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# Style Recipes

Styles are found in the [geoscript.style](#) package.

## Creating Strokes

*Create a Stroke Symbolizer with a Color*

```
Stroke stroke = new Stroke("#1E90FF")
```



*Create a Stroke Symbolizer with a Color and Width*

```
Stroke stroke = new Stroke("#1E90FF", 0.5)
```



### Create a Stroke Symbolizer with casing

```
Symbolizer stroke = new Stroke(color: "#333333", width: 5, cap: "round").zindex(0) +  
    new Stroke(color: "#6699FF", width: 3, cap: "round").zindex(1)
```



### Create a Stroke Symbolizer with Dashes

```
Stroke stroke = new Stroke("#1E90FF", 0.75, [5,5], "round", "bevel")
```



### Create a Stroke Symbolizer with railroad Hatching

```
Symbolizer stroke = new Stroke("#1E90FF", 1) + new Hatch("vertline", new Stroke  
    ("#1E90FF", 0.5), 6).zindex(1)
```



*Create a Stroke Symbolizer with spaced Shape symbols*

```
Symbolizer stroke = new Stroke(width: 0, dash: [4, 4]).shape(new Shape("#1E90FF", 6, "circle").stroke("navy", 0.75))
```



*Create a Stroke Symbolizer with alternating spaced Shape symbols*

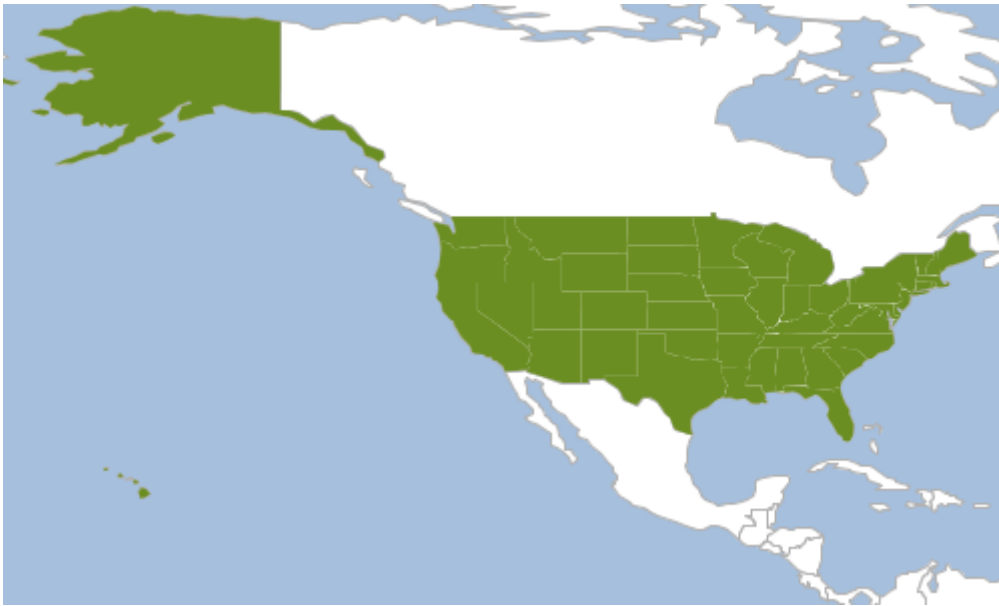
```
Symbolizer stroke = new Stroke("#0000FF", 1, [10,10]).zindex(0) + new Stroke(null, 0, [[5,15],7.5]).shape(new Shape(null, 5, "circle").stroke("#000033",1)).zindex(1)
```



## Creating Fills

*Create a Fill Symbolizer with a Color*

```
Fill fill = new Fill("#6B8E23")
```



*Create a Fill Symbolizer with a Color and a Stroke*

```
Symbolizer symbolizer = new Fill("#6B8E23") + new Stroke("black", 0.1)
```



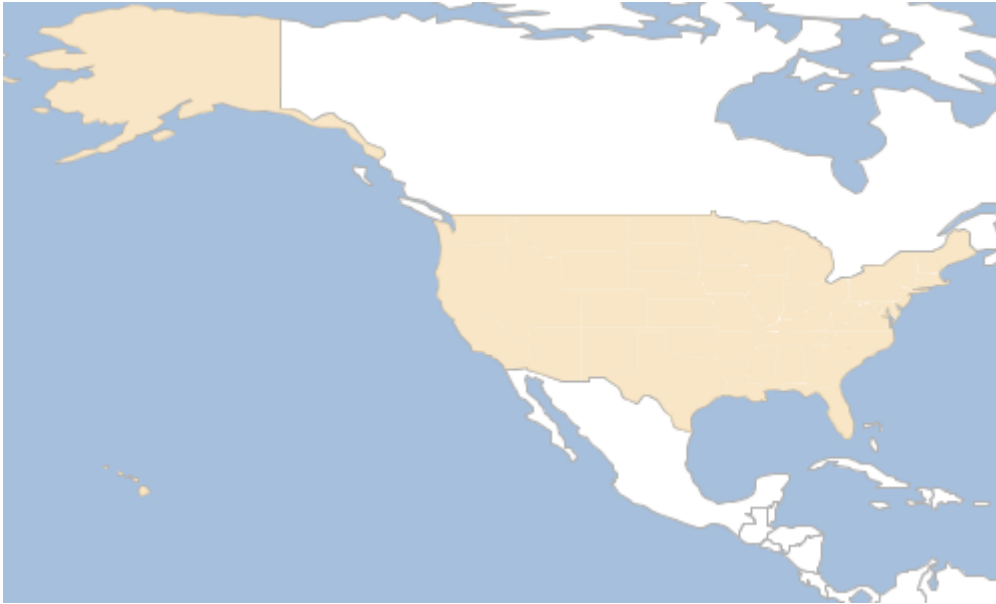
*Create a Fill Symbolizer with a Color and Opacity*

```
Fill fill = new Fill("#6B8E23", 0.35)
```



