

1 **Investigating the regional variation in rules and best management**
2 **practices for forestry in New Zealand**

3 Melissa Pendly^{a1}, Mark Bloomberg^b and Rien Visser^a

4 ^aUniversity of Canterbury, Christchurch, NZ; ^bLincoln University, Lincoln, NZ

5

6 Under the *Resource Management Act 1991* (NZ), the interpretation and
7 implementation of environmental policy is primarily the responsibility of local
8 government. The management of forestry operations may be influenced via two
9 written means: statutory rules published in regional and district plans, and
10 recommended best management practices (BMPs) published in guidelines. There are
11 concerns that inconsistency between jurisdictions' rules have a negative impact on the
12 forestry industry; both in terms of cost and achieving positive environmental
13 outcomes. This research investigated and quantified the variation in Permitted
14 Activity rules and BMPs between the sixteen Regional Councils of New Zealand.
15 Specifically, all rules and BMPs associated with culvert installation and earthworks
16 were categorised and compared. It has been found that there is significant variation in
17 these regional rules and BMPs. It includes variation in both the level of control, i.e.,
18 the number of rules and BMPs per council, and the nature of control, i.e., the
19 proportion of rules or BMPs utilised. Further, the rules and BMPs of one council are
20 seldom the same as another. This variation is apparent on both a national scale and
21 when considering only neighbouring pairs of councils.

22

23 **Keywords:** Resource Management Act; environmental standards; earthworks;
24 culverts

25 **Introduction**

26 Resource management activities in New Zealand, including forestry, are governed by the
27 *Resource Management Act 1991* (NZ). Under the Act, the interpretation and implementation
28 of policy is primarily the responsibility of local government, rather than central government
29 (Furuseth 1995). The purpose of the Act, detailed in s.5, is to “promote the sustainable

¹ Corresponding author. Email: m.pendly@gmail.com

30 management of natural and physical resources”, which includes “avoiding, remedying or
31 mitigating any adverse environmental effects of activities on the environment”.

32 There are two levels of local government in New Zealand: Regional Councils and
33 territorial authorities. Some territorial authorities also have the responsibilities of a Regional
34 Council and these are known as unitary authorities. Both types of local authorities publish
35 resource management plans, statutory documents which underpin local authorities’
36 implementation of the Act. These plans contain rules, often specified as conditions under
37 which activities in the environment may take place. Some local authorities publish additional
38 documents which detail practices determined by a council to be the most practicable means of
39 avoiding, remedying, or mitigating an activity’s adverse environmental effects. These
40 documents have a variety of titles, including ‘guidelines’, ‘codes of practice’ and ‘technical
41 publications’. These terms all describe what will be referred to hereafter as ‘best management
42 practices’ (BMPs).

43 There are concerns within the forestry industry that variation in environmental rules
44 and BMPs between the 16 regional/unitary councils and 61 territorial authorities extant in
45 New Zealand makes it very difficult to plan operations or assess compliance. To investigate
46 this variation, the environmental regulations promulgated by local governments were
47 examined, with a focus on forestry earthworks operations.

48 Regional Councils serve a number of functions which territorial authorities do not,
49 including: soil conservation; maintenance and enhancement of water quality, quantity and
50 ecosystems; setting minimum or maximum water body flow levels; and controlling
51 discharges of contaminants to water, land and air (*Resource Management Act 1991* (NZ), s.
52 30 & 31). This research focuses only on the sixteen councils which have Regional Council
53 responsibilities (Chatham Islands Council was excluded), as their functions are more closely
54 linked to the environmental effects of forestry earthworks operations.

55 ***Regulatory Variation and Effects***

56 Under the *Resource Management Act 1991* (NZ), local government was expected to set
57 environmental rules and guidance based on locally specific values. There are many core,
58 nationally applicable values such as water quality and the protection of soils, which should
59 have led these entities to develop nationally consistent rules. Most local authorities displayed
60 a reluctance to collaborate during the development of their rules following the introduction of
61 the Act (Dixon, Ericksen et al. 1997), resulting in variation in rules across the districts and
62 regions of New Zealand.

63 Inter-regional inconsistency of regulation is not necessarily a flaw of the Act, but
64 rather a reflection of its purpose. According to Furuseth (1995), the underlying belief of this
65 resource management approach is that decisions should be made by those communities which
66 will be most affected. In fact, regional variability is considered the “correct result” of the
67 reform process (Furuseth 1995, p. 188).

68 Nevertheless, a number of forestry companies have raised concerns that this variation
69 has a negative impact on the forestry industry. Companies have suggested that the complexity
70 of the resource management framework has led to increased administrative and operational
71 expenses, greater focus on paperwork than field outcomes, confusion over rules in different
72 jurisdictions, and a reduction in the industry’s ability to attract investors (Johnston 2010,
73 Maunder 2010, PF Olsen Ltd 2010, Strang 2010). Many forestry companies operate across a
74 number of jurisdictions. Although some companies’ estates consist of several forests spread
75 across New Zealand, other estates or parts of estates can consist of one contiguous forest
76 spread over several regions and districts (e.g. Kaingaroa Forest). To address this, this
77 research investigated variation on both a national scale and between neighbouring councils.

