From static PDFs to interactive, geospatial PDFs

or, *'I never knew that PDFs could do that!'*

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PDFs

Great for **static** sharing of **complex graphical layouts** in a **device-independent**, **print-friendly** manner

So…perfect for **maps**!

However…

But:

No way to get back the original data

Difficult to edit

No interactivity

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QGIS demo

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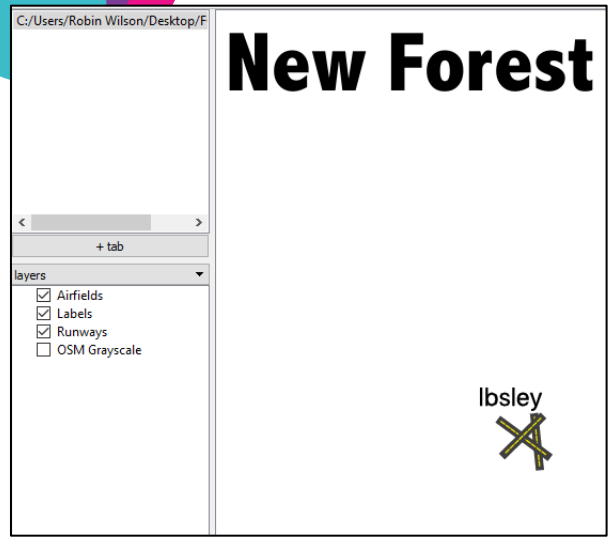
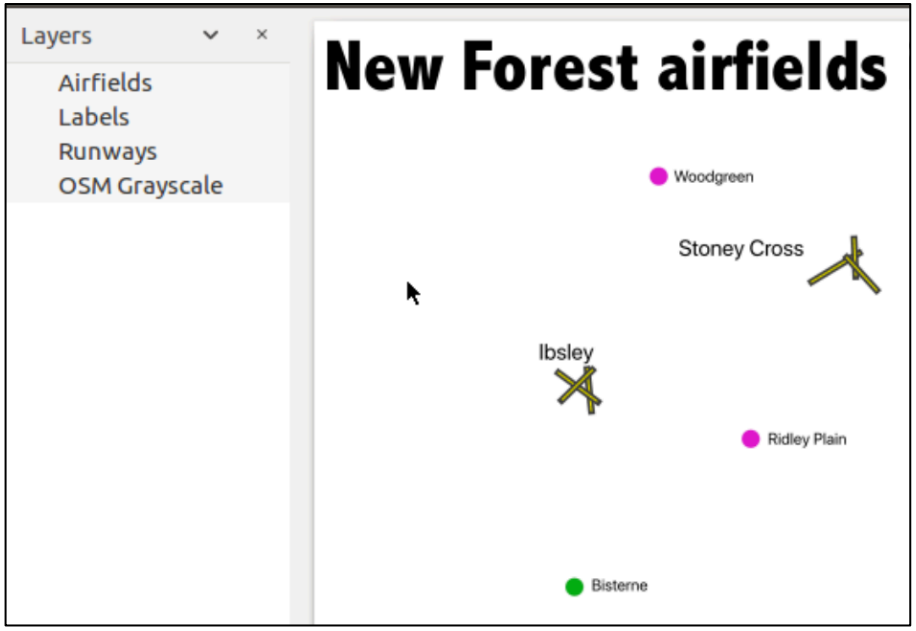
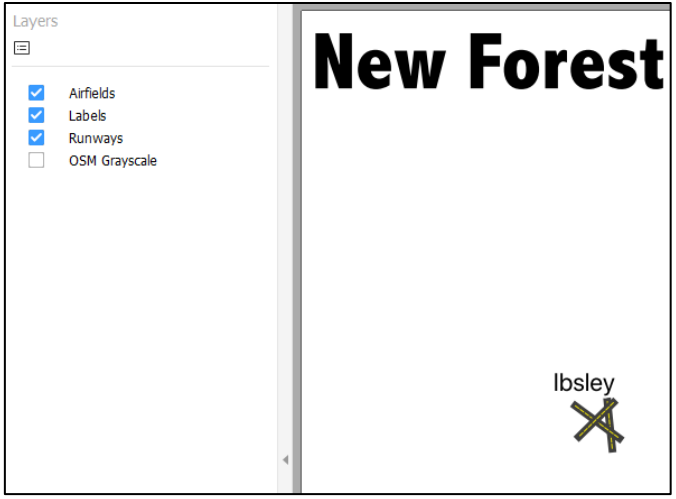
Other software



xpdf



evince
(Gnome)