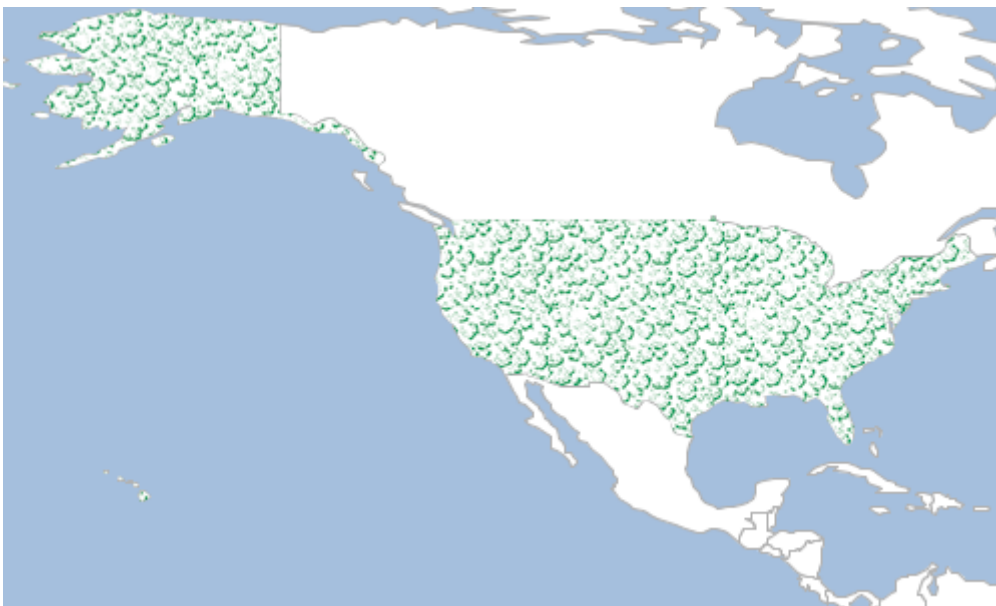
*Create a Fill Symbolizer from named parameters*

```
Fill fill = new Fill(color: "wheat", opacity: 0.75)
```



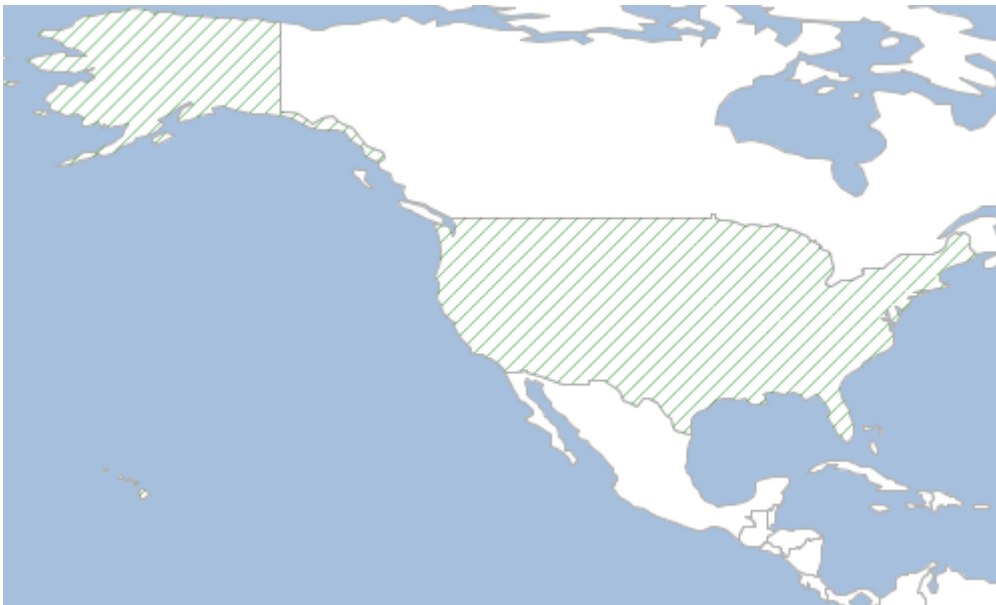
*Create a Fill Symbolizer with an Icon*

```
Fill fill = new Fill("green").icon('src/main/resources/trees.png', 'image/png')
```



*Create a Fill Symbolizer with a Hatch*

```
Fill fill = new Fill("green").hatch("slash", new Stroke("green", 0.25), 8)
```



*Create a Fill Symbolizer with a random fill*

```
Symbolizer symbolizer = new Fill("white").hatch("circle", new Fill("black"), 2).
random(
    random: "free",
    seed: 0,
    symbolCount: 50,
    tileSize: 50,
    rotation: "none"
) + new Stroke("black", 0.25)
```

