Table of Contents

S1	tyle Recipes	
	Creating Basic Styles	
	Creating Strokes	
	Creating Fills	7
	Creating Shapes	11
	Creating Icons	13
	Creating Labels	14
	Creating Transforms	19
	Creating Gradients	21
	Creating Unique Values	23
	Creating Color Maps	25
	Creating Channel Selection and Contrast Enhancement	27
	Reading and Writing Styles	29

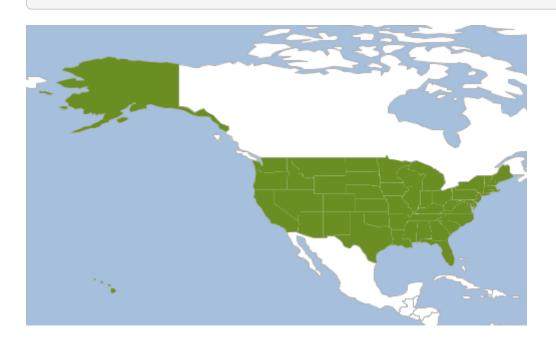
Style Recipes

Styles are found in the **geoscript.style** package.

Styles are made up Symbolizers and Composites. A Symbolizer is a particular style like Stroke or Fill. Symbolizers also have methods for controlling the drawing order (zindex), the min and max scale (range), and filtering (where).

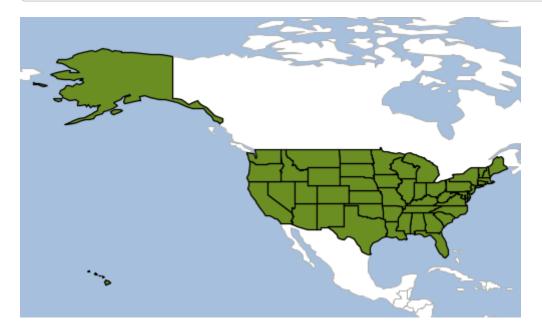
Creating Basic Styles

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



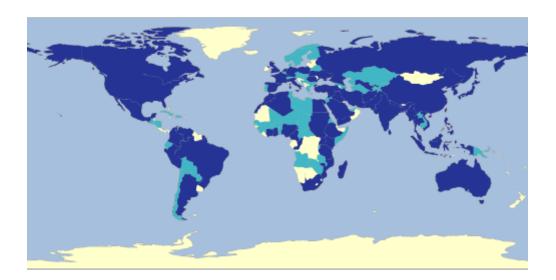
A Composite is simply two or more Symbolizers. So, a Composite would be a combination of a Stroke symbolizer (to style the boundary) and a Fill Symbolizer (to style the interior).

```
Composite composite = new Fill("#6B8E23") + new Stroke("black", 0.75)
```



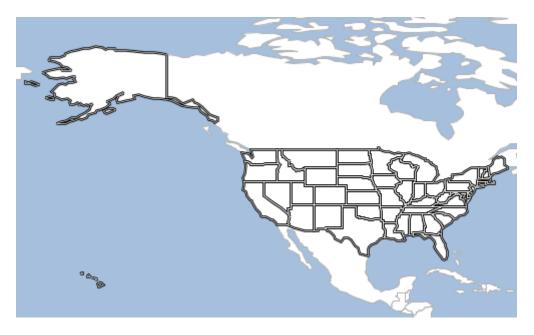
A Symbolizer can use the where method to restrict which features are styled.

```
Symbolizer symbolizer = new Fill("#ffffcc").where("PEOPLE < 4504128.33") +
    new Fill("#41b6c4").where("PEOPLE BETWEEN 4504128.33 AND 16639804.33") +
    new Fill("#253494").where("PEOPLE > 16639804.33")
```



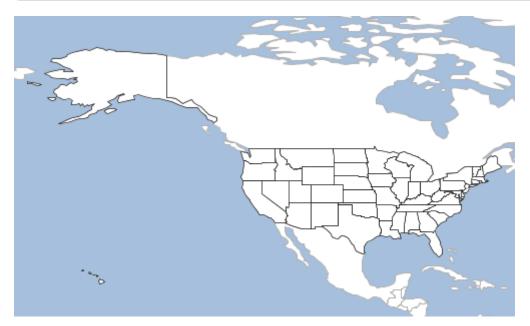
The zindex method is used to order Symbolizers on top of each other. In this recipe we use it to create line casings.

