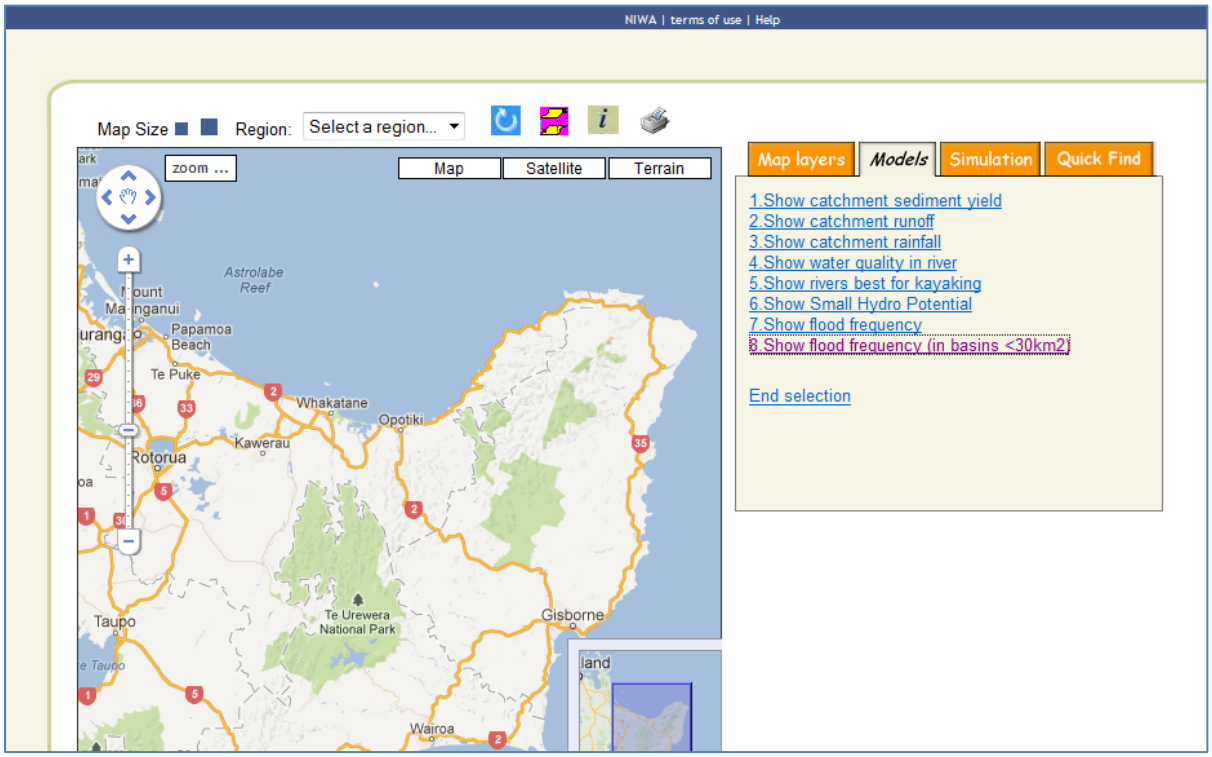
Small Basin flood flow estimation

The NZ Forest Road Engineering manual (NZFOA, 2011, page 121) draws attention to the flood prediction model available within NIWA's online Water Resource Explorer (WRENZ)

http://wrenz.niwa.co.nz/webmodel/

(Note that the Link has no "www")



Instructions to use WRENZ

1. Scroll and zoom in the map interface to the location of interest.
2. Click on "Map layers", tick the "Rivers" box, and then "Refresh Map". Rivers will appear, coloured according to the stream order. The more rivers depicted on screen, the slower it will be (so zoom in first).
3. Click on the orange "Models" tab.
4. Select "**8. Show flood frequency (in basins < 30 km^2)**".
5. Click on a reach of the river of interest. A box will appear with three tabs: Pearson, Rational, and Help.
    a. The model under the Pearson tab provides flood magnitudes for 6 return intervals, using the research from Pearson (1991).
    b. The model under the Rational tab is similar, but uses the Rational Method instead. The user is required to enter a runoff coefficient suitable to the catchment.
    c. The Help tab provides the more important information for the assessments, including a link to Pearson (1991). Note that some source data (HIRDS rainfalls and LRI slopes) were not available everywhere, but this is a miniscule problem for NZ as a whole.

Recommended procedure

1 Run Option 8 first for small basin (note that it is intended for catchments of less than 3000 ha, ie < 30 km^2).
2. Run the Rational Method to obtain a second estimate. Expert judgement is needed to set the correct runoff co-efficient 'C' (being a dimensionless co-efficient, which relates the total depth of storm runoff to the total depth of precipitation rainfall, once the whole catchment is contributing to flood flows). Page 122 of the NZ Forest Road Engineering manual gives some typical values. Note that while some texts will give rather low values for forests, at least one North Island Regional Council insists a minimum value of 0.7 be used for C.
3. Run the alternate model (option 7) to obtain a third estimate (less suited to very small basins)

Note: NIWA's advice is that Option 8. "Show flood frequency (in basins < 30 km^2) " is more suitable than the Option 7 method for small basins". D Collins pers .comm. Both models were developed from catchments of 10,000 ha or less.

References:

Option 8
Pearson, C.P. 1991. Regional flood frequency analysis for small New Zealand basins. 2. Flood frequency groups. NZ Journal of Hydrology V 30

Abstract: One hundred and seventeen small New Zealand drainage basins with areas of less the 100 square kilometres were used in a regional flood frequency study. Each basin had annual maximum flood peak series of length 10 or more years. L-moment statistics of the flood series and basin physical characteristics were used to classify the basins into six non-geographic flood frequency groups. Dimensionless flood frequency growth curves for each group offer robust alternatives to geographic regionalisation and flood contour maps
www.hydrologynz.org.nz/downloads/20120611-085227-JoHNZ_v30_2_pearson2.pdf

Option 7
McKerchar, A.I. 1991 Regional flood frequency analysis for small New Zealand basins . 1. Mean annual flood estimation. NZ Journal of Hydrology V30.

Abstract: One hundred and forty New Zealand basins with areas of less than 100 square kilometres were used to investigate regional methods for estimating mean annual floods for small ungauged basins. Besides the usual sample estimate of mean annual flood, data on slope, soil and hydrogeology were processed from the New Zealand Land Resources Inventory for each basin. Other variables used in the prediction of mean annual flood were basin area, and three rainfall statistics for each basin: 1-hour and 24-hour 5-year return period intensities, and mean annual totals.

www.hydrologynz.org.nz/downloads/JoHNZ_1991_v30_2_McKerchar.pdf

Rational Method

Refer to standard texts. Eg

Maidment, D.R. 1993. Handbook of Hydrology, McGraw-Hill
or
Chow V T, D R Maidment and L Mays 1988 Applied Hydrology. McGraw-Hill Series in Water Resources and Environmental Engineering