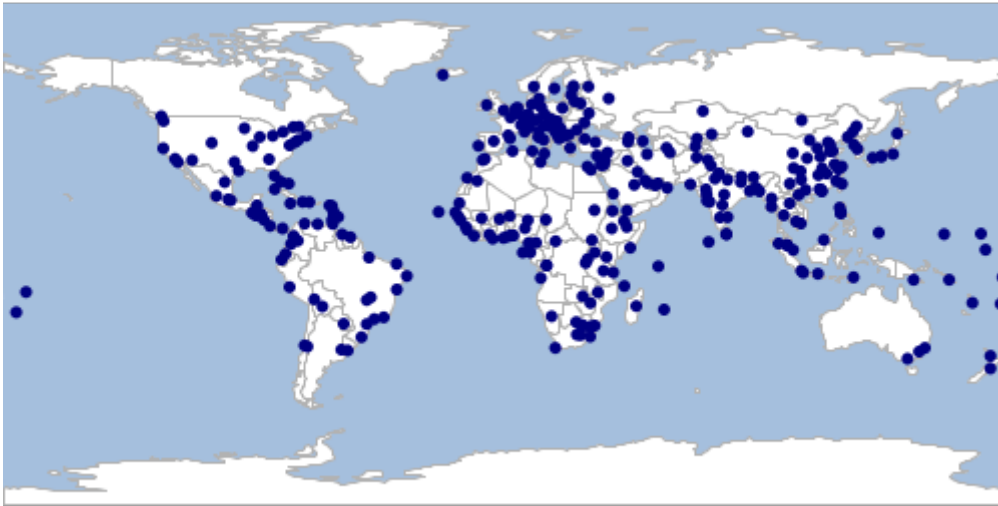


## Creating Shapes

*Create a Shape Symbolizer with a Color*

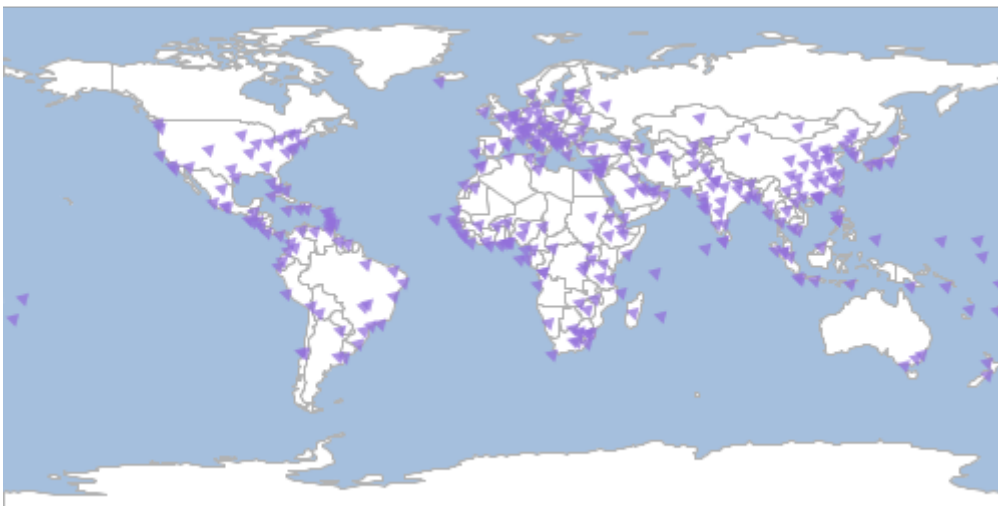
```
Shape shape = new Shape("navy")
```





*Create a Shape Symbolizer with a color, size, type, opacity and angle*

```
Shape shape = new Shape("#9370DB", 8, "triangle", 0.75, 45)
```



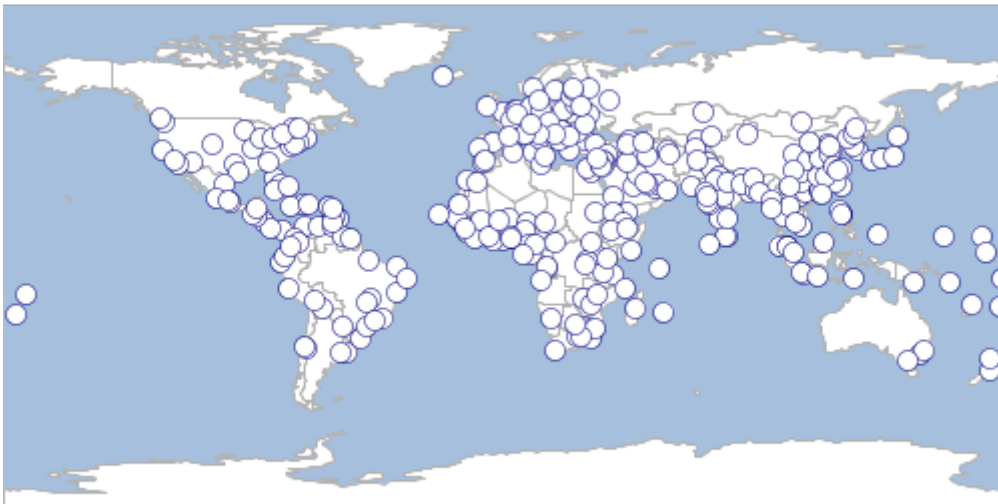
*Create a Shape Symbolizer with named parameters*

```
Shape shape = new Shape(color: "#8B4513", size: 10, type: "star", opacity: 1.0,  
rotation: 0)
```



*Create a Shape Symbolizer with Stroke outline*

```
Symbolizer symbolizer = new Shape("white", 10).stroke("navy", 0.5)
```



## Creating Icons

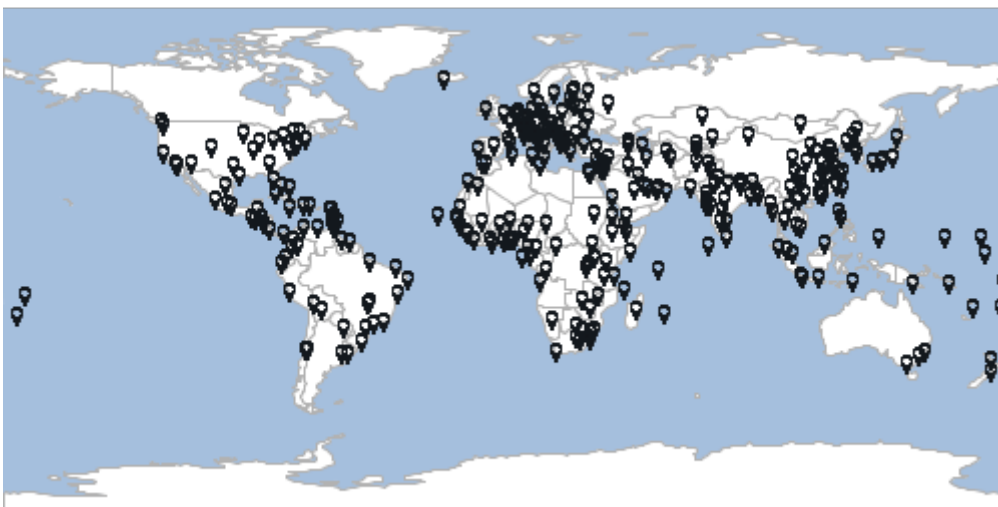
*Create an Icon Symbolizer*

```
Symbolizer symbolizer = new Icon("src/main/resources/place.png", "image/png", 12)
```



### Create an Icon Symbolizer

```
Symbolizer symbolizer = new Icon(url: "src/main/resources/place.png", format:
"image/png", size: 10)
```



## Creating Labels

### Create a Label for a Point Layer

```
Symbolizer symbolizer = new Shape("blue", 6).stroke("navy", 0.5) + new Label("NAME"
).point(
    [0.5,0.5], ①
    [0, 5.0], ②
    0 ③
)
```

① anchor

② displacement

③ rotation



*Create a Label for a Polygon Layer*

```
Symbolizer symbolizer = new Fill("white") + new Stroke("black", 0.1) + new Label  
("NAME_1")  
    .point(anchor: [0.5,0.5])  
    .polygonAlign("mbr")
```