Foxit Reader

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GDAL – PDF from XML Composition File

```
gdal_create output.pdf -co COMPOSITION_FILE=input.xml
```

Sponsored development

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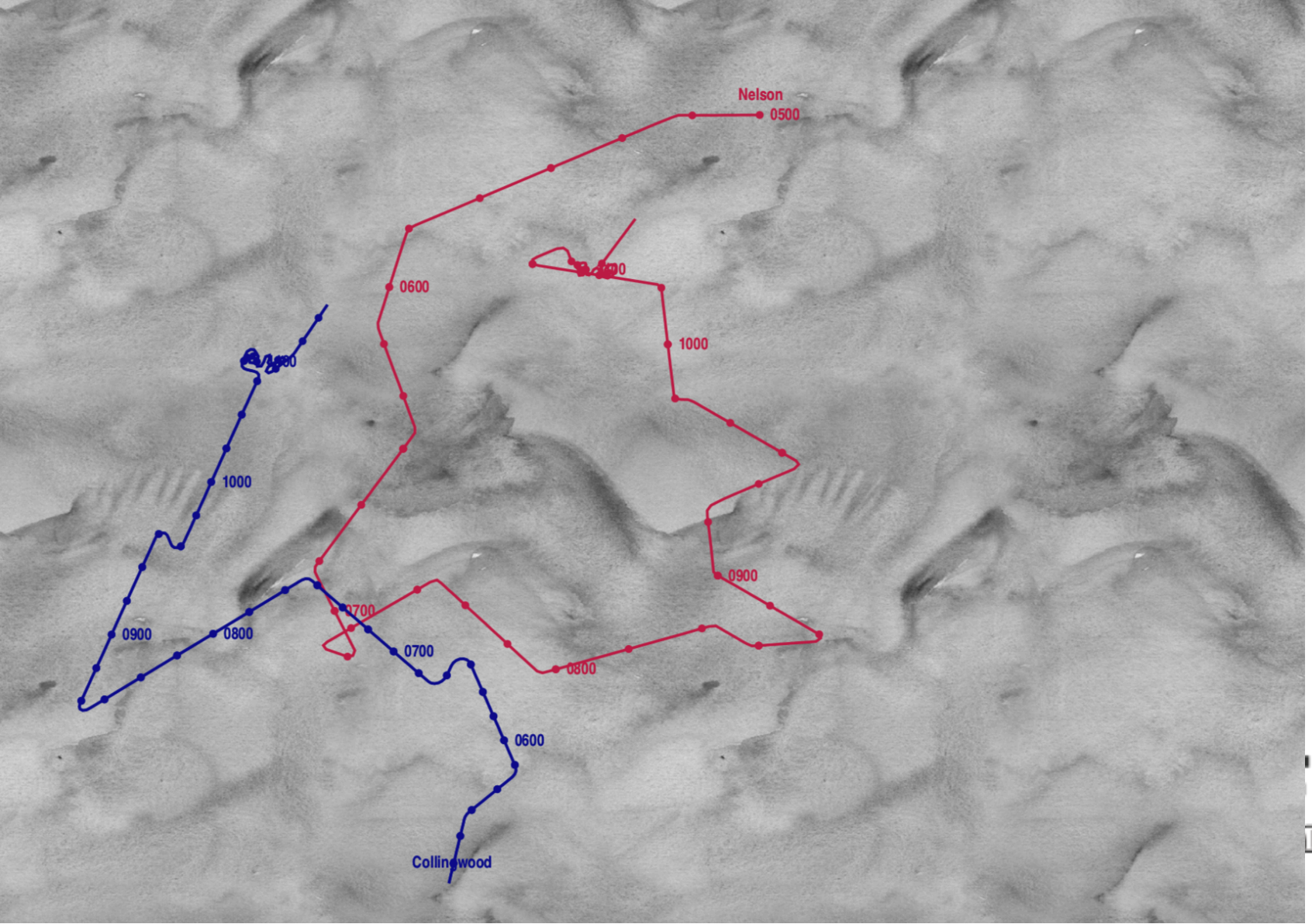