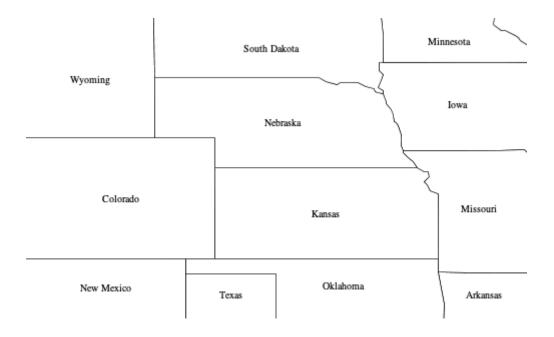
```
Symbolizer symbolizer = new Stroke("black", 2.0).zindex(0) + new Stroke("white", 0.1
).zindex(1)
```



The scale method is used to create Symbolizers that are dependent on map scale.

```
Symbolizer symbolizer = (new Fill("white") + new Stroke("black", 0.1)) + new Label
("NAME_1")
    .point(anchor: [0.5,0.5])
    .polygonAlign("mbr")
    .range(max: 16000000)
```





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



Create a Stroke Symbolizer with Dashes

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



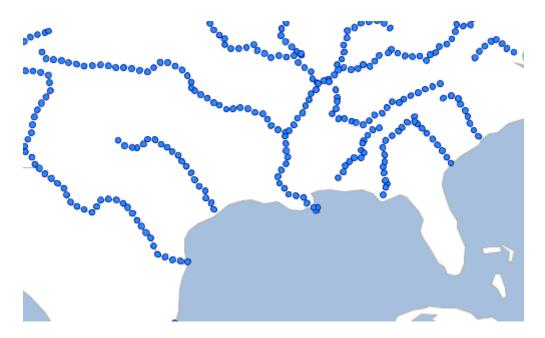
Create a Stroke Symbolizer with railroad Hatching

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

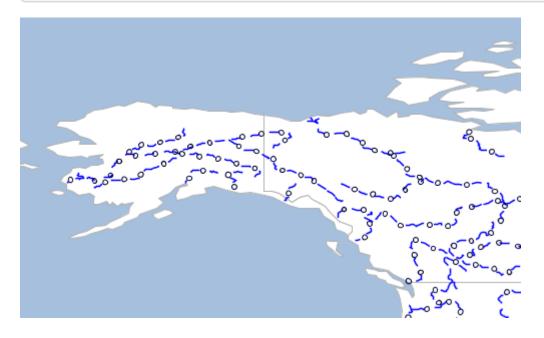


Create a Stroke Symbolizer with spaced Shape symbols

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



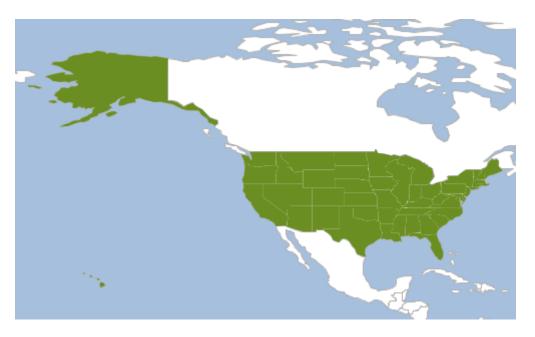
Create a Stroke Symbolizer with alternating spaced Shape symbols