### Create a Label for a Line Layer

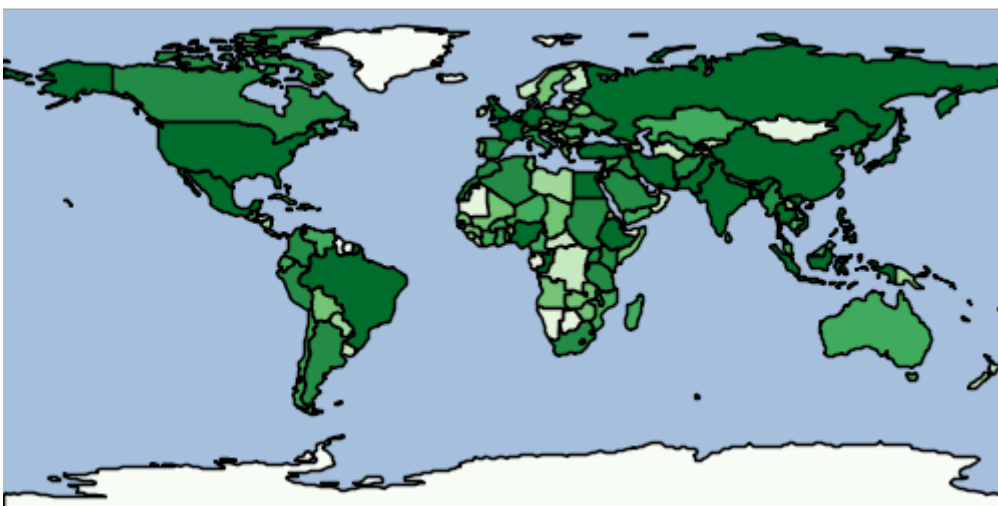
```
Symbolizer symbolizer = new Stroke("blue", 0.75) + new Label("name")
    .fill(new Fill("navy"))
    .linear(follow: true, offset: 50, displacement: 200, repeat: 150)
    .maxDisplacement(400).maxAngleDelta(90)
    .halo(new Fill("white"), 2.5)
    .font(new Font(size: 10, weight: "bold"))
```



## Creating Gradients

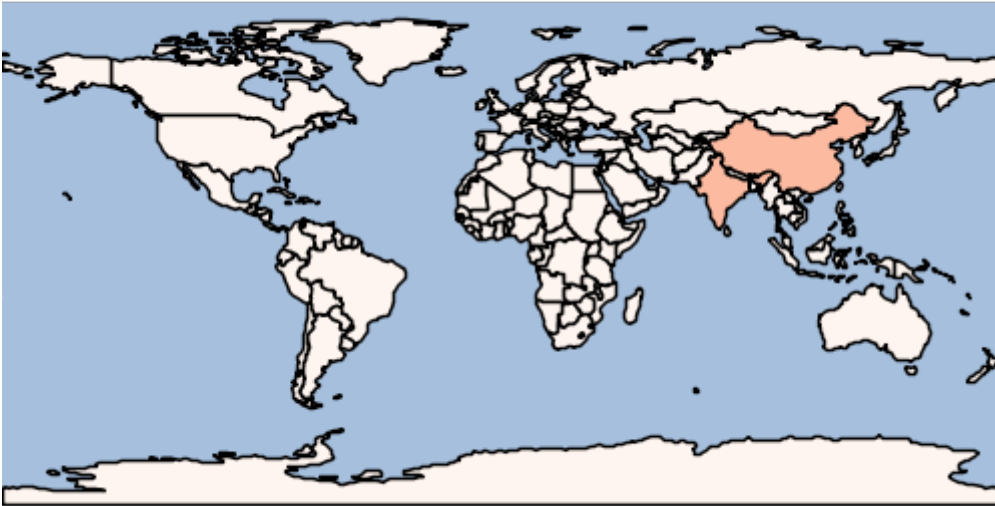
Create a Gradient Symbolizer from a Layer's Field using quantile method

```
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
Gradient gradient = new Gradient(countries, "PEOPLE", "quantile", 8, "Greens")
countries.style = gradient
```



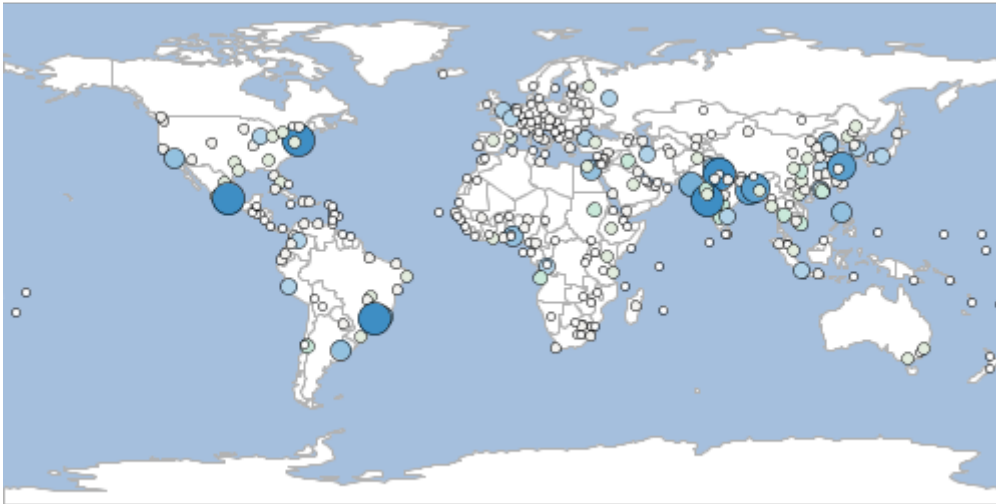
### Create a Gradient Symbolizer from a Layer's Field using equal interval method

```
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
Gradient gradient = new Gradient(countries, "PEOPLE", "equalinterval", 3, "Reds")
countries.style = gradient
```



### Create a custom Gradient Symbolizer between Symbolizers and values

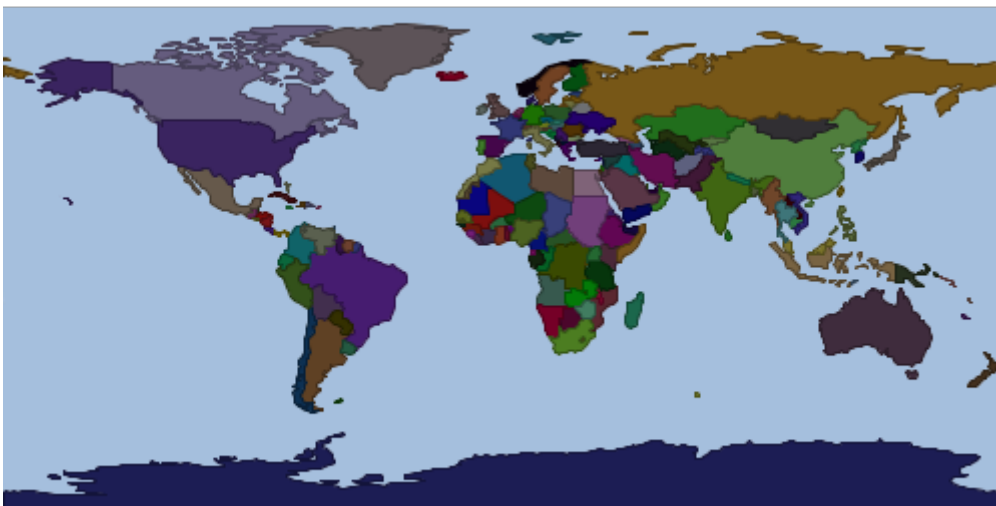
```
Gradient gradient = new Gradient(
    new Property("POP2020"),
    [0, 10000, 20000, 30000],
    [
        new Shape("white", 4).stroke("black", 0.5),
        new Shape("#b0d2e8", 8).stroke("black", 0.5),
        new Shape("#3e8ec4", 16).stroke("black", 0.5),
        new Shape("#08306b", 24).stroke("black", 0.5)
    ],
    5,
    "linear"
)
```