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XML Composition File

```
<PDFComposition>
        <Metadata>
                <Author>Robin Wilson</Author>
        </Metadata>

        <LayerTree displayOnlyOnVisiblePages="true">
                <Layer id="background" name="Background chart"/>
                <Layer id="nelson" name="Nelson"/>
                <Layer id="collingwood" name="Collingwood"/>
        </LayerTree>
...
```

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XML Composition File

```
<Page id="page_1">
        <DPI>72</DPI>
        <Width>841.698</Width>
        <Height>595.14</Height>
        <Georeferencing id="georeferenced">
                <SRS>EPSG:4326</SRS>
                <ControlPoint x="1" y="1" GeoY="50" GeoX="-0.8"/>
                <ControlPoint x="1" y="595.14" GeoY="50.4" GeoX="-0.8"/>
                <ControlPoint x="841.698" y="1" GeoY="50" GeoX="-0.1"/>
                <ControlPoint x="841.698" y="595.14" GeoY="50.4" GeoX="-0.1"/>
        </Georeferencing>
...
```

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XML Composition File

```
<Content>
   <IfLayerOn layerId="background">
      <Raster dataset="chart.tif" georeferencingId="georeferenced"/>
   </IfLayerOn>
   <IfLayerOn layerId="nelson">
      <Vector dataset="Nelson.shp" layer="Nelson" georeferencingId="georeferenced"
              ogrStyleString='SYMBOL(c:#bd1b44,s:2,id:"ogr-sym-3")'>
         <LogicalStructure displayLayerName="Nelson" fieldToDisplay="time"/>
      </Vector>
   </IfLayerOn>
...
```

