Detailed fluvial-geomorphologic mapping of wadeable streams: a proposal of universal map symbology

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ABSTRACT

Detailed maps are important components of fluvial-geomorphological research, connecting several tools, namely field mapping of presented channel and floodplain forms and the assessment of fluvial processes and hydromorphological conditions of current river management. In this paper, we propose a universal map legend for the complex mapping of small stream channels in a detailed scale, which means including both the channel and adjacent floodplain segments. With the help of the symbology we are able to demonstrate both fluvial forms (i.e. individual features, grain size of bed sediments and fluvial deposits) and fluvial processes (i.e. contemporary trends in channels, character of lateral sediment inputs and flow characteristics) in a single map. In total, nearly 150 symbols were proposed and created as a combination of TrueType font and ArcGIS Style files. However, the principle can be used in various software. The work is accompanied by three map examples from the Nízký Jeseník Mts (the Stará Voda Stream) and the Moravskoslezské Beskydy Mts (the Lubina and Bystří Streams).

1. Introduction

Fluvial geomorphology is a science investigating complex behaviour of river channels at spatial scales from individual cross-sections to entire basins (Newson & Sear, 1998). This science contributes to the practical issues of river management and traditional engineering perception of streams and rivers by complex temporal and spatial assessment of fluvial forms and related processes (Dollar, 2002). The cooperation between river engineers and fluvial geomorphologists is necessary especially with regard to the character of the restoration of rivers and their sustainability as the number of restoration projects has dramatically increased in Europe since the ratification of the Water Framework Directive (2000/60/EC) (European Commission, 2000). Although common technical plans of river restorations usually only include ‘forms’ (i.e. individual spatial units) in channels and adjacent floodplain area, the information on participating fluvial processes is equally necessary for successful execution of restoration projects (Dufour & Piégay, 2009). Geomorphological mapping at the scale of channel units (10\(^{-1}\) – 10\(^{-2}\) m) or channel reaches (10\(^{1}\) – 10\(^{-2}\) m) (sensu Montgomery & Buffington, 1998) belongs to the standardised part of the methodology of scientific research and restoration planning in fluvial environment including small wadeable streams. Conventional GPS devices are usually insufficient to cover a very detailed mapping scale (often varying between 1:100 and 1:200) in these streams and spatial inaccuracy can increase if highly confined and densely forested mountain valleys are present in the study area. Therefore, geodetic total stations, terrestrial LiDar, tapes and laser rangefinders with included clinometers are used to obtain the topography of investigated channel reaches, channel and floodplain units and other features such as in-stream wood (e.g. Campana, Marchese, Theule, & Comiti, 2014; David, Wohl, Yochum, & Bledsoe, 2010; Galia & Škarpich, 2016; Owczarek, 2008; Ruiz-Villanueva et al., 2010). The grain-size parameters of bed sediments or deposited material, which belong to the basic characteristics of fluvial systems included in thematic maps, can be quantified by random pebble counts (Wolman, 1954), visual estimations of main grain-size populations (Buffington & Montgomery, 1999) or software processing of images (Graham, Rice, & Reid, 2005).

For scientific and practical purposes, it is notable that mapped channels and adjacent floodplains include both qualitative (individual forms) and quantitative characteristics (e.g. mean grain-size of bed sediments or gravel bars). However, resulting maps often lack information on temporal variations of observed parameters (e.g. development of bars, activity of sediment...

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inputs) or in-channel processes (e.g. channel reaches with prevailing erosion or sediment deposition). Therefore, such maps usually represent a static ‘snapshot’ of the fluvial landscape at a particular time, which does not correspond to the general perception of fluvial systems provided by geomorphologists. Complex fluvial geomorphological maps displaying both forms and processes are quite rare. In order to add process-based characteristics into these ‘snapshots’, stream channels are sometimes schematised into several individual maps or longitudinal profiles showing the same channel reach from different perspectives. For example, Hooke (2003) conceptualised coarse sediment connectivity in a channel reach into individual maps displaying (i) individual sediment sources (yet not distinguishing their supply potential), (ii) present stream bed grain-size characteristics, (iii) the function of the channel reach (the balance between deposition and erosion), (iv) an interpretation part showing relations between sediment supply, sediment transport and its storage and finally (v) a system map producing connectivity of sediments and the presence of barriers for sediment transport. Similarly, Gália and Škarpich (2016) separately illustrated (i) bed grain-size characteristics, (ii) present function of a channel reach and (iii) stream transport capacity via calculated unit stream power.