## Creating Unique Values

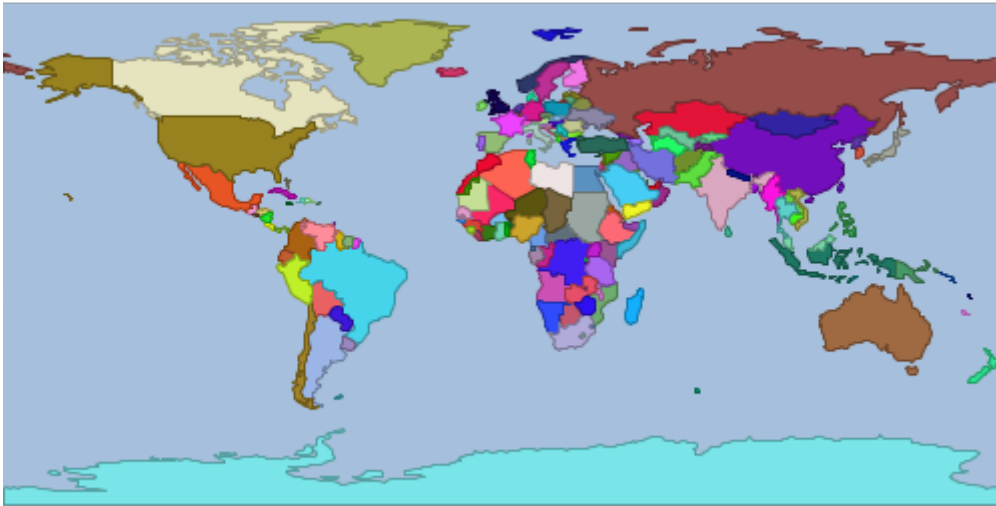
*Create a Unique Values Symbolizer from a Layer's Field*

```
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
UniqueValues uniqueValues = new UniqueValues(countries, "NAME")
countries.style = uniqueValues
```



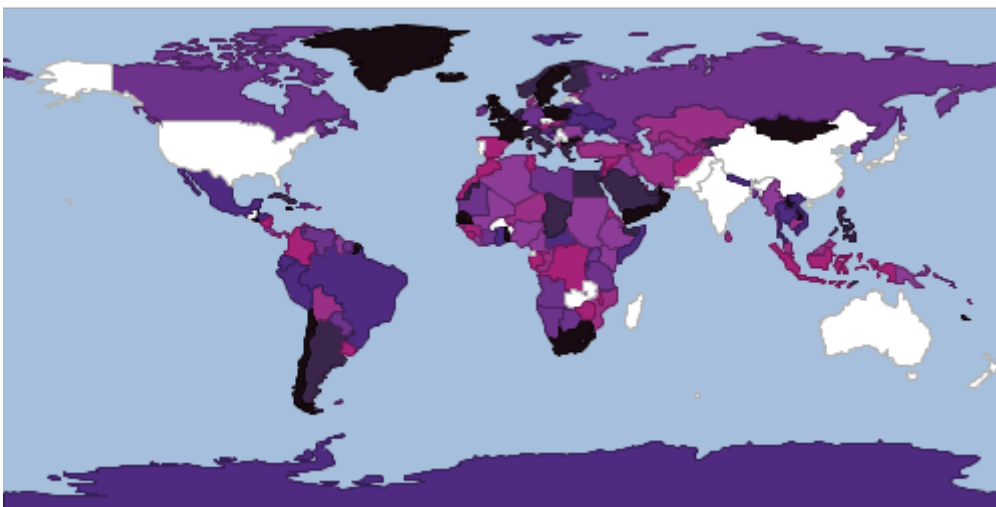
*Create a Unique Values Symbolizer from a Layer's Field and a Closure*

```
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
UniqueValues uniqueValues = new UniqueValues(countries, "NAME", {int index, String
value -> Color.getRandom()})
countries.style = uniqueValues
```



*Create a Unique Values Symbolizer from a Layer's Field and a color palette*

```
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
UniqueValues uniqueValues = new UniqueValues(countries, "NAME",
"LightPurpleToDarkPurpleHeatMap")
countries.style = uniqueValues
```

