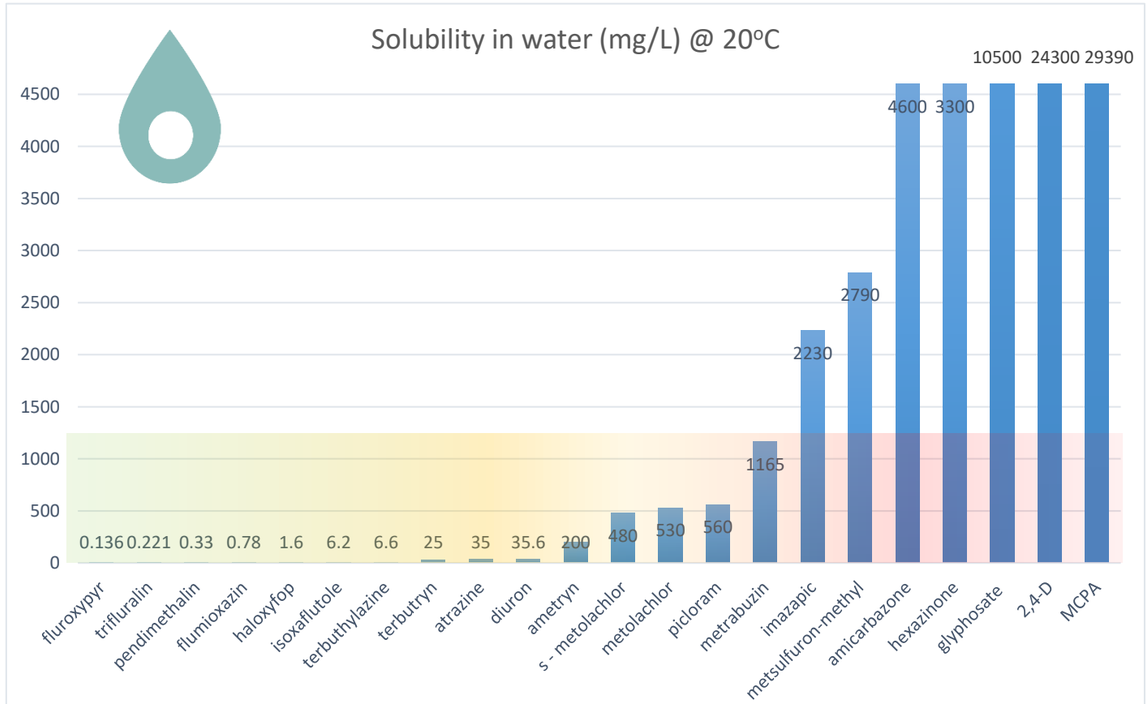
Chemical environmental risk is composed of four factors: ●Chemical environmental toxicity ●Chemical application rate ●Chemical half-life (persistence) ●Chemical mobility (solubility + KoC)*
The most influential factors are rate and environmental toxicity followed by half-life, particularly where the half-life is very low.
**Mobility can overcome the effect of rate where the KoC is very high for example pendimethalin.*



95% protection value for the protection of moderately disturbed aquatic ecosystems (ug/L) sources:
~Current Australian & New Zealand Guidelines for Fresh & Marine Water Quality
* King et al. 2017 a, b. Proposed values: https://www.publications.qld.gov.au/dataset/proposed-guideline-values-27-pesticides-used-in-the-gbr-catchment







Data sources: Pesticide Properties Database, University of Hertfordshire https://sitem.herts.ac.uk & Kegley, S.E., Hill, B.R., Orme S., Choi A.H., PAN Pesticide Database, Pesticide Action Network, North America http://www.pesticideinfo.org/

Managing environmental risk

Environmental risk can be managed with careful decision-making based on the following principles.

#1 Less on = Less off

Reduce the amount applied through

- Banded application: use shielded or hooded sprayers or a dual spray bar.
- Strategic application: create zones across the farm, or within block where residuals herbicides are only applied as required.
- Lower rates: choose products that are effective at a lower rate and where possible choose the lowest effective rate or all chemicals.