78 Central government has taken action to address these concerns. Under the Act, there
79 is provision for National Environmental Standards (NESs). These are promulgated by central
80 government to ensure that the decision-making process for a particular resource is consistent
81 across New Zealand. Put simply, “they create a level playing field” (MfE 2013a). The
82 Proposed NES for Plantation Forestry (PNESPF) was introduced in 2010, intended to
83 “improve national consistency in local authority plan rules relating to plantation forestry and
84 provide certainty for those involved in managing plantation forests” (MfE 2013b). The
85 PNESPF is yet to be implemented.

86 Regional differences in forestry rules have already been analysed as part of the
87 development of the PNESPF. The New Zealand Ministry for the Environment (MfE) carried
88 out a survey of plantation forestry rules across regional, unitary and district authorities. The
89 resultant *Review of Authority Rules* (ROAR) allows rules’ stringency across different
90 authorities to be compared (MfE 2013a). Another review commissioned by the MfE indicated
91 that there is variation in regional forestry rules (Devlin 2009). However, these reviews neither
92 outlined nor quantified all the variations between councils.

93 ***Research Objectives***

94 The objective of this research is to investigate how rules and BMPs affecting forestry vary
95 across the regions of New Zealand. Rules and BMPs cover many different facets of forestry.

96 This research focuses just on culverts and earthworks operations. Every region has rules or
97 guidelines for these operations, and they are a common activity (which can have significant
98 adverse environmental effects if poorly conducted) at forestry operations across the country.
99 This research will address how much variation exists in the rules and BMPs for forestry
100 earthworks across, and between neighbouring, regional and unitary councils of New Zealand.

101 **Methods**

102 To quantify variation between rules and BMPs requires that textual information be compared.
103 This is different to comparing quantitative data and necessitated a system be developed to
104 facilitate comparison. Further, as regional plans and BMP documents do not necessarily
105 follow standard formats or use particular keywords, one could not simply compare two
106 sections of text and deem them ‘different’ if the words were not exactly the same.

107 A methodology was developed which required the texts to be read and interpreted
108 before being sorted into a database for comparison. Due to the number of exclusions which
109 had to be considered, no automated or software options were deemed suitable, this process
110 was performed manually with a protocol developed to ensure the comparison remained
111 objective.

112 *Sources of Evidence*

113 The rules and BMPs examined were obtained from the regional plans and BMP documents
114 published by the sixteen regional authorities of New Zealand. These documents were sourced
115 from the websites of each council, which contain libraries of council publications.

116 *Exclusions*

117 Based on the experiences of a short pilot study, it was decided that some rules would be
118 excluded from this research.

- 119 1. Rules regarding waahi tapu (sites sacred to Maori) and archaeological sites were
120 excluded because these sites are regulated by the *Historic Places Act 1993* (NZ).
- 121 2. Where a council specified special rules for specific zones or areas, these were not
122 included. Many of these rules reflect values of areas of importance, and are specific to
123 each region. As such, this study focussed only on the ‘general’ rules for each region.
- 124 3. The rules examined from regional plans were sourced from the lowest level of control
125 under the *Resource Management Act 1991* (NZ). Under the Act, there is a hierarchy
126 of stringency of control, from Permitted (least controlled) through Controlled,

127 Restricted Discretionary, Discretionary, Non-complying and Prohibited Activities
128 (most controlled). Where possible, rules for Permitted Activities were examined. If
129 the activity was not Permitted, then Controlled Activity rules were examined, and so
130 on. Restricted Discretionary, Discretionary and Non-complying Activity rules are
131 more difficult to compare, as councils use their discretion in granting these resource
132 consents, so there are few written rules to compare. The text included as BMPs in this
133 study were those which directed a particular practice should be adopted, or which
134 detailed outcomes which should be achieved or avoided. Text which encouraged one
135 to ‘consider’ options, discussed the merits of several options, or provided background
136 information on adverse environmental effects, was excluded.

137 *Categorisation*

138 It was not possible to fit each council’s rules and BMPs into predetermined categories due to
139 their number and variety. Instead, one council’s documents were examined first, and a
140 category was created for each rule and BMP encountered. For each council examined
141 thereafter, its rules/BMPs were either placed into these existing categories, or a new category
142 was created. Examples of categories include ‘Minimum Culvert Diameter’, ‘Maximum Fill
143 Height’, ‘Water Quality – Visual Clarity’, and ‘Contaminants – Refuelling’. The order in
144 which councils were examined was maintained to avoid sorting bias.

145 A rule or BMP may fit into more than one category if it has multiple foci. For
146 example, a rule which states “The activity shall not cause or induce erosion to land or to the
147 bed or banks of any surface water body, where the erosion is persistent or requires active
148 erosion control measures to bring it under control” (Bay of Plenty Regional Council 2008, p.
149 170) was included in three different categories, which are ‘Erosion – Land’, ‘Erosion –
150 Surface Water Body Bed’ and ‘Erosion – Surface Water Body Banks’. It is important to note
151 that categorisation under multiple categories may only occur if the rule has multiple foci, and
152 does not merely mention elements of other categories. For example, the rule which states
153 “The activity shall not obstruct or divert the flow of water in such a manner that it results in
154 damming, flooding or erosion” (Bay of Plenty Regional Council 2008, p. 171) is categorised
155 only under ‘Obstruction/Diversion’. However, if the rule had stated “The activity shall not
156 cause damming, flooding or erosion” then it would be categorised under ‘Damming’,
157 ‘Flooding’ and ‘Erosion’.