Detailed geomorphological maps are an important and standard part of many scientific papers. However, the approaches of authors in cartography vary and there is nothing like standardised symbology, although some symbols often look similar as they proceed from standardised symbology related to general geomorphology proposed by Demek and Embleton (1972), for example, symbols for gully/gorge or landslide used by Harvey (2001) and Hooke (2003). There were some attempts to digitise Demek and Embleton (1972) symbology both for ArcGIS (Létal & Voženilek, 2002) and Microstation (Kusendová, 2000) software. However, these symbols are rather suitable for maps at smaller scales (i.e. Karampoglidas, Benito-Calvo, & Pérez-Gonzáles, 2015; Piacentini, Urbano, Sciarra, Schipani, & Miccadei, 2016) but not for detailed fluvial-geomorphological mapping and/or general geomorphological maps of larger areas (Fonseca, Zezere, & Neves, 2014; Gessert, 2016; Ondicol, 2009). Symbols in detailed maps accompanying fluvial-geomorphological papers differ, for example, in the level of symbolisation/graphicness, from nearly artistic approaches, in some cases even without a legend (Dietrich et al., 2006 or Hassan et al., 2008), to more symbolised forms (Malik & Matyja, 2008; Owczarek, 2008; Ruiz-Villanueva et al., 2010). For complete fluvial-geomorphological characterisation of a mapped area, a series of several maps with a different focus is sometimes used rather than one complex map (Hooke, 2003; Wheaton et al., 2015), although the possibility to use colours in maps facilitates the creation of more complex, yet still uncluttered maps (Poeppl, Keesstrab, & Hein, 2015; Ruiz-Villanueva et al., 2010). Other possibilities of geovisualisation in fluvial-geomorphological mapping can be pseudo-3D visualisation (used both to explain studied problems and processes [Ruiz-Villanueva et al., 2010] or to characterise the study area [Poeppl et al., 2015]), or annotated photographs (Wheaton et al., 2015; Wistuba & Sady, 2011).

The aims of the study are (i) to demonstrate complex fluvial-geomorphological mapping of small stream channels (i.e. easily wadeable channels during ordinary flow conditions) including both the channel-reach and adjacent floodplain segments and related fluvial processes, and (ii) to propose and create universal map symbology for such a purpose. Having used the proposed symbology, the resulting maps provide spatial information on presented in-channel and floodplain forms, prevailing channel processes, median grain-size populations of bed sediments and bars, the character of lateral sediment supply and flow hydraulics, and also the variety of human interventions in the channel. Three morphologically different channel reaches from the temperate climate environment were selected as map examples: (i) a stepped-bed close-to-nature channel in a highly confined mountain valley, (ii) a pool-riffle channel in a semi-confined valley affected by historical mining and (iii) a heavily human-impacted mountain channel with check-dams in poor hydromorphological conditions.

2. Methods

2.1. Building the symbology

The list of symbolised features, divided into hierarchical groups, was created according to standard classifications of channel and floodplain units and other features of wadeable streams (e.g. Halwas & Church, 2002; Jones, Brewer, Johnstone, & Macklin, 2007; Montgomery & Buffington, 1998; Wheaton et al., 2015) and based on practical field observations and mapping results. The symbology comprises TrueType font file and ArcGIS Style file, which is a commonly used approach when building symbology for ESRI ArcGIS software (Létal & Voženilek, 2002; Robinson et al., 2013; Zhang & Qi, 2008). However, despite significant improvements in cartographic possibilities of ArcGIS Desktop in the last years (Eicher & Briat, 2005; Hardy & Kressmann, 2005), some limitations still exist. Therefore, the final form of the symbology is a compromise between the cartographic ideal, possibilities of used software and easy usage not requiring exigent manual readjustment. Since the font includes basic symbols (both final and sub-elementary parts used further in combinations), these are further used in
ArcGIS Style file in various combinations, colours and geometries (point, line, areal). It is thus necessary to have both font installed and Style file loaded for the proper use of symbology. We further created a sample geodatabase of a pre-prepared structure (data layers, attribute fields and symbology) for the storage of mapped data.