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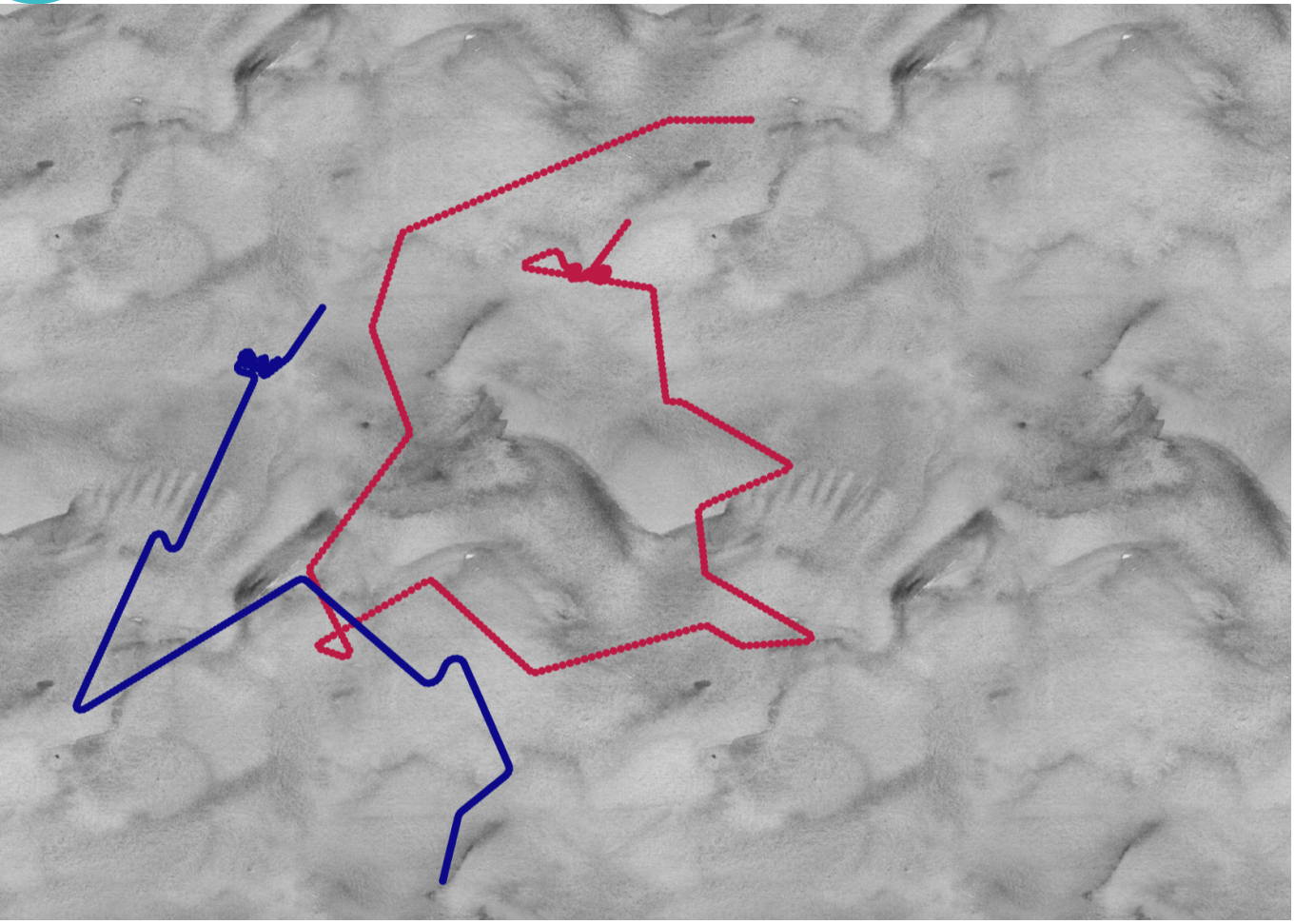

Layers

Background chart

Nelson (non-interactive)

Collingwood (non-interactive)