158 **Classification**

159 The classification of each rule or BMP is made up of two elements. The first element
 160 indicates whether a rule / BMP is prescriptive or outcome-based, whilst the second element
 161 indicates whether or not a rule / BMP is the same as that of another council.

162 *Prescriptive or Outcome-based*

163 The first element in the classification is the letter ‘O’ or ‘P’ (Table 1), which indicates
 164 whether the rule or BMP is prescriptive or outcome-based. This classification is based on the
 165 principle outlined by Williams, Baldwin et al. (1999), who stated that prescriptive codes of
 166 practice are audited by checking whether prescriptions have been complied with, while
 167 outcome-based codes are audited by checking if the desired outcome has been achieved (or
 168 the undesired outcome has been avoided).

169
 170 **Table 1:** Examples of classification of rules and BMPs as prescriptive or outcome-based,
 171 note that outcomes are underlined.

Classification	Rule / BMP
P	“Watercourses should be crossed at right angles to the stream.”
P	“Avoid construction during fish spawning and migration periods”
O	“... is of sufficient size to contain the bankfull flow <u>without causing flooding onto neighbouring properties.</u> ”
O	“...the culvert <u>shall not cause or induce erosion of the bed or banks of any surface water body.</u> ”

172
 173 In some cases, rules or BMPs may be prescriptive but also outline an (un)desired outcome. In
 174 these instances, they were classified as prescriptive if the prescription gave enough detail to
 175 allow an assessment of compliance to be made without waiting for an outcome. If a rule or
 176 BMP prohibited a particular activity or practice, that rule was classified as a prescription.

177 *Numbering*

178 Each rule and BMP was also assigned a number, which indicates whether it is the same as, or
 179 different to, another in the category. Some key elements which determine if two rules or
 180 BMPs were classified as the same (i.e. assigned the same number) are: the method by which

181 outcomes are measured (such as parameters for measuring the visual clarity of water); the
 182 wording/phrasing used; and similarity in quantitative specifications.

183 *Collation of Dataset*

184 The documents were examined systematically to ensure that each rule and BMP was
 185 categorised and classified. The resultant datasets consist of the classified rules and BMPs, by
 186 council and category (Table 2 shows an example of part of the dataset for culverts). If a
 187 council did not have a rule or BMP for a particular category, that cell was left blank.

188

189 **Table 2:** Sample of rows from a dataset.

Category \ Council	Northland	Waikato	Bay Of Plenty	Gisborne
Construction - Batter slopes			P1	P2
Construction - Bed disturbance	P1		P2	
Construction - Culvert Length	P1			
Construction - Earth Bunds		P1		
Construction - Flood flow		P3	P1	P2
Construction - Inlet / outlet protection			P1	P1
Construction - Invert depth		P2	P1	

190

191 To understand how the dataset is organised, note that Table 2 shows an example of seven
 192 categories for culvert rules or BMPs. The first row in Table 2 shows that only two of the four
 193 councils (Bay of Plenty and Gisborne) had a rule for “Construction – Batter slopes.” The
 194 codes P1 and P2 for these respective councils shows that both used a prescriptive rule rather
 195 than an outcome-based (O) rule, and also that the rules adopted by these councils were
 196 substantively different—if they had been the same, both council’s rules would have been
 197 coded P1.

198 The comparison of texts to enable classification was achieved by compiling a database of
 199 rules and BMPs. This database followed the same format as Table 2, but included a copy of
 200 the text of relevant rules/BMPs beneath the classification. The full database is available as an
 201 appendix to the Thesis summarised by this paper (Pendly 2014).

202 *Analysis*

203 *Nationwide Variation*

204 The following analytical methods were used to answer the first research question: “How
205 much variation exists in the rules and BMPs for forestry earthworks across the regional and
206 unitary councils of New Zealand?”

- 207 1. Count the number of categories for which each individual council has rules/BMPs.
- 208 2. Count the number of categories which each individual council regulates using rules,
209 and the number of categories regulated using BMPs.
- 210 3. Count the total number of rules/BMPs which regulate each category across the
211 country, and count how many unique rules/BMPs are in force (i.e. number of different
212 classifications in category).
- 213 4. Count the number of categories which are regulated by only prescriptive rules or
214 BMPs, only outcome-based rules or BMPs, or a mixture of both, across the country.

215 The number of categories (measured by the analytical method 1. above) is a measure of the
216 amount of different criteria applied by councils to culvert and earthwork activities. A large
217 number of categories indicates that councils consider there are many different criteria that
218 need to be applied.

219 In contrast, the number of categories which each individual council regulates using
220 rules/BMPs (measured by the analytical method 2. above) is a measure of variation between
221 councils. If councils were consistent across New Zealand, all councils would have rules or
222 BMPs in all categories. If individual councils do not have rules in all categories, then they
223 are diverging from what other councils use as criteria in their rules and BMPs.

224 Likewise, the analytical method 3. above is a measure of divergence between councils, in that
225 a large number of different classifications in each category shows that councils are choosing
226 to specify a rule or BMP for a specific category in different ways. If all councils used a
227 consistent approach to regulating a particular criteria, then there would be a small number of
228 rules, with identical wording and method (prescriptive or outcome-based) used by all
229 councils.

230 *Variation between Neighbouring Councils*

231 The following methods were used to answer the second research question: “How much
232 variation exists in the rules and BMPs for forestry earthworks between neighbouring regional

233 and unitary councils?” There are 23 pairs of neighbouring councils which share a border;
234 these pairs were those for which these analyses were carried out.