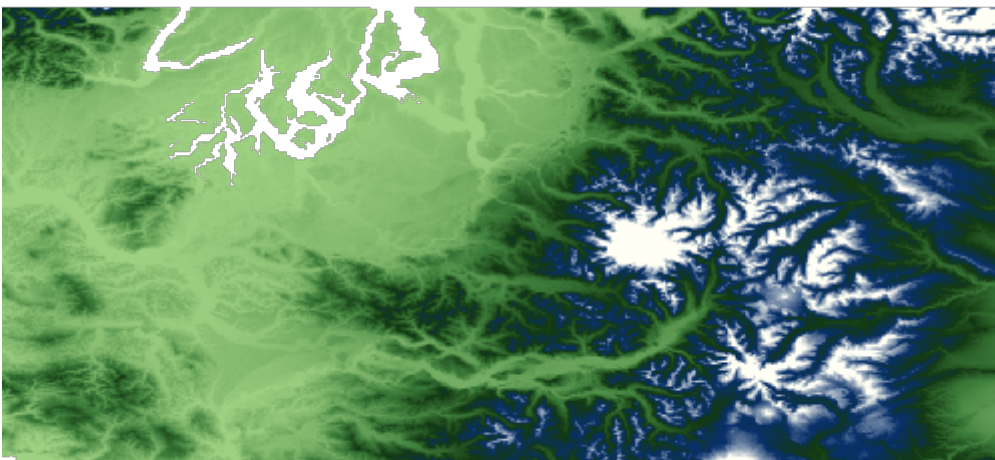


## Creating Color Maps



### Create a ColorMap Symbolizer for a Raster using a list of Colors

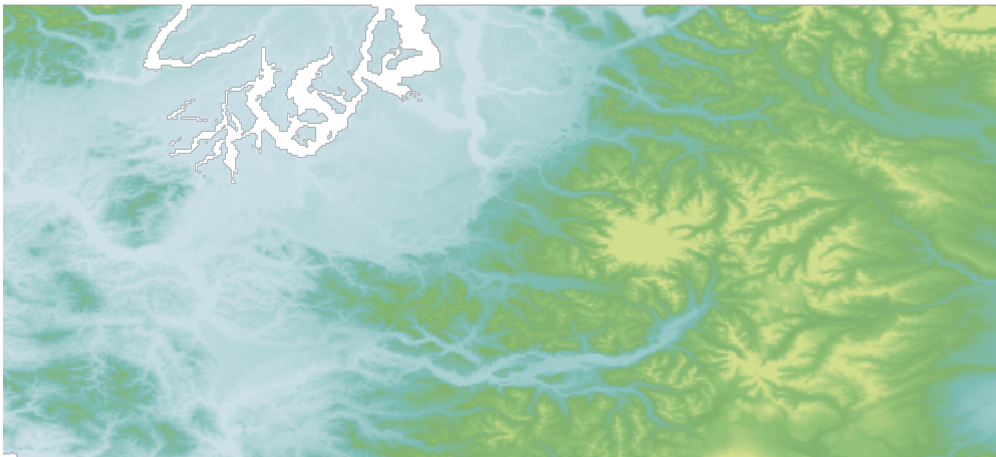
```
Format format = new GeoTIFF(new File('src/main/resources/pc.tif'))
Raster raster = format.read()
ColorMap colorMap = new ColorMap([
    [color: "#9fd182", quantity:25],
    [color: "#3e7f3c", quantity:470],
    [color: "#133912", quantity:920],
    [color: "#08306b", quantity:1370],
    [color: "#ffffff5", quantity:1820],
])
raster.style = colorMap
```



### Create a ColorMap Symbolizer for a Raster using a color palette

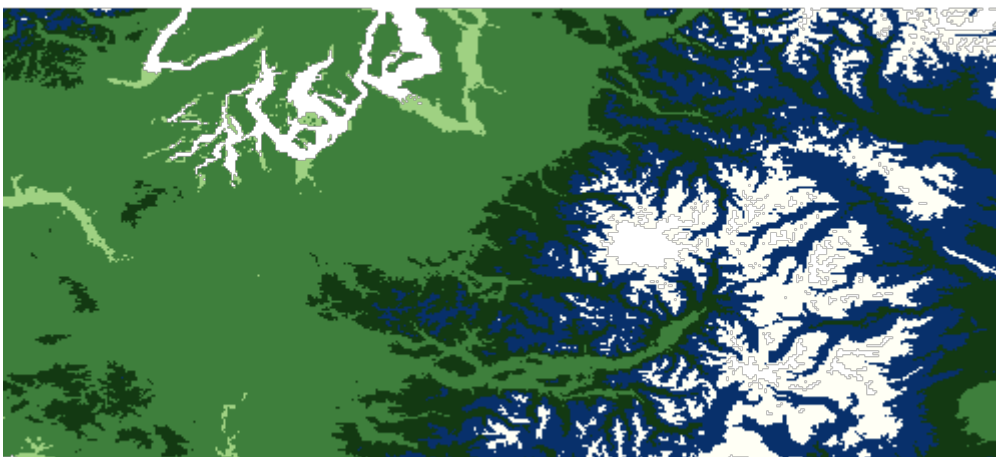
```
Format format = new GeoTIFF(new File('src/main/resources/pc.tif'))
Raster raster = format.read()
ColorMap colorMap = new ColorMap(
    25,           ①
    1820,         ②
    "MutedTerrain", ③
    5             ④
)
println colorMap
raster.style = colorMap
```

- ① min value
- ② max value
- ③ color palette name
- ④ number of categories



*Create a ColorMap Symbolizer with intervals for a Raster using a list of Colors*

```
Format format = new GeoTIFF(new File('src/main/resources/pc.tif'))
Raster raster = format.read()
ColorMap colorMap = new ColorMap([
    [color: "#9fd182", quantity:25],
    [color: "#3e7f3c", quantity:470],
    [color: "#133912", quantity:920],
    [color: "#08306b", quantity:1370],
    [color: "#ffffff5", quantity:1820],
], "intervals", true)
raster.style = colorMap
```



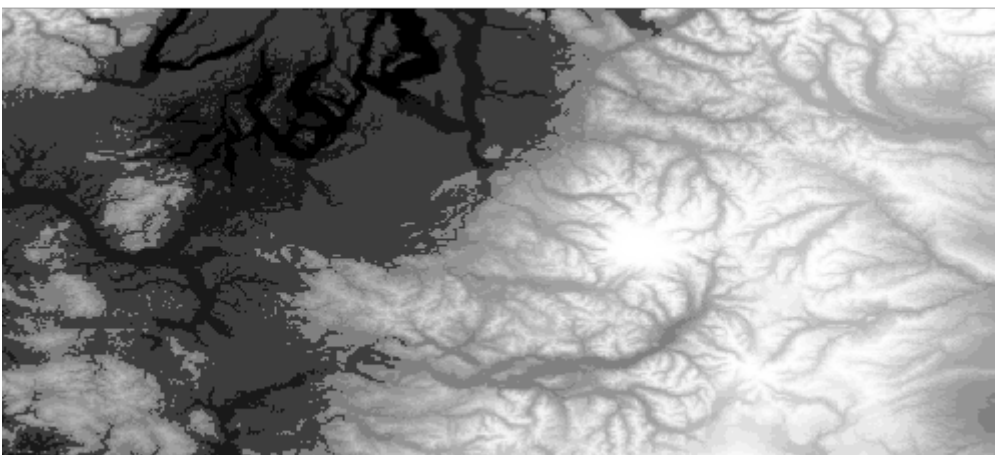
Create a Raster Symbolizer using ChannelSelection and ContrastEnhancement using the normalize method

```
Format format = new GeoTIFF(new File('src/main/resources/pc.tif'))
Raster raster = format.read()
Symbolizer symbolizer = new ChannelSelection()
    .gray("1", new ContrastEnhancement("normalize"))
raster.style = symbolizer
```



Create a Raster Symbolizer using ChannelSelection and ContrastEnhancement using the histogram method

```
Format format = new GeoTIFF(new File('src/main/resources/pc.tif'))
Raster raster = format.read()
Symbolizer symbolizer = new ChannelSelection()
    .gray("1", new ContrastEnhancement("histogram", 0.65))
raster.style = symbolizer
```



# Reading and Writing Styles

Style Readers and Writers are found in the [geoscript.style.io](https://geoscript.style.io) package.