Creating Fills

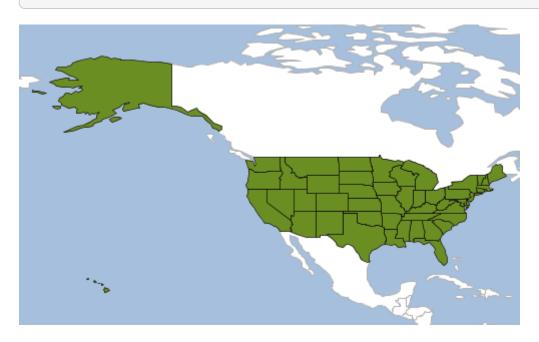
Create a Fill Symbolizer with a Color

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



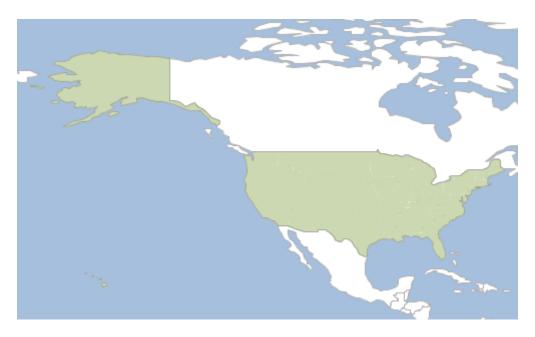
Create a Fill Symbolizer with a Color and a Stroke

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



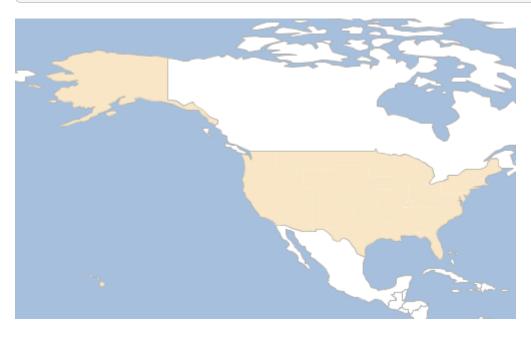
Create a Fill Symbolizer with a Color and Opacity

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



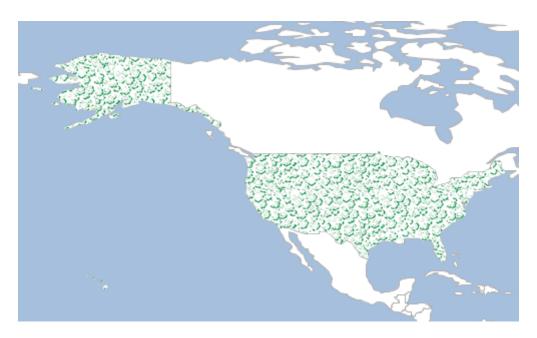
Create a Fill Symbolizer from named parameters