235 1. Count how many categories one or both of the neighbouring councils have rules or
236 BMPs for (=n).

237 2. Count how many categories for which:

238 a. Both councils have the same rule/BMP (i.e. have the same classification),

239 b. Both councils have different rules/BMPs (i.e. have different classifications),

240 c. Council A has a rule/BMP but Council B does not, and,

241 d. Council B has a rule/BMP but Council A does not.

242 Counts 2a. – d. above were expressed as percentages of n . This indicates how much similarity
243 (2a.) and difference (2b.) there is in the rules and BMPs between councils, and also to what
244 extent each council regulates in categories that its neighbour does not (2c. & 2d.).

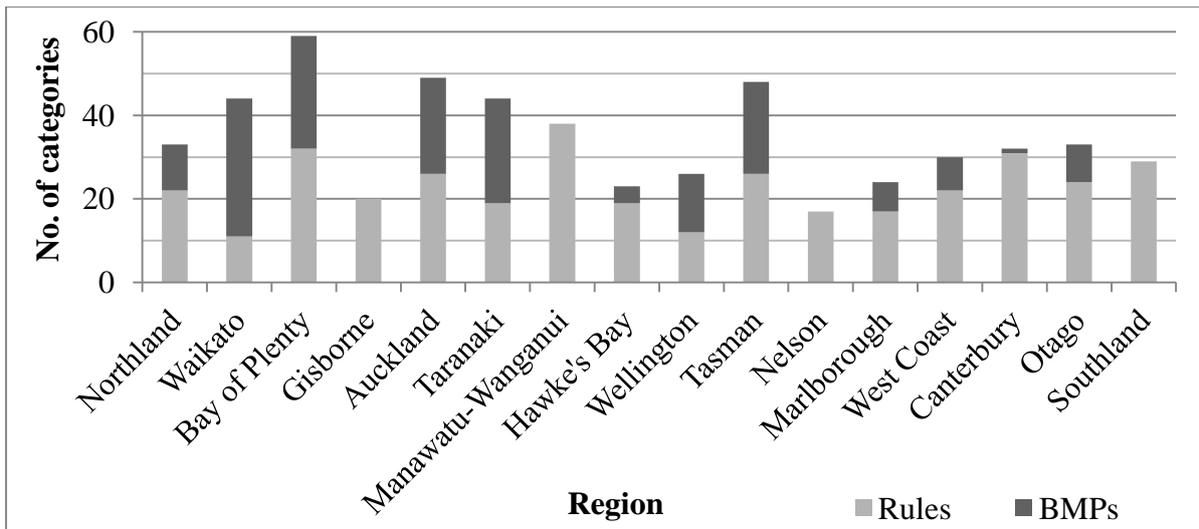
245 **Results**

246 *Nationwide Variation*

247 After categorising and classifying the rules and BMPs for culverts, a total of 125 categories
248 had been created. In all, 549 classifications (different rules or BMPs) were made across these
249 125 categories. In the case of earthworks, 318 classifications were made across 79 categories.

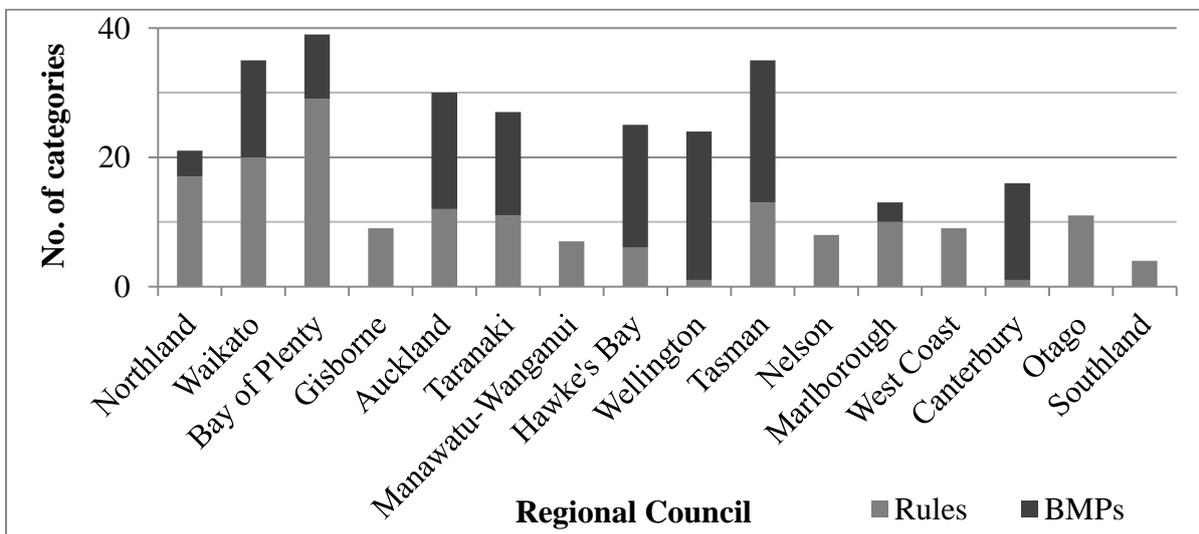
250 *Number of Categories Addressed per Regional Council*

251 The variation in the level and nature of regulation of each category was striking. Figures 1a
252 (culverts) and 1b (earthworks) show the number of categories for which each Regional
253 Council has a rule or BMP (or both, which is shown as a rule). The graphs would be uniform
254 if there was no variation between regions; this is evidently not the case. The variation in
255 proportions of rule and BMP use across the different councils is also apparent.