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Preprocessing

- Convert series of points to a line

- Extract points:
  - Every hour
  - Every 10 minutes
  - First point

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```
<IfLayerOn layerId="Nelson">
   <Vector dataset="Nelson_10min.geojson" layer="Nelson_10min"
           georeferencingId="georeferenced"
           ogrStyleString='SYMBOL(c:#bd1b44,s:2,id:"ogr-sym-3")'>
      <LogicalStructure displayLayerName="Nelson" fieldToDisplay="time"/>
   </Vector>
   <VectorLabel dataset="Nelson_Hourly.geojson" layer="Nelson_Hourly"
           georeferencingId="georeferenced"
           ogrStyleString='LABEL(t:{time_str},c:#bd1b44,s:24pt,p:4,dx:7mm,bo:1)'/>
   <VectorLabel dataset="Nelson_FirstPoint.geojson" layer="Nelson_FirstPoint"
           georeferencingId="georeferenced"
           ogrStyleString='LABEL(t:"Nelson",c:#bd1b44,s:24pt,p:2,dy:10mm,bo:1)'/>
   <Vector dataset="Nelson_Lines.geojson" layer="Nelson_Lines"
           georeferencingId="georeferenced" ogrStyleString='PEN(c:#bd1b44,w:5px)'/>
</IfLayerOn>
```

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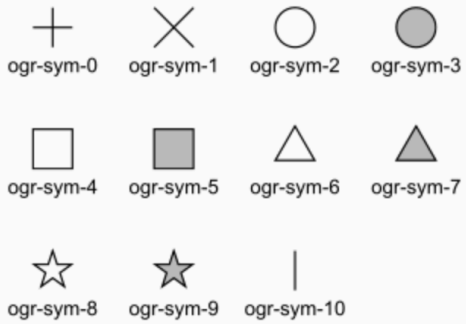
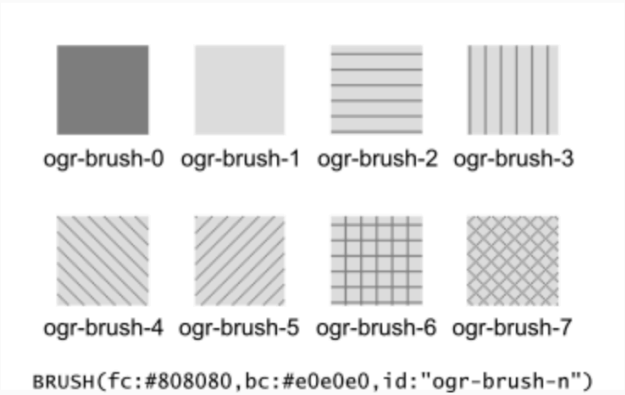
Here is the current list of OGR symbol ids (this could grow over time):