2.2. Maps: examples from Nízký Jeseník Mts and Moravskoslezské Beskydy Mts, Czechia

Proposed symbology was applied in three detailed fluvial-geomorphological maps covering various geomorphological settings of streams: channel reaches of Bystrý, Lubina and Stará Voda draining the Moravskoslezské Beskydy Mts and the Nízký Jeseník Mts, Czech Republic (Figure 1).

All investigated channel reaches and included forms were topographically mapped by a 50-m tape and laser rangefinder with included clinometer. Median grain-size characteristics of individual channel units were visually estimated using the procedure of Buffington and Montgomery (1999) and characterised by a simplified Wentworth (1922) scale. Prevailing channel processes were assessed by the presence or absence of typical features: dominant erosional processes in the channel were characterised by unstable banks containing exposed tree roots or by exposed bedrock outcrops in the channel bed. A depositional channel reach was identified on the basis of median grain size and widening of the bankfull channel. A channel reach without the dominance of these features was classified as transport-balanced. A bank failure was classified as stabilised if it was covered by vegetation preventing sediment supply during ordinary flow (up to ca. bankfull flow). However, we assumed reactivation of sediment supply from stabilised bank failures during infrequent high-magnitude floods. The bankfull channel manifested itself by typical marks such as inflexion in the bank slope or the presence of riparian vegetation (Navratil, Albert, Hérouin, & Gresillon, 2006). A low flow channel corresponded to our visual observations of wetted perimeter during an ordinary (ca. mean annual) discharge. The zones of relatively fast and slow flow were distinguished for these ordinary flow conditions. Note that the flow velocities can reversely change during floods, especially in the case of pool-riffles, when pools are understood as zones of high velocities and bed erosion during flood events (Lisle, 1986). Each piece of in-stream wood was measured with a tape, while the orientation against the flow direction (intervals of ±22.5°) was noted in the field. In-stream wood was classified as large wood if its diameter exceeded 0.1 m and length 1 m (Wohl et al., 2010). Any human interventions into the streams or floodplains (e.g. constructed roads and their crossing with a stream, bank stabilisations, grade-control structures) were plotted as well; the height of a check-dam and bed sill was measured in the case of the Bystrý Stream.

The first mapped example (Figure 1(a)) represents the stepped-bed headwater channel Lubina in the Moravskoslezské Beskydy Mts (flysch Western Carpathians, Czech Republic). A typical feature of the mapped stream is the alteration of erosional and depositional reaches accompanied by lateral sediment supply from bank failures and frequent bedload transport. Gravel, cobbles and boulders represent grain-size material of the channel bed and deposits. Additional information on the geomorphic processes in this stream could be obtained from Galia and Škarpich (2013).

The second map illustrates the pool-riffle channel Stará Voda in a semi-confined valley (Nízký Jeseník...
Mt's, Eastern Sudetes, Czech Republic) (Figure 1(b)). The valley was affected by the mining of slate slabs during the nineteenth and the first half of the twentieth century and related dumps represented important inputs of coarse sediments into the stream channel. Prevailing channel bed grain-size fractions were usually cobbles and gravel in riffles and fine sediments <2 mm in pools; the locations directly affected by dumps also contain boulder grain-size fractions. For details of the influence of dumps on local gravel-bed streams and a detailed description of the Stará Voda Stream see Galia (2016).

The channelised part of the Bystrý Stream (Figure 1(c)) is displayed in the third map. This stream was affected by extensive reconstruction of check-dams and bank stabilisations after a high-magnitude flood in 1997. The mapped channel reach had originally pool-riffle morphology, which is now transformed into uniform rapid reaches separated by individual check-dams. Effects of such a type of management on bed sediments and channel-reach morphology in this stream is comprehensively described in Galia and Škarpick (2017).

3. Results and discussion

There are 80 symbols in the font file (Figure 2(a)). These are further used in various combinations and defined colours (Figure 2(b)) to create complex symbology saved as ArcGIS Style file with 148 symbols (see an example of selected symbols in Figure 2(c) or a complete legend in the Main map), colours and labels. With some limitations the proposed symbology can also be used for hand-drawn maps during field mapping. The symbols are arranged into hierarchised and numbered groups: (1) Channel system, (2) Hillslope-channel coupling system, (3) Valley floor (floodplain) system, (4) Artificial objects, (5) Crossings and (6) Mapping. Derived from the classification system, each symbol then has its number, used in parentheses in the following text.