256

257 **Figure 1a:** Number of categories for rules or BMPs for Culverts, by Regional Council.



258

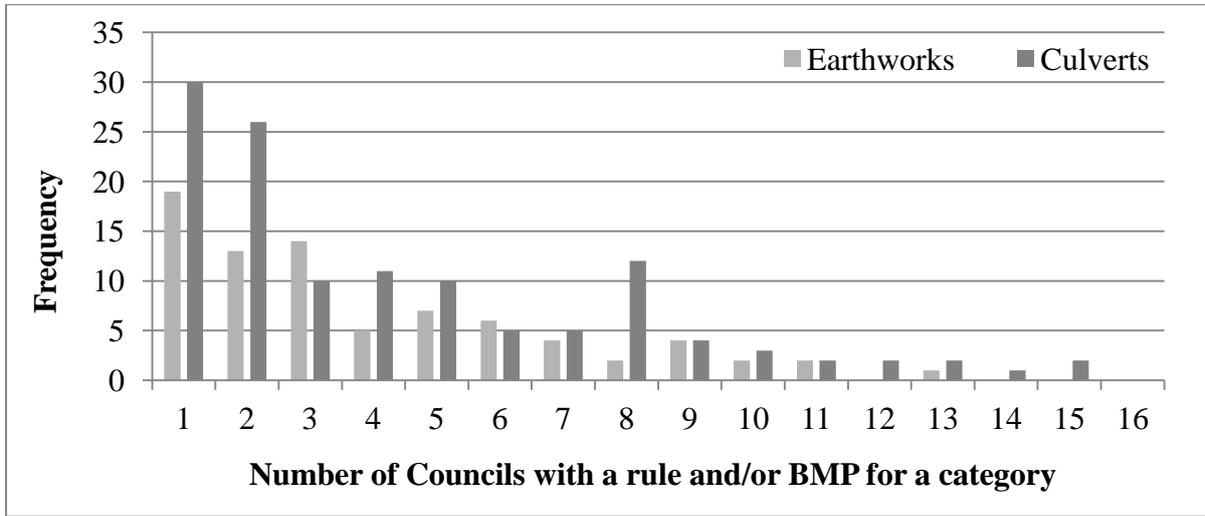
259 **Figure 1b:** Number of categories for rules or BMPs for Earthworks, by Regional Council.

260 *Number of Regional Councils per Category*

261 Some councils exercise a greater level of control than others, as is evident by the different
 262 numbers of rules / BMPs implemented by each. Individual councils addressed between 13.6%
 263 and 46.4% of the 125 culverts categories, and between 5.1% and 49.4% of the 79 earthworks
 264 categories. The average category was addressed by only one quarter of councils, for both
 265 culverts and earthworks. This shows that none of the councils are addressing the full scope of
 266 potential categories, and some are addressing significantly fewer categories than their
 267 counterparts.

268 Only 7.2% of culverts categories and 3.8% of earthworks categories were addressed
 269 by more than ten councils, with the majority of categories being addressed by three or fewer

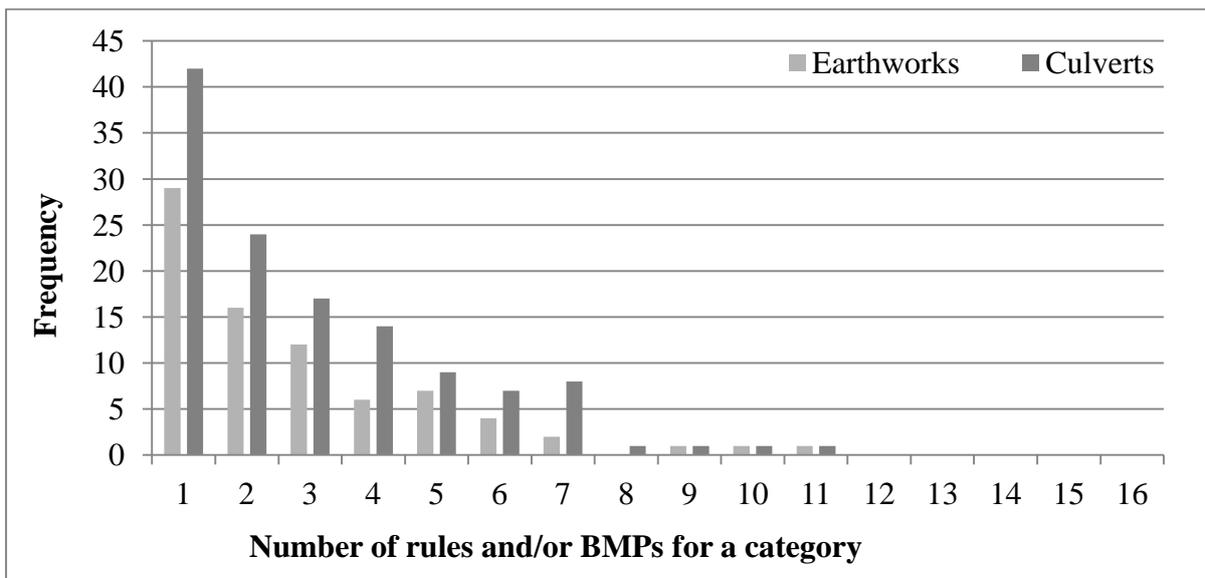
270 councils (culverts: 53%, earthworks: 59%). There were no categories addressed by all of the
 271 Regional Councils (Figure 2).