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



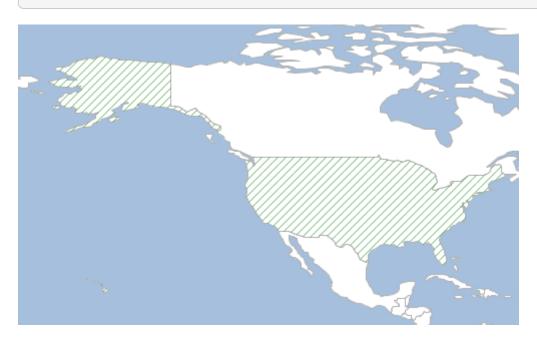
Create a Fill Symbolizer with an Icon

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



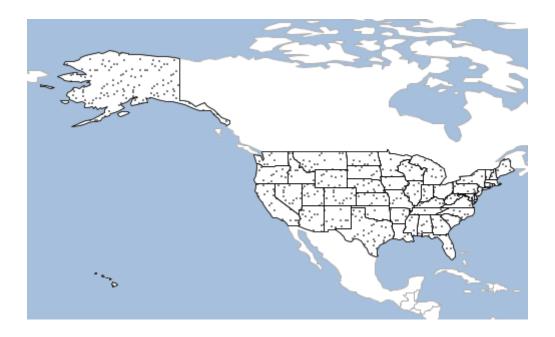
Create a Fill Symbolizer with a Hatch

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



Create a Fill Symbolizer with a random fill

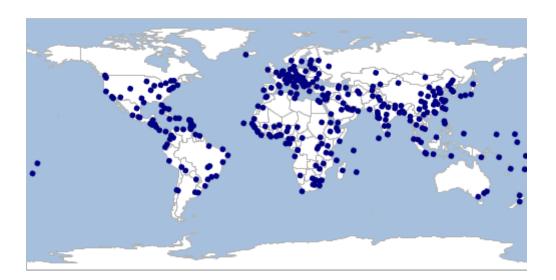
```
Symbolizer symbolizer = new Fill("white").hatch("circle", new Fill("black"), 2).
random(
    random: "free",
    seed: 0,
    symbolCount: 50,
    tileSize: 50,
    rotation: "none"
) + new Stroke("black", 0.25)
```



Creating Shapes

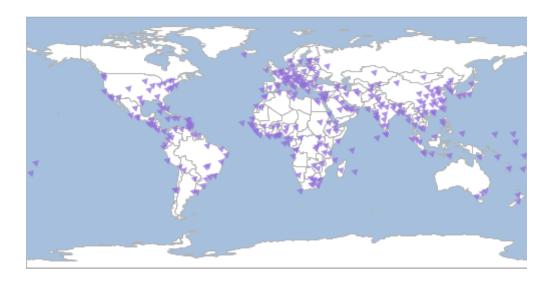
Create a Shape Symbolizer with a Color

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



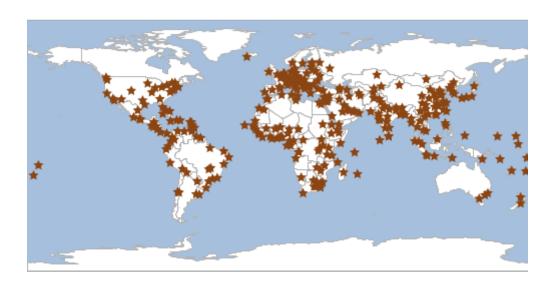
Create a Shape Symbolizer with a color, size, type, opacity and angle

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



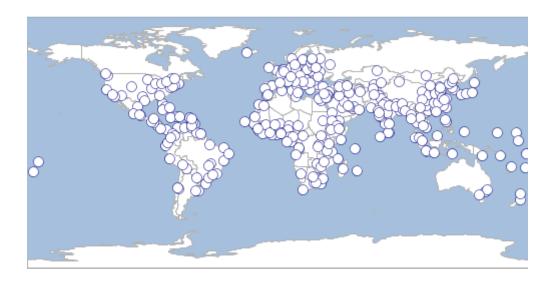
Create a Shape Symbolizer with named parameters

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



Create a Shape Symbolizer with Stroke outline

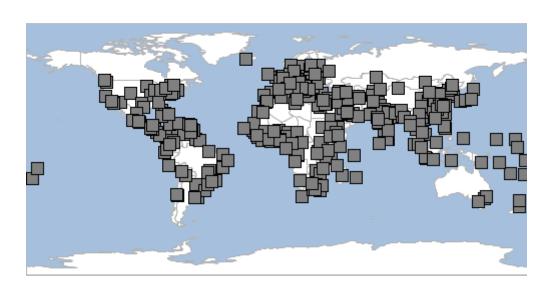
```
Symbolizer symbolizer = new Shape("white", 10).stroke("navy", 0.5)
```