First, bankfull channel (1.1.1) is drawn, defined by areal symbol; its texture denotes (1.3) Bed sediment size (six grades of dominant grain-sizes from clay/silt to bedrock, according to the simplified standard Wentworth (1922) scale), while the colour defines (1.2) a dominant process in the channel (erosion, deposition or transport-balanced). Highly desaturated and very light colours were used for these background symbols. Within the bankfull channel, borders for a low flow channel (1.1.2) can be drawn. The border of floodplain (1.1.2) often lies outside the mapped extent. The symbol for thalweg (1.4.4) defines (1.5) Channel-reach morphology according to Montgomery and Buffington (1997) classification of mountain streams with joined cascades and step-pools into one category ‘stepped-bed channel’ after Comiti and Mao (2012). On the line, point symbols for flow directions and zones of fast/slow flow can be placed. Within the channel, (1.6) Channel units (such as steps, riffle or bars) and (1.7) In-stream wood (according to Wohl et al., 2010; Wohl & Cadol, 2011) are mapped. The length and orientation of in-stream wood should be measured in the field. The texture of (1.6.4) a bar symbol is the same as that used for (1.3) bed sediments. In the case of confined and semi-confined valleys, symbols for (2) Hillslope-channel coupling system are used, divided into groups of (2.1) natural forms (such as a gully or a cone) and (2.2) anthropogenic forms. Similarly, for reaches with developed floodplain segments or valley deposits, (3.1) floodplain vegetation and (3.2) formations (such as oxbows or low floodplain...

![Figure 2](https://example.com/figure2.png)

Figure 2. (a) Map of symbols included in TrueType font file; (b) Predefined colours; (c) Examples of basic symbols combined into final symbology.
terraces) are mapped. The symbols for vegetation (distinguishing grassland, shrubs and broad-leaved/coniferous trees) have a different colour for natural/man-influenced ecosystems. Artificial objects can be grouped into Bed stabilisation, Grade-control structures and Embankments (classified according to the used river engineering techniques in European gravel-bed streams). For Grade-control structures, we use different symbols for structures allowing migration of dominant or interested fish species (by the height of a structure or by the presence of a fishpass), and the symbols can be labelled by their height value above the downstream water level or by mean slope for Boulder ramp, respectively. In the group of Crossings, features as ford or bridge are defined. The last group, Mapping, includes symbols for features like triangulation points, points of data sampling or the position of cross-sections. Triangulation points can be labelled with their name, altitude, denivelation or other parameters.

A part of the symbols (e.g. landslide or embankments) was prepared both with point and line/areal geometry, with the usage depending on the scale and/or the size of mapped features. Similarly, some linear features such as gullies and levees can be mapped either as linear features (one line for a feature) or areal features (where the edges of a feature are mapped and symbolised). When drawing the edge lines using asymmetrical symbols, it is necessary to draw the line in the right direction (or change the line direction when drawing in the reverse direction) in order to have hachures oriented down the slope. In some cases, the geometry of a symbol was selected not only according to the character of a feature, but considering the cartographic possibilities of ArcGIS, for example, crossings are created as point symbols. Thus it is necessary to set the size of a symbol to span the whole width of a stream (floodplain).

For the automation of map creation, simplifying the process of map creation and achieving good-looking results, it is useful to utilise some cartographic functions of ArcGIS Desktop software. First, the size and angle of point symbols can be controlled directly by the attribute value for each feature (Layer properties – Symbology – Advanced). Second, with the Align Marker to Stroke or Fill function (available for Cartographic representation symbology only), point symbols can easily be aligned to be perpendicular (e.g. crossing or grade-control structure symbols) or parallel (e.g. embankment symbols) with thalweg or bank lines. Furthermore, all the symbols can be adjusted manually after converting to graphics.