272
 273 **Figure 2:** Frequency of number of councils to have a rule/BMP for any one category.

274 *Number of Rules and BMPs per Category*

275 There is potential for any one category to include up to sixteen rules/BMPs, assuming that
 276 every council had a rule/BMP and that it was different to every other. If there was no
 277 variation between regions, Figure 3 would show a frequency of 125 (culverts) and 79
 278 (earthworks) categories which had only one rule/BMP. Instead, the number of different
 279 rules / BMPs per category ranged from one to eleven (Figure 3). The most varied category for
 280 culverts was ‘Flood Flow’, and for earthworks was ‘Water Quality – Visual Clarity’.



281
 282 **Figure 3:** Frequency of number of rules/BMPs in any one category.

283 Few categories had no variation in rules/BMPs between multiple councils. In all, 37% of
284 earthworks categories and 34% of culverts categories featured only one rule/BMP utilised by
285 only one council. The exclusion of those categories addressed by only one council revealed
286 that 13% (earthworks) and 10% (culverts) of categories featured total agreement, where a
287 sole rule/BMP was applied by multiple councils. A further 42% (earthworks) and 30%
288 (culverts) of categories featured partial agreement, where several councils applied the same
289 classification, and other councils applied a different one. Total disagreement featured in 33%
290 (earthworks) and 24% (culverts) of categories, with no common rules/BMPs between
291 councils.

292 *Variation between Neighbouring Councils*

293 There was considerable variation in the number of categories addressed by the 23 pairs of
294 neighbouring councils. If there was no variation, the same categories would be addressed by
295 every pair of councils. None of the 23 pairs addressed all of the same categories. For culverts,
296 the proportion of categories addressed by both neighbouring councils ranged from 28% to
297 66%, with an average of 45%. For earthworks, the range was 15% to 72%, with an average of
298 42%.

299 Many categories were addressed by only one council in each pair. The proportion of
300 categories addressed by only one of the pair ranged from 57% to 96% for earthworks and
301 43% to 89% for culverts (67% to 89%, excluding the West Coast – Otago pair). Thus, for all
302 but one of the pairs, the majority of categories were addressed by only one of the two. In the
303 majority of cases, councils disagreed on those occasions when both councils addressed a
304 category. Across all neighbouring councils, the number of categories over which neighbours
305 agreed ranged from 0 to 14 (culverts) and 0 to 11 (earthworks). Of the 23 neighbouring pairs,
306 zero agreement featured for 3 (culverts) and 15 (earthworks) pairs. The average number of
307 matching categories between two neighbouring councils was 3.2 (culverts) and 1.5
308 (earthworks). The highest degree of agreement between a pair of neighbouring councils was
309 25% (earthworks) and 35% (culverts), with the remainder all less than 17% (earthworks) and
310 11% (culverts). If there was no variation, the agreement between all pairs would be 100%, so
311 it is evident that there is marked variation between neighbouring councils.

312 *Examples of Variation*

313 The following are examples of the variation between Regional Councils' rules / BMPs. In
314 some of the examples, councils are neighbours (indicated by a superscript to the council
315 name).

316 *Maximum Area of Soil Exposure*

317 The maximum permitted area of soil exposed by earthworks operations was specified by five
 318 councils, each of which had a unique rule. The areas ranged from 500m² to 10,000m² (Table
 319 3).

320

321 **Table 3:** Rules for the ‘Maximum Exposed Area of Soil’ category. Superscripts to council
 322 names indicate neighbouring councils.

Council	Classification	Rule (R) / BMP (B)	Maximum Area
Bay of Plenty ¹	P1	R	Within any 12 month period: Slope 0 - 15°: 10,000m ² Slope >15 - 25°: 5,000m ² Slope >25 - 35°: 500m ²
Waikato ^{1,2,3}	P2	R	Within any 12 month period: Slope > 25°: 2,000m ²
Auckland ²	P3	R	Slope: <15°: 10,000m ² Slope: ≥ 15°: 2,500m ²
Taranaki ³	P4	R	8,000m ²
Tasman	P5	R	Within any 12 month period: 10,000m ²

323

324 *Fill Height over Culverts*

325 There were two categories for fill height over culverts; one for maximum and another for
 326 minimum. A mixture of rules and BMPs were utilised in these categories, with nine councils
 327 addressing the maximum and six addressing the minimum fill heights. Whilst some councils
 328 set limits and conditions on fill height, others simply recommended complying with
 329 manufacturer recommendations (Table 4).

330 **Table 4:** Rules and BMPs for Minimum and Maximum Fill Height over Culvert categories.
 331 Superscripts to council names indicate neighbouring councils.