Here is the current list of OGR brush ids (this could grow over time):



- `a` : **Angle** - Rotation angle (in degrees, counterclockwise).
- `c` : **Text Foreground Color**, expressed in hexadecimal (#RRGGBB[AA]) Suggested default: black (c:#000000)
- `b` : **Text Background Color** - Color of the filled box to draw behind the label, expressed in hexadecimal (#RRGGBB[AA]). No box drawn if not set.
- `o` : **Text Outline Color** - Color of the text outline (halo in MapInfo terminology), expressed in hexadecimal (#RRGGBB[AA]). No outline if not set.
- `h` : **Shadow Color** - Color of the text shadow, expressed in hexadecimal (#RRGGBB[AA]). No shadow if not set.
- `w` : **Stretch** - The stretch factor changes the width of all characters in the font by the given percentage. For example, a setting of 150 results in all characters in the font being stretched to 150% of their usual width. The default stretch factor is 100.
- `m` : **Label Placement Mode** - How the text is drawn relative to the feature's geometry.

From OGR Feature Style docs

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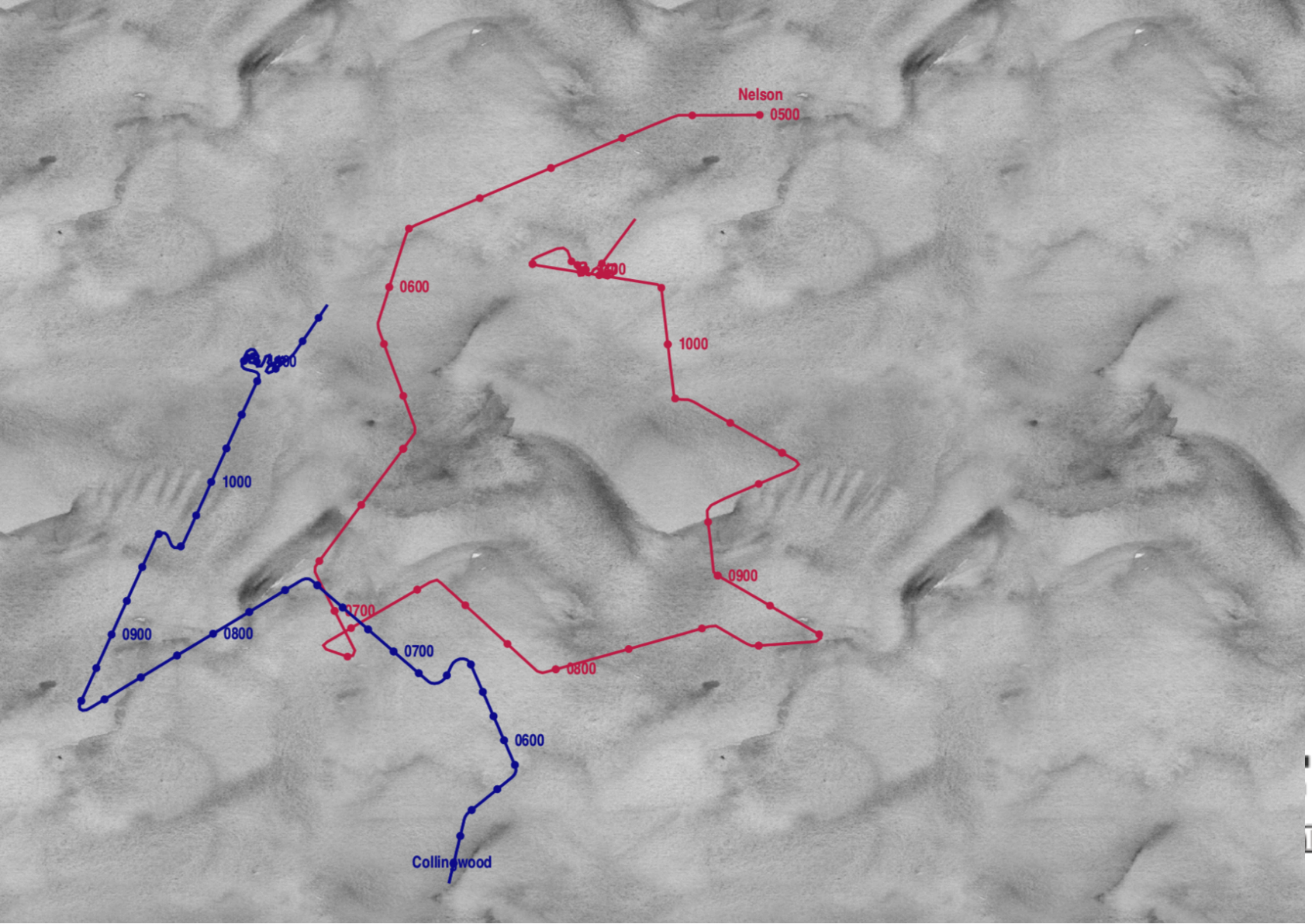

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What if we take it a bit *too* far?

PDF Javascript