## Finding Style Readers and Writers

### *List all Style Writers*

```
List<Writer> writers = Writers.list()
writers.each { Writer writer ->
    println writer.class.simpleName
}
```

```
SLDWriter
ColorTableWriter
YSLDWriter
```

### *Find a Style Writer*

```
Writer writer = Writers.find("sld")
println writer.class.simpleName
```

```
SLDWriter
```

### *List all Style Readers*

```
List<Reader> readers = Readers.list()
readers.each { Reader reader ->
    println reader.class.simpleName
}
```

```
SLDReader
CSSReader
ColorTableReader
YSLDReader
SimpleStyleReader
```

### *Find a Style Reader*

```
Reader reader = Readers.find("sld")
println reader.class.simpleName
```

## SLD

GeoScript Groovy can read and write Style Layer Descriptor (SLD) documents.

### *Write a Symbolizer to SLD*

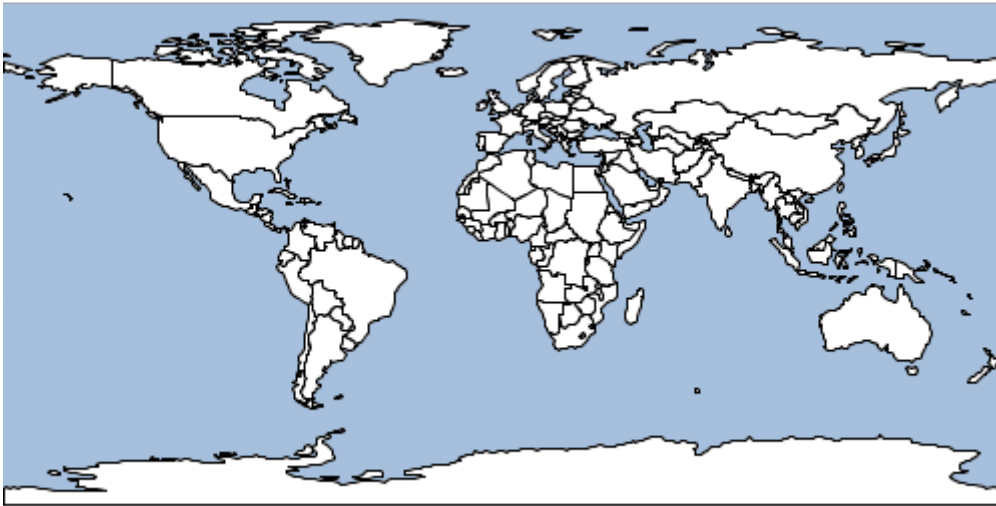
```
Symbolizer symbolizer = new Fill("white") + new Stroke("black", 0.5)
SLDWriter writer = new SLDWriter()
String sld = writer.write(symbolizer)
println sld
```

```
<?xml version="1.0" encoding="UTF-8"?>
<sld:StyledLayerDescriptor xmlns="http://www.opengis.net/sld"
xmlns:sld="http://www.opengis.net/sld" xmlns:ogc="http://www.opengis.net/ogc"
xmlns:gml="http://www.opengis.net/gml" version="1.0.0">
  <sld:UserLayer>
    <sld:LayerFeatureConstraints>
      <sld:FeatureTypeConstraint/>
    </sld:LayerFeatureConstraints>
    <sld:UserStyle>
      <sld:Name>Default Styler</sld:Name>
      <sld:FeatureTypeStyle>
        <sld:Name>name</sld:Name>
        <sld:Rule>
          <sld:PolygonSymbolizer>
            <sld:Fill>
              <sld:CssParameter name="fill">#ffffff</sld:CssParameter>
            </sld:Fill>
          </sld:PolygonSymbolizer>
          <sld:LineSymbolizer>
            <sld:Stroke>
              <sld:CssParameter name="stroke-width">0.5</sld:CssParameter>
            </sld:Stroke>
          </sld:LineSymbolizer>
        </sld:Rule>
      </sld:FeatureTypeStyle>
    </sld:UserStyle>
  </sld:UserLayer>
</sld:StyledLayerDescriptor>
```

```
String sld = "<?xml version='1.0' encoding='UTF-8'?>
<sld:StyledLayerDescriptor xmlns='http://www.opengis.net/sld'
xmlns:sld='http://www.opengis.net/sld' xmlns:ogc='http://www.opengis.net/ogc'
xmlns:gml='http://www.opengis.net/gml' version='1.0.0'>
  <sld:UserLayer>
    <sld:LayerFeatureConstraints>
      <sld:FeatureTypeConstraint/>
    </sld:LayerFeatureConstraints>
    <sld:UserStyle>
      <sld:Name>Default Styler</sld:Name>
      <sld:FeatureTypeStyle>
        <sld:Name>name</sld:Name>
        <sld:Rule>
          <sld:PolygonSymbolizer>
            <sld:Fill>
              <sld:CssParameter name='fill'>#ffffff</sld:CssParameter>
            </sld:Fill>
          </sld:PolygonSymbolizer>
          <sld:LineSymbolizer>
            <sld:Stroke>
              <sld:CssParameter name='stroke'>#000000</sld:CssParameter>
              <sld:CssParameter name='stroke-width'>0.5</sld:CssParameter>
            </sld:Stroke>
          </sld:LineSymbolizer>
        </sld:Rule>
      </sld:FeatureTypeStyle>
    </sld:UserStyle>
  </sld:UserLayer>
</sld:StyledLayerDescriptor>
"""

SLDReader reader = new SLDReader()
Style style = reader.read(sld)

Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
countries.style = style
```



## CSS

GeoScript Groovy can only read CSS documents.

*Read a Style from an CSS String*

```
String css = ""
* {
  fill: #ffffff;
  fill-opacity: 1.0;
  stroke: #000000;
  stroke-width: 1.2;
}
""

CSSReader reader = new CSSReader()
Style style = reader.read(css)

Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
countries.style = style
```



## YSLD

GeoScript Groovy can read and write YAML Style Layer Descriptors (YSLD) documents.