The process of mapping and map creation (using the proposed symbology and procedures) consists of several subsequent steps (Figure 3). After fieldwork, which often combines various mapping methods like hand sketches, surveying and collection of data and/or materials for laboratory analyses (e.g. grain-size analysis), all the data have to be converted into the digital form usable in ArcGIS. A sample geodatabase with a pre-prepared structure (data layers, attribute fields and symbology saved as Cartographic representation rules) is provided for this (Table 1). The usage of particular symbols (and their geometric variants – point, line and areal) depends on mapped features, type of stream, mapping details and scale of the final map. The final step of map production comprises symbolisation, fine adjustment of symbols and the map (e.g. the smoothing of planar lines into curves, size modification, orientation and feature labelling) and the map export or print. The TrueType font file, ArcGIS Style file and sample geodatabase can be downloaded in archive as Supplementary file of the paper.

The above-mentioned files and procedures were used to create three sample maps. Data from the mapping, originally drawn by hand in field, were digitised in ArcGIS software, stored in a geodatabase and symbolised using the proposed symbology and methods with a detailed 1:150 scale, which allows describing the streams and their floodplains in high detail, nearly without generalisation.

4. Conclusion

Wadeable stream channels belong to the most active landforms from the geomorphic perspective. They are
| Code  | Description                                           | Code  | Description                                           | Code  | Description                                           | Code  | Description                                           | Code  | Description                                           |
|-------|-------------------------------------------------------|-------|-------------------------------------------------------|-------|-------------------------------------------------------|-------|-------------------------------------------------------|-------|-------------------------------------------------------|
| 31110 | Grassland, natural                                    | 1610  | Step                                                 | 1410  | Stream flow direction                                 | 1620  | Pool                                                 | 1120  | Low discharge                                         | 1311  | Clay/silt, erosion                                    |
| 31120 | Grassland, man influenced                            | 1660  | Bedrock step                                         | 1420  | Zone of fast flow                                     | 1630  | Riffle                                               | 1130  | Valley floor/floodplain                               | 1312  | Clay/silt, deposition                                 |
| 31210 | Shrubs, natural                                       | 2111  | Gully (line)                                         | 1430  | Zone of slow flow                                     | 2120  | Cone                                                 | 1510  | Stepped bed                                           | 1313  | Clay/silt, transport-balanced                        |
| 31220 | Shrubs, man influenced                                | 2112  | Gully (edge)                                         | 1610  | Step                                                 | 2150  | Rock flow                                            | 1520  | Plane bed                                             | 1321  | Sand, erosion                                         |
| 31311 | Trees (forest), deciduous, natural                   | 2131  | Landslide, active                                    | 1660  | Bedrock step                                         | 2210  | Pile                                                 | 1530  | Pool-riffle                                           | 1322  | Sand, deposition                                      |
| 31312 | Trees (forest), deciduous, man influenced             | 2132  | Landslide, stabilized                                | 1710  | Large wood                                            | 3210  | Avulsion channel                                     | 1540  | Dune-ripple                                           | 1323  | Sand, transport-balanced                             |
| 31321 | Trees (forest), conifer, natural                      | 2141  | Bank failure, active                                 | 1720  | Log jam                                               | 3220  | Oxbow                                                | 1550  | Bedrock ripple                                        | 1331  | Gravel, erosion                                       |
| 31322 | Trees (forest), conifer, man influenced               | 2142  | Bank failure, stabilized                             | 1730  | Small wood accumulation                               | 3230  | Oxbow lake                                           | 1560  | Anabranching channel                                 | 1332  | Gravel, deposition                                    |
| 31331 | Trees (forest), mixed, natural                        | 2150  | Rock flow                                            | 1740  | Beaver dam                                            | 3240  | Backswamp                                            | 3210  | Avulsion channel                                     | 1333  | Gravel, transport-balanced                           |
| 31332 | Trees (forest), mixed, man influenced                 | 2221  | Earthwork (line)                                     | 2110  | Gully                                                | 3260  | Crevase splays                                       | 3220  | Oxbow                                                | 1341  | Cobble, erosion                                       |
|       |                                                       | 2222  | Earthwork (edge)                                     | 2131  | Landslide, active                                     | 3280  | Debris flow deposits                                 | 3230  | Oxbow lake                                            | 1342  | Cobble, deposition                                    |
|       |                                                       | 3251  | Natural levees (line)                                | 2132  | Landslide, stabilized                                | 4350  | Scour hole                                           | 4400  | Rock groyne                                          | 1343  | Cobble, transport-balanced                           |
|       |                                                       | 3252  | Natural levees (edge)                                | 2141  | Bank failure, active                                 |       |                                                     |       |                                                      | 1351  | Boulder, erosion                                      |