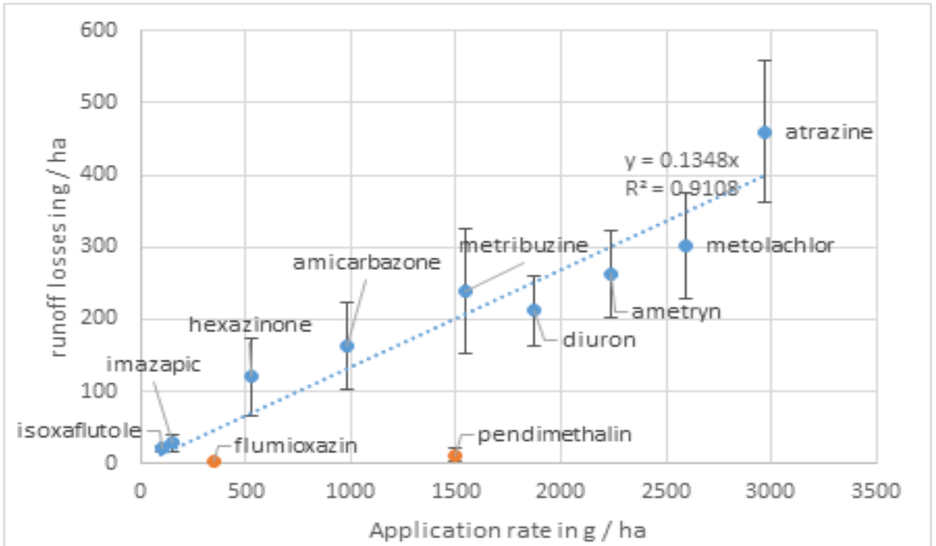


Figure 1 – Run-off Loads Compared to Application Rate (Compiled by E. Fillols, 2018)

Figure 1 shows a strong correlation between rate applied and runoff losses (R2 = 0.91). This shows that for all the herbicides on this line, you could expect to lose on average 13% of applied herbicide if run-off occurs after 48 hours or so. This suggests that application rate is the major influence on losses, e.g. Barrage at 4 kg vs Balance at 150 g – both have potential to lose 13% but in absolute volumes losses from Balance are smaller. Pendimethalin and flumioxazin do not fit this correlation and have minor run-off losses.

#2 Pay attention to timing

The risk of losses of chemical (or any other ag input) to the environment through run-off or leaching is greatly reduced where there is adequate time between application and rainfall that runs off.

Any rain (or irrigation) that falls between application and a run-off will further decrease losses. The risk of loss to the environment is low early in the season and increases closer to and within the wet season.

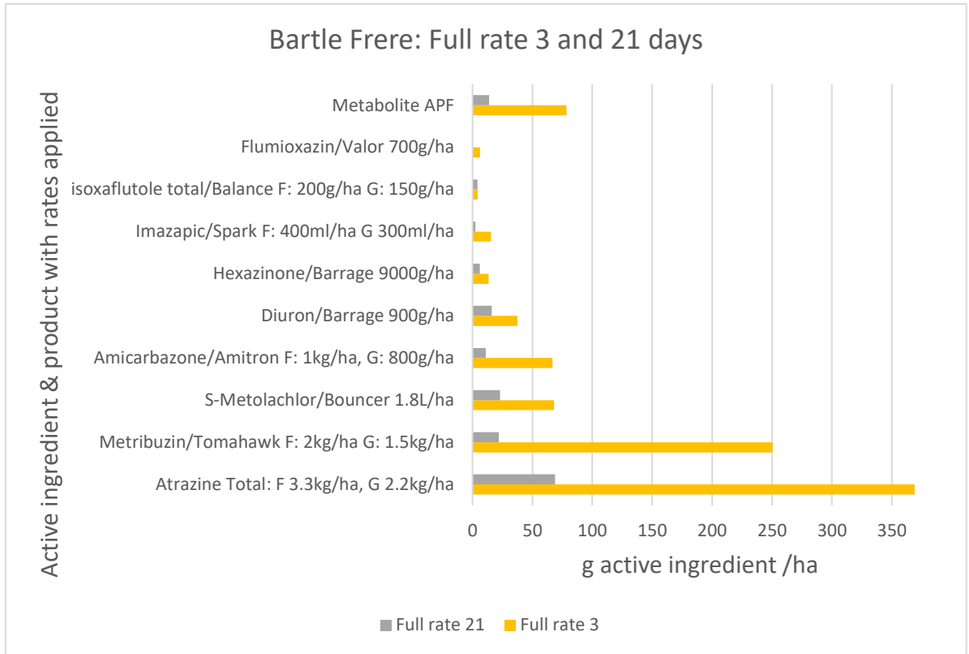


Figure 2 shows run-off from residual chemical applied at 21 days and 3 days before rainfall simulation run to the point of run-off. 100 mm of infiltrating rainfall fell between application at 21 days and rainfall simulation. Note greater losses from products applied at higher rates.

Figure 2 - The importance of timing in reducing run-off (Compiled by B. Billing, 2018)

#3 The right product. At the right rate. In the right place. At the right time.

- Where the risk of loss is high choose the most suitable products with the lowest eco-toxicity and or rate for the job.
- The lowest risk will likely come from knock down chemicals that often have lower eco-toxicity and a short half-life.
- Consider strategic application of riskier chemicals, e.g. earlier in the season or only apply where they have the greatest use.