*Write a Symbolizer to YSLD*

```
Symbolizer symbolizer = new Fill("white") + new Stroke("black", 0.5)
YSLDWriter writer = new YSLDWriter()
String ysl = writer.write(symbolizer)
println ysl
```

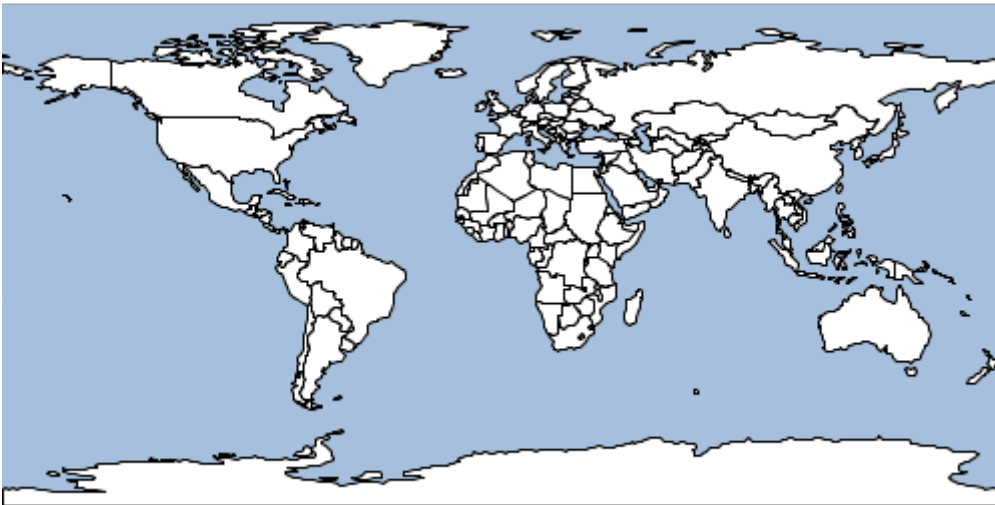
```
name: Default Styler
feature-styles:
- name: name
  rules:
  - scale: [min, max]
    symbolizers:
    - polygon:
        fill-color: '#FFFFFF'
    - line:
        stroke-color: '#000000'
        stroke-width: 0.5
```



```
String ysl = ""
name: Default Styler
feature-styles:
- name: name
  rules:
  - scale: [min, max]
    symbolizers:
    - polygon:
        fill-color: '#FFFFFF'
    - line:
        stroke-color: '#000000'
        stroke-width: 0.5
""

YSLDReader reader = new YSLDReader()
Style style = reader.read(ysl)

Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
countries.style = style
```



## Simple Style Reader

A SimpleStyleReader that can easily create simple Styles using Maps or Strings.

- Fill properties: fill and fill-opacity
- Stroke properties: stroke, stroke-width, stroke-opacity
- Shape properties: shape, shape-size, shape-type
- Label properties: label-size, label-style, label-weight, label-family

### *Read a Style with fill and stroke properties from a Simple Style String*

```
String str = "fill=#555555 fill-opacity=0.6 stroke=#555555 stroke-width=0.5"  
SimpleStyleReader reader = new SimpleStyleReader()  
Style style = reader.read(str)  
  
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')  
Layer countries = workspace.get("countries")  
countries.style = style
```



### *Read a Style with fill, stroke, and label properties from a Simple Style String*

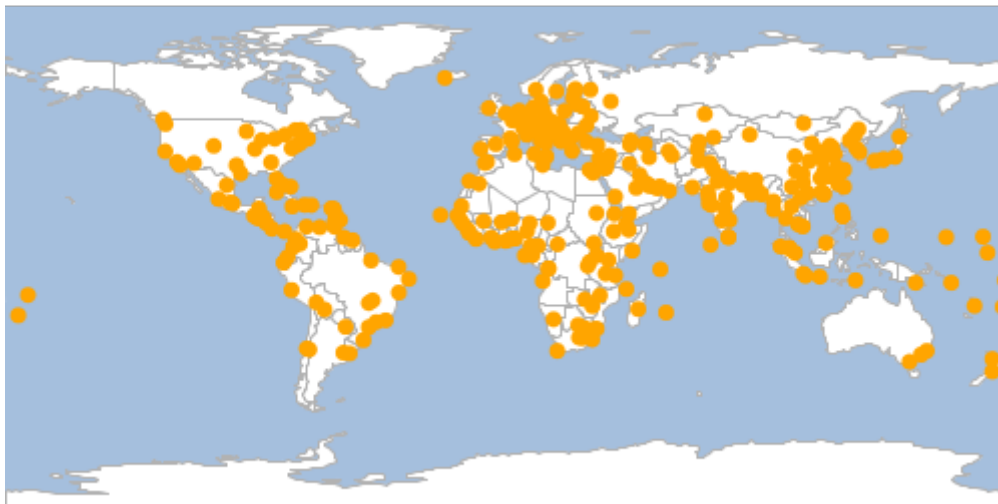
```
String str = "fill=white stroke=navy label=NAME label-size=10"  
SimpleStyleReader reader = new SimpleStyleReader()  
Style style = reader.read(str)  
  
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')  
Layer countries = workspace.get("countries")  
countries.style = style
```



*Read a Style with shape properties from a Simple Style String*

```
String str = "shape-type=circle shape-size=8 shape=orange"
SimpleStyleReader reader = new SimpleStyleReader()
Style style = reader.read(str)
println style

Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer places = workspace.get("places")
places.style = style
```



### *Read a Style with fill and stroke properties from a Simple Style Map*

```
Map map = [  
    'fill': '#555555',  
    'fill-opacity': 0.6,  
    'stroke': '#555555',  
    'stroke-width': 0.5  
]  
SimpleStyleReader reader = new SimpleStyleReader()  
Style style = reader.read(map)  
  
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')  
Layer countries = workspace.get("countries")  
countries.style = style
```



## Color Table

GeoScript Groovy can read and write color table strings and files. This format can be used with ColorMaps to style Rasters.

### *Write a ColorMap to a color table string*

```
ColorMap colorMap = new ColorMap(25, 1820, "BoldLandUse", 5)  
ColorTableWriter writer = new ColorTableWriter()  
String str = writer.write(colorMap)  
println str
```

```
25.0 178 156 195  
473.75 79 142 187  
922.5 143 146 56  
1371.25 193 132 55  
1820.0 181 214 177
```

### *Read a ColorMap from a color table string*

```
Format format = new GeoTIFF(new File('src/main/resources/pc.tif'))
Raster raster = format.read()
ColorTableReader reader = new ColorTableReader()
ColorMap colorMap = reader.read("""25.0 178 156 195
473.75 79 142 187
922.5 143 146 56
1371.25 193 132 55
1820.0 181 214 177
""")
raster.style = colorMap
```