Council	Maximum Height		Minimum Height	
	Rule (R) / BMP(B)	Details	Rule (R) / BMP(B)	Details
Otago ^{7, 8}	R	1.5 metres above lowest part of bed.	B	Check manufacturer's recommendations
	B	Check manufacturer's recommendations		
Northland	B			
Waikato ^{1, 4, 9}	B			
West Coast ^{2, 6, 7}	B			
Bay of Plenty ^{1, 3}	R	1.5 metres above culvert crest.	B	Recommended minimum: 800mm.
Canterbury ^{2, 8, 10}	N/A		R	500 millimetres, or the diameter of the culvert, whichever is the greater.
Gisborne ³	R	2.5 metres.	N/A	
Taranaki ^{5, 9}	R	1 metre above bed level.	N/A	
Manawatu-Wanganui ^{4, 5}	R	2 metres, unless a spillway is constructed for passage of 200 year flood without fill being overtopped.	N/A	
Tasman ^{6, 10}	R	2 metres, unless culvert is designed for 1% AEP flood flow and has secondary flow path.	N/A	

332

333 Some councils included details on how to measure fill height — notably, Bay of Plenty
 334 measured it from the culvert crest, whereas Taranaki and Otago measured it from bed level.
 335 This rule has some interesting consequences for culverts in the latter two regions. Taranaki
 336 and Otago Regional Councils specified maximum fill depths of 1 and 1.5 metres above the
 337 bed level respectively (Table 4). Assuming a culvert diameter of 1 metre; which is the
 338 maximum permitted diameter in Taranaki (Taranaki Regional Council 2001, p. 137) (Otago
 339 does not specify a maximum culvert diameter); a culvert in Taranaki would have no fill over
 340 it, whilst one in Otago would have 500 millimetres over it. By comparison, the *New Zealand*
 341 *Forest Road Engineering Manual* recommends that the depth of fill over a culvert should be

342 equal to the culvert pipe diameter (Gilmore, Mackie et al. 2011, p. 115), so under those
343 guidelines culverts in Taranaki and Otago would be lacking 1 metre and 0.5 metres of fill
344 respectively.

345 **Discussion**

346 *Differentiation of Rules and BMPs*

347 In analysing the results of this study, rules and BMPs were not considered separately. If rules
348 and BMPs had been considered ‘different’ based simply on their source, it would have
349 inflated disagreement between councils. BMPs were included in this study to acknowledge
350 the use of non-statutory documents, so to automatically assign them different classifications
351 would make little sense. However, the difference in legal status of rules and BMPs had to be
352 recognised. If two councils had the same rule, but one had an additional BMP which would
353 change the classification, that BMP was disregarded. If one council had a rule and another
354 council had a different rule and a BMP which, on combination, made the classifications the
355 same, that BMP would be included. This recognises that while a council may use fewer rules
356 than another council and ‘fill the gaps’ through the use of BMPs, they do not alter the legal
357 requirements outlined in a regional plan.

358 *Outdating of Research*

359 It should be noted that the results of this research were already outdated before publication.
360 Regional plans are subject to change, with new plans being proposed and existing plans being
361 modified. One such change was the notification of the draft *Auckland Unitary Plan*;
362 becoming a proposed plan with legal effect on 30 September 2013 (Auckland Council 2013).
363 Other plans and BMP documents may have been changed or replaced since this research was
364 conducted. As such, this research is a snapshot of the regulatory environment during
365 mid-2013.

366 *Justification of Variation*

367 The results of this research have shown that there is variation in the rules and BMPs of
368 Regional Councils, which leads to the question of whether or not the variation is justified.
369 One would expect minimal variation between Regional Councils’ Permitted Activity
370 conditions for activities conducted in general areas. Although inconsistency of policy is not
371 necessarily a flaw of the *Resource Management Act 1991* (NZ), but rather a reflection of its
372 purpose (Furuseth 1995), it is questionable whether the variation could be justified by this

373 alone. For example, it seems unlikely that the communities of Taranaki, Bay of Plenty and
374 Gisborne chose to disallow more than 1, 2 and 2.5 metres of fill over a culvert, respectively.
375 It would be difficult to justify such trivial differences between rules using this argument, and
376 even more difficult to argue against convergence of rules on that basis.

377 The variation in geomorphology across New Zealand could also be presented as
378 justification. However, given that the rules relating to areas of special geomorphology were
379 excluded from the study, it seems unlikely that this is the source of variation. It is possible
380 that some of the variation could be attributed to differences in the overall geomorphology of
381 one region compared to another. However, that seems unlikely given the low proportions of
382 matching rules/BMPs between neighbouring councils.

383 This research cannot show conclusively whether or not the variation which exists
384 between the Regional Councils' rules and BMPs can be justified by regional differences in
385 community and geomorphology. Nor can it identify the sources of that variation, or show
386 whether or not the variation in rules and BMPs is simply arbitrary. However, it can be stated
387 that the degree of variation found between Regional Councils is unexpectedly, and perhaps
388 unjustifiably, high, especially given the parameters of this study.

389 *Convergence and Divergence*

390 An international study of pulp and paper mill environmental compliance (which included
391 New Zealand mills) found evidence of convergence; when one jurisdiction tightened its rules,
392 other jurisdictions followed suit. It is not uncommon for one authority to model their policies
393 and rules on those of another authority, although there may be a time lag (Kagan,
394 Gunningham et al. 2003).

395 Although convergence and divergence are analysed by comparing how rules have changed
396 over time, which has not been done for this research, the (dis)similarities between Regional
397 Councils can indicate whether or not convergence has occurred. Observations were made
398 which allow the identification of some examples of convergence, and a discussion of
399 potential drivers of, or barriers to, convergence.