|       |                                                       | 3270  | Floodplain terrace                                   | 2142  | Bank failure, stabilized                             |       |                                                     |       |                                                      | 1352  | Boulder, deposition                                   |
|       |                                                       | 4101  | Artificial levee (line)                              | 2150  | Rock flow                                            |       |                                                     |       |                                                      | 1353  | Boulder, transport-balanced                           |
|       |                                                       | 4102  | Artificial levee (edge)                              | 2220  | Earthwork                                            |       |                                                     |       |                                                      | 1361  | Bedrock channel, erosion                             |
|       |                                                       | 4311  | Bed sill                                             | 3250  | Natural levees                                       |       |                                                     |       |                                                      | 1362  | Bedrock channel, deposition                          |
|       |                                                       | 4312  | Bed sill with fishpass                               | 4311  | Bed sill                                             |       |                                                     |       |                                                      | 1363  | Bedrock channel, transport-balanced                  |
|       |                                                       | 4321  | Check dam                                            | 4312  | Bed sill with fishpass                               |       |                                                     |       |                                                      | 1641  | Bar, clay/silt                                       |
|       |                                                       | 4322  | Check dam with fishpass                              | 4321  | Check dam                                            |       |                                                     |       |                                                      | 1642  | Bar, sand                                             |
|       |                                                       | 4331  | Boulder ramp                                         | 4322  | Check dam with fishpass                              |       |                                                     |       |                                                      | 1643  | Bar, gravel                                           |
|       |                                                       | 4332  | Boulder ramp with fishpass                           | 4331  | Boulder ramp                                         |       |                                                     |       |                                                      | 1644  | Bar, cobble                                           |
|       |                                                       | 4341  | Weir                                                | 4332  | Boulder ramp with fishpass                           |       |                                                     |       |                                                      | 1645  | Bar, boulder                                          |
|       |                                                       | 4342  | Weir with fishpass                                   | 4341  | Weir                                                 |       |                                                     |       |                                                      | 1650  | Island                                               |
|       |                                                       | 4510  | Willow spilling                                      | 4342  | Weir with fishpass                                   |       |                                                     |       |                                                      | 1670  | Bedrock chute                                        |
|       |                                                       | 4520  | Log walling                                         | 4510  | Willow spilling                                      |       |                                                     |       |                                                      | 4210  | Bed stabilisation, concrete                          |
|       |                                                       | 4530  | Fascine                                             | 4520  | Log walling                                         |       |                                                     |       |                                                      | 4220  | Bed stabilisation, stone path                        |
also perceived as potentially hazardous in inhabited areas for their proneness to flash flooding, which is often accompanied by massive transport of sediments and extensive erosion and deposition (Borga, Stoffel, Marchi, Marra, & Jakob, 2014; Jarrett, 1990). The knowledge not exclusively of in-channel and floodplain forms, but also of fluvial processes and related potential morphological changes in channels is necessary for modern river management practices and designs of sustainable river restorations (Dollar, 2002). Therefore, we proposed a complex mapping approach for small wadeable streams on three detailed map examples, which includes both natural and man-made features as well as related processes (i.e. the activity of lateral sediment supply, presence of erosional/depositional tendency in the channel or delineated zones of fast or slow flows). Apart from the complete symbology list, sample maps of three streams parts from the Nizký Jeseník Mts and the Beskydy Mts (Czechia) were provided.

In the paper, we describe the mapping and symbolisation workflow for ESRI ArcGIS software using a combination of TrueType font file, ArcGIS Style file and a sample geodatabase. All the files are available for download (in Supplementary file) and usage. Nevertheless, the proposed symbology and mapping approach are also applicable in another graphic, cartographic or GIS software (with more or less intensive adjustments of the original work). Similarly, if considered to be insufficient for certain mapping purposes or various geomorphological settings, symbols can be added into the symbology system in order to fulfil mapping needs. We believe that the usage of standardised symbology (and cartographic workflow) for detailed fluvial-geomorphological mapping can simplify the process of geodata visualization and sharing.

Software

Font was created in FontForge (version 2016-10-04) software. Symbol style file, sample geodatabase and maps were created using ESRI ArcGIS (version 10.2.1) software. The supplementary file (an illustrated poster with a complete legend and sample maps) was created in Adobe InDesign (CS6 version) software.

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