```
<Javascript>
...
</Javascript>
```

```
var btn = this.addField("btn1" , "button", 1, fldRect);
btn.setAction("MouseUp", "JS CODE HERE")
```

```
var ocgs = this.getOCGs();
ocgs[0].state = false
ocgs[0].state = true
```

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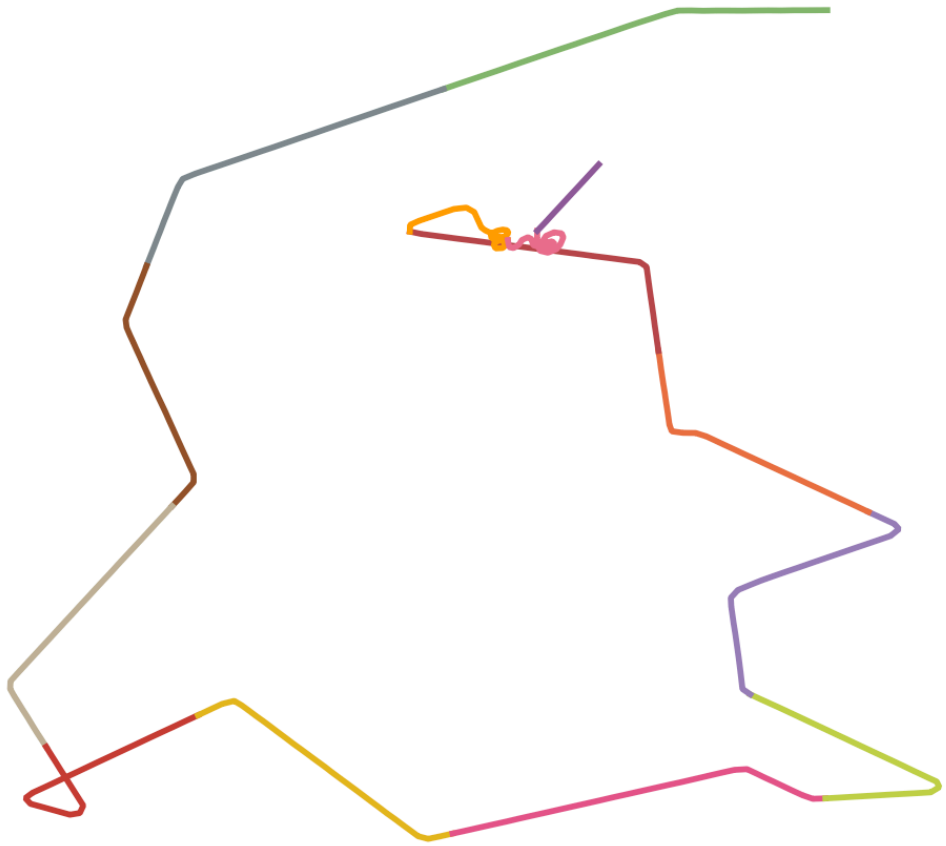
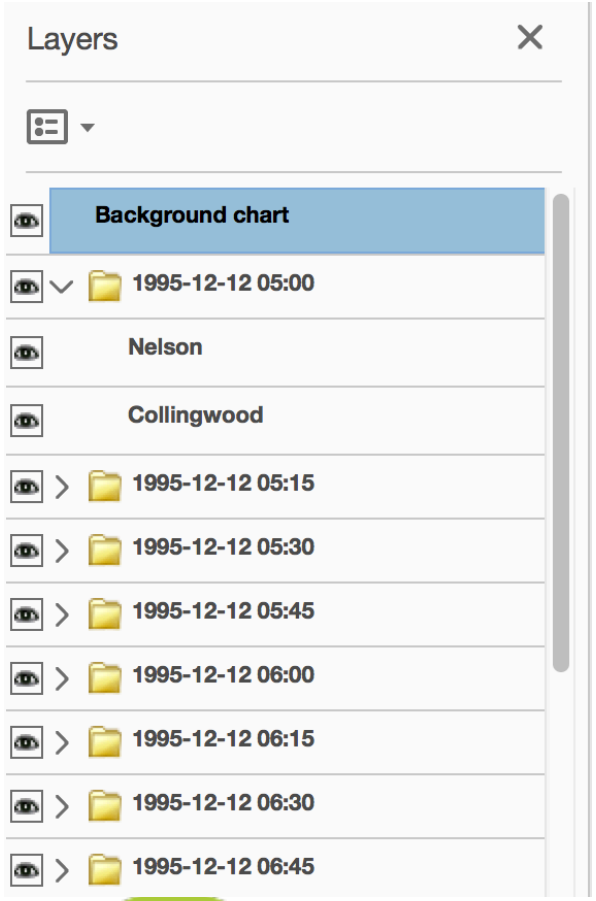
Split track into 15 minute chunks

1 chunk = 1 layer





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PDF Javascript

```
function nextTimestep() {
        // Simplified to remove all edge cases
        // Get the next OCG (layer) and turn it on
        timestamps[current_index].ocg.state = true;

        // Update the displayed time
        var txt = this.getField("txtTime");
        txt.value = timestamps[current_index].name;

        current_index++;
}
app.setInterval("nextTimestep()", 1000);
```

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Taking it *even* further…

Demo

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Advantages…?

- No need to install other software – just uses Adobe Reader
- Still easily printable, at any timestep/zoom level
- All contained in one file
- Still have all the standard GeoPDF features (reload into GIS, measure, identify point etc)

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PDF Javascript strangeness

```
// Print these elements to the console. We have to do this to initialise
// the media component - rather strange, but it works.
console.println(app.media);
console.println(this.media);

// The factor of 0.732 here is established by trial and error
// and seems to be the conversion factor between the units of pageViewX/Y
// and actual page units
factor = 0.732 / (dpi / 99);

// Don't even ask...
var d1 = util.scand('yyyy-mm-dd hh:mm:ss', '2019-03-14 08:23:45')
```

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Summary

- QGIS can export to GeoPDF
- Basic GeoPDF's can be quite powerful
- GDAL can create them – including (basic) styling
- You can even do (crazy) Javascript stuff to make it fully interactive

Any questions?

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