400 *Rules*

401 One may expect that convergence between regional plans would have occurred in the last 22
402 years. However, this research shows there are very few matching rules between neighbouring
403 jurisdictions, which in turn indicates limited convergence. The level of co-operation required
404 to converge plans would be significant. The structure of regional plans is quite varied, so any

405 attempt to streamline the plans would likely require the adoption of a common structure along
406 with a rewrite of rules in the plans.

407 *BMPs*

408 It appears that convergence has occurred between the BMPs of Regional Councils. The
409 Auckland Regional Council's *Technical Publication Number 90* (1999) has been adopted by
410 a number of others, either directly or through incorporation into their own BMP documents.
411 The Waikato Regional Council's *Clean Streams* (Legg 2004) guideline has likewise been
412 adopted by a number of councils around the country, as has the Wellington Regional
413 Council's *Fish-friendly culverts and rock ramps in small streams* (2003) pamphlet.

414 Perhaps the prevalence of convergence in BMPs is due to their status. As BMPs are
415 not necessarily statutory documents it would be much easier for councils to converge their
416 BMPs than their regional plans.

417 There is also some evidence of divergence. The *Technical Publication Number 90*
418 (Auckland Regional Council 1999) was not the source of the Auckland region's BMPs for
419 this research. Rather, the forestry-specific *Technical Publication 223* (Dunphy, Bryant et al.
420 2007) was used. A number of Regional Councils have converged their BMPs based on the
421 older document, whilst the publishing council has adopted a new document. There is already
422 evidence of convergence towards the new, with the Hawke's Bay Regional Council using it
423 as the basis of its guideline (Shaver 2009).

424 *Future Convergence*

425 The issue which spurred this research is the inconsistency of environmental regulation
426 governing forestry across the jurisdictions of New Zealand. By pushing for an improvement
427 in consistency, the forestry industry is applying pressure for convergence to occur.

428 The adoption of a standardised set of BMPs would not completely address the issue of
429 inconsistency between Regional Councils. The limitations of this option have already been
430 analysed as part of the development of the PNESPF. A key limitation identified by the MfE
431 was that BMPs do not have legal status, and as such "there is no guarantee that councils
432 would implement it and therefore long-term national certainty cannot be assured" (MfE 2010,
433 p. 116).

434 How, then, to achieve consistency? There are a number of different options, the merits
435 of which have already been analysed by the MfE (2010, Appendix 4). The PNESPF outlines
436 standardised sets of activity conditions for both 'earthworks' and 'river crossings', among
437 other activities (MfE 2010). The results of this research have shown that the general

438 Permitted Activity conditions for these operations are inconsistent; the PNESPF may be a
439 viable option for setting a consistent basic standard for these operations.

440 *Effect on Industry*

441 Variation in regulation can lead to increased administrative and operational expenses, and
442 requirements for multiple resource consents made investment less attractive to shareholders
443 (Johnston 2010, PF Olsen Ltd 2010, Strang 2010). However, the number of resource consents
444 required would not be altered by a reduction in variation between Regional Councils, but it
445 may make the process of compiling those resource consent applications easier.

446 The results of this study revealed two interesting points regarding neighbouring
447 Regional Councils. There is little common ground between councils in terms of the categories
448 addressed, and there are even fewer matching rules and BMPs. It is easy to see how operating
449 under multiple Regional Councils may be confusing for operational personnel and
450 contractors.

451 *Subjectivity of Results*

452 Although every effort was made to conduct this study in an objective manner, categorising
453 the rules and BMPs was conducted by only one person, the lead author. To gauge possible
454 subjective bias, a peer review exercise was conducted to test both the methods and results of
455 this study. Five experts from Regional Councils and the forestry industry volunteered to take
456 part in an exercise categorising and classifying rules for general earthworks from a subset of
457 councils.

458 The experts' results were compared with the author's and with each other. Total agreement
459 was not achieved by any pair of study personnel, so it is not possible to rule out all
460 subjectivity. For the majority of categories (71%) at least one expert was in agreement with
461 the author's classifications. Likewise, for 58% of categories the most common expert result
462 concurred with the author's results. It was established that the author's interpretation of rules
463 was not vastly different to that of the expert panel.

464 **Conclusion**

465 The results of this study show there is significant variation in the level and nature of
466 regulation of culverts and earthworks operations. On a national level, the minority of
467 categories featured total agreement i.e. a single rule or BMP being applied by multiple
468 councils. It was most apparent in the analysis of neighbouring Regional Councils, with low

469 proportions of matching rules/BMPs between neighbours, including several pairs featuring
470 nil agreement. Given that only the ‘general’ rules and BMPs were examined, and that those
471 rules which applied to areas of special importance or value were excluded, one would expect
472 there to be little variation. The level of control varies between Regional Councils, with some
473 councils addressing more categories than others; whilst the nature of regulation varied in the
474 proportions of rules and BMPs utilised.

475 Most categories were addressed by only a small number of councils, whilst few
476 categories were addressed by the majority of councils. As such, few operational aspects must
477 be considered when working with multiple councils, whilst individual councils require that
478 certain aspects are managed which others do not. Considering the results for neighbouring
479 councils, it was apparent that the majority of categories were addressed by only one of each
480 pair of councils, showing that subscription to individual categories varied across regional
481 boundaries.

482 In conclusion, the variation between Regional Councils’ rules and BMPs for
483 earthworks and culverts is significant. Work on improving consistency of forestry regulation
484 is ongoing, and it is clear that this variation is one aspect of the resource management
485 framework which must be addressed.

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