

TOWARDS A STANDARD
GEOGRAPHIC FEATURE SET:
VEGETATION FEATURES WITHIN A
BROAD TAXONOMY

TECHNICAL REPORT

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1 INTRODUCTION

The project reported here is a contribution to the National Placenames Data Model being developed by the Committee for Geographical Names in Australasia (CGNA) as part of the Australian Spatial Data Infrastructure. A standardised set of designations for all types of geographic features is required for the Data Model, and the initial stage of the project developed the methodology on a subset of toponyms. That successful pilot stage was reported in the APIT Technical Report Number 1 (Blair and Henderson-Brooks, 2002).

That report

- suggested that the vast majority of Australia's topographic features would fall within seven categories:
 - hypsographic features
 - vegetation features
 - coastal features
 - hydrographic features
 - bathymetric features
 - ice features
 - construction/habitation features
- presented a methodology for establishing standard feature sets, and applied it to elevated hypsographic (raised relief) features
- outlined an approach which would generate a standard feature set as close to current practice as possible.

This paper takes up those three issues, and reports progress in each area.

2 THE BROAD CATEGORIES

Recent work has confirmed that the topography of Australia can be captured by the seven previously-listed categories, although the listing does not properly reflect a logical taxonomy and one class of features does not appear at all.

The list obscures the fact that coastal features are a sub-class of the hydrographic, and omits those landform features (such as deserts and claypans) which are characterised by absence of vegetation.

The current proposed taxonomy (Figure 1: *Broad Taxonomy*) introduces five new semantic components – [\pm natural], [\pm marine], [\pm littoral], [\pm vegetative] and [\pm constructed] – and indicates that natural groups of features might be described as:

- marine
- coastal – that is, [+ hydrographic, + littoral]
- (other) hydrographic
- relief
- non-relief
- construction
- administrative

The new semantic components enable several intuitive subclassifications to be made.

The component [\pm natural] separates all natural features from cultural features, and [\pm constructed] divides the cultural features into constructed elements and administrative units.

The component [\pm marine], currently defined as relating to undersea features, marks off the National Gazetteer feature code BATH from all other natural features. Within the non-undersea hydrographic set, [+ littoral] identifies those features which are bordered, either partially or wholly, by sea or ocean. The non-littoral hydrographic feature set contains STR and other inland features as well as more-obviously coast-related features such as BAY and BGHT.

The component [\pm vegetative] produces two subclasses of non-hydrographic, non-relief features – those which are defined by their type of vegetation cover and those which are defined by absence of vegetation.

Some uncertainties remain. The most obvious omission is that ice features are not yet placed on the chart. And the final status of some elements presently regarded as hydrographic is unclear: littoral features (such as BANK, BCH, SPIT) could conceivably be regarded as land-based and therefore as [- hydrographic], or as a subset of [+ marine] since they are defined as being bordered by sea or ocean.

3 A NEWLY-DEFINED SUBSET: VEGETATION FEATURES

A vegetation features set (Figure 2: *Vegetation Features*) now joins the revised group of raised relief features (Figure 3: *Hypsographic Features: Elevated*) as the second completed analysis of feature sets. The analysis required the addition of only two semantic components, [\pm arboreal] and [\pm cultivated], apart from the top-level distinguisher [\pm vegetative].

The component [+ arboreal] identifies features which are characterised by the presence of trees and/or bushes. Both arboreal and non-arboreal features respond to the semantic component [\pm cultivated]. The features FRST and WOOD within the non-cultivated arboreal set are separated by the previously-defined component [\pm extended].

This second subset of the total analysis produces, by the use of four binary semantic components, five features (PLAN, FRST, WOOD, FLD, PLN) covering 35 generic descriptors.

A current listing of semantic components and their definitions is given in Table 1. The feature code definitions for raised relief features and vegetation features are given in Tables 2a and 2b.

TABLE 1: Semantic Components Set

| <i>A feature with this component</i> | <i>exhibits this characteristic</i> |
|--------------------------------------|--|
| APICAL | is recognised as the uppermost part of a larger relief feature |
| MARINE | is a sea or ocean, or is an undersea feature |
| BROAD | is perceived as having significant width |
| CONSTRUCTED | is primarily the result of human intervention and manufacture |
| DEEP | is characterised more by depth than by breadth |
| ELEVATED | rises above its surrounds, and is therefore a raised relief feature |
| EXTENDED | is perceived as having significant length or extent |
| HORIZONTAL | is perceived as having no significant gradient, and is characterised by absence of vertical aspect |
| HYDROGRAPHIC | is characterised by the permanent or intermittent presence of water |
| HYPSOGRAPHIC | is characterised by relief, either positive or negative |
| INDEPENDENT | is perceived as hypsographic in its own right, not as part of a larger feature |
| ISOLATED | rises conspicuously from level surrounds |
| LITTORAL | is bordered, either partially or totally, by sea or ocean |
| NATURAL | is produced primarily by forces of nature, not culture |
| OPEN | is bounded on only one side by a larger relief feature |
| PROJECTED | extends further from a larger relief feature in either the lateral or vertical dimension |
| RAISED | has a further elevation within the context of a larger relief feature |
| SHEER | is characterised by extreme gradient |
| STABLE | is not subject to obvious short-term deformation and relocation |
| TALL | has major elevation, arbitrarily set at >300m |
| VEGETATIVE | is characterised by the presence of vegetation |

TABLE 2A – Feature Code Definitions:

Elevated Hypsographic (Relief) Features

| | |
|------|---|
| CLIF | A perpendicular or steep face of rock. |
| DUNE | A mound or ridge of drifted sand. |
| GORG | A steep sided narrow valley. |
| HILL | A major elevation of the earth's surface, which is arbitrarily marked as less than 300m above sea level, rising conspicuously from the surrounding level but not normally an isolated feature. |
| LDGE | A narrow horizontal shelf-like surface on a mountain or hill. |
| MT | A major elevation of the earth's surface, which is arbitrarily marked as greater than 300m above sea level, rising conspicuously from the surrounding level but not normally an isolated feature. |
| PASS | A relatively horizontal opening between hills or mountains or within a range. |
| PEAK | The uppermost prominent point of a height feature. |
| PL | An extensive area of relatively flat land in an area of high relief. |
| RDGE | A long and narrow stretch of elevated ground on a mountain or hill or within a range. |
| RNGE | An extended line of mountains or hills forming a connected system. |
| ROCK | A prominent outcrop of stone on another height feature. |
| SLP | A gradient on a height feature. |
| SPUR | A narrow linear projection from a mountain or hill, normally less than 2km long and decreasing in elevation. |
| TOR | A prominent and isolated rock. |
| VAL | A relatively low region bounded by hills or mountains. |
| VCRT | A circular depression formed at or near the peak of a volcanic structure. |

TABLE 2B – Feature Code Definitions:

Vegetation Features

| | |
|------|--|
| FLD | cultivated ground, prepared or productive for agriculture |
| FRST | uncultivated tree-covered land of considerable extent |
| PLAN | cultivated ground for arboriculture |
| PLN | ground with non-arboreal vegetation, not cleared for agriculture |
| WOOD | uncultivated tree-covered land, not perceived as extensive |

4 THE STANDARD SET AND THE NATIONAL GAZETTEER

The two subsets of the taxonomy now completed permit a comparison of the results with the set of codes used by the National Gazetteer of Australia for the same population of generic descriptors. Table 3 reveals a low level of divergence between the two sets.

Table 3: *Standard Feature Set and the National Gazetteer*

| <i>Raised Relief Features</i> | | |
|-------------------------------|--|--|
| <i>NGA</i> | <i>SFS</i> | <i>comment</i> |
| CLIF | stet | |
| CRTR | → VCRT, DEPR (?) | split between [+ elevated] = volcanic and [- elevated] = other craters |
| DUNE | stet | |
| GORG | stet | |
| HILL | stet | |
| LDGE | stet | |
| MT | stet | |
| PASS | stet | |
| PEAK | <i>rock column</i> → ROCK <i>butte</i> → HILL | not [+ apical] <i>butte</i> is [+ independent, + isolated] |
| PL | stet | |
| RDGE | <i>spur</i> → SPUR | RDGE = [- projected] <i>spur</i> = [+ projected] (merely level of generality) |
| RNGE | stet | |
| ROCK | split with TOR | [+ independent] v [- independent] |
| SLP | stet | |
| VAL | stet | |

| <i>Vegetation Features</i> | | |
|----------------------------|-----------------|--|
| <i>NGA</i> | <i>SFS</i> | <i>comment</i> |
| FRST | split with WOOD | [+ extended] v [- extended] (merely level of generality) |
| PLAN | stet | |
| PLN | field → FLD | [+ cultivated] (merely level of generality) |
| TREE | not used | |

The nineteen features codes used by the Gazetteer are mapped to 22 in the Standard Feature Set. Twelve of the Gazetteer codes remain unchanged, while one (TREE) is not currently planned for retention. Three of the Gazetteer codes (CRTR, ROCK, FRST) hide significant differences within them, and the Standard Feature Set separates each into two separate codes. One (FRST), however, is an optional split and depends only on the required level of generality or specificity in the structure. CRTR generates DEPR to distinguish between volcanic craters and other depressions (such as those caused by meteorites); the ROCK code includes generic descriptors which can apply to either of the [\pm independent] sets, and so a second feature TOR is generated.

The remaining three discrepancies are minor, involving the transfer of three generic descriptors to neighbouring feature codes.

5 SUMMARY

The 76 generic descriptors (including twelve homonyms) which the relevant jurisdictions employ to refer to *raised relief* features in the geographical environment were semantically analysed into fourteen components. These semantic components were shown to be useful in separating the descriptors into seventeen feature-code sets.

We have now added a further 35 generic descriptors in the *vegetation* subset, and by adding three new semantic components to the stock of binary elements we have fully specified five new feature codes.

These two subsets are placed in the broad taxonomy tree at the fifth level, one within the fourth-level Relief group and the other within Non-Relief.

The broad taxonomy has progressed, and is now reasonably well established except for uncertainty about the placement of littoral features and the omission of ice features at this stage.

The degree of consonance with existing practice (as represented by the National Gazetteer of Australia) is high, with only minor re-mapping required except for the two feature codes CRTR and ROCK.

6 CONCLUSIONS

The results of the previous pilot study (Blair and Henderson-Brooks, 2002) have been confirmed by the application of binary semantic analysis to a second set of generic descriptors. A complete analysis of geographic descriptors in current Australasian use has a high probability of producing a standard feature set with minimal disruption to existing practice but with an improved level of reliability.

7 REFERENCES

Blair, D and C Henderson-Brooks, 'Towards a standard geographic feature set: elevated relief features.' *APIT Technical Report 1, 2002*. Sydney: Asia-Pacific Institute for Toponymy.