Creating Icons

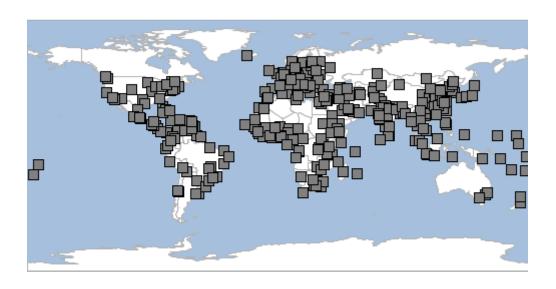
Create an Icon Symbolizer

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



Create an Icon Symbolizer

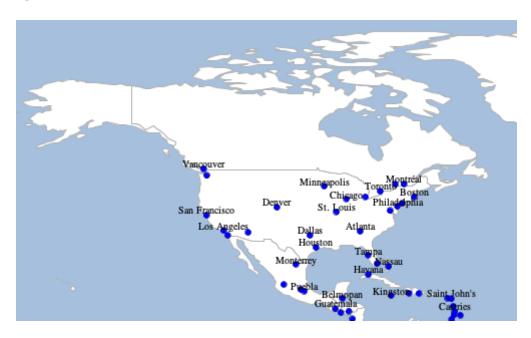
```
Symbolizer symbolizer = new Icon(url: "src/main/resources/place.png", format:
"image/png", size: 10)
```



Creating Labels

Create a Label for a Point Layer

- 1 anchor
- ② displacement
- 3 rotation



- 1 style (normal, italic, oblique)
- 2 weight (normal, bold)
- 3 size (8,12,16,ect..)
- 4 family (serif, arial, verdana)



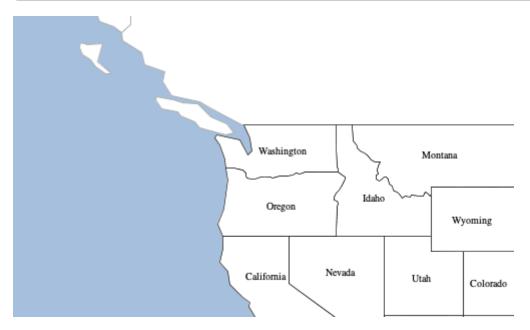
Create a Label for a Point Layer with Halo

```
Symbolizer symbolizer = new Shape("blue", 6).stroke("navy", 0.5) + new Label("NAME"
).point(
       [0.5,0.5],
       [0, 5.0],
       0
).fill(new Fill("white")) + new Halo(new Fill("navy"), 2.5)
```



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")
```

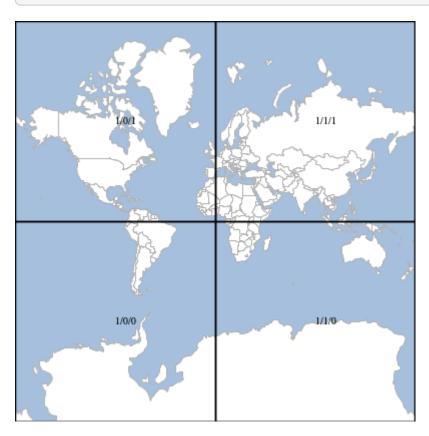


Create a Label for a Polygon Layer using an Expression



Create a Label for a Polygon Layer using an Expression that concatenates properties and strings.

```
Expression expression = Expression.fromCQL("Concatenate(z, '/', x, '/', y)")
Symbolizer symbolizer = new Stroke("black", 1.0) + new Label(expression)
```



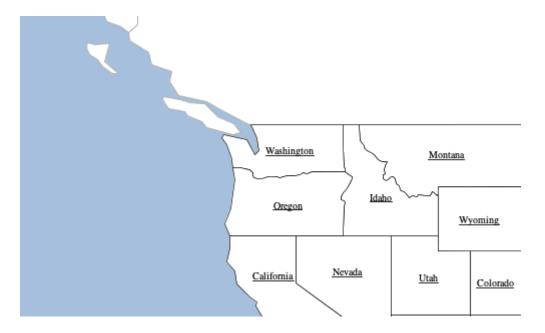
Create a Label for a Polygon Layer with strike through style.



Create a Label for a Polygon Layer with word and character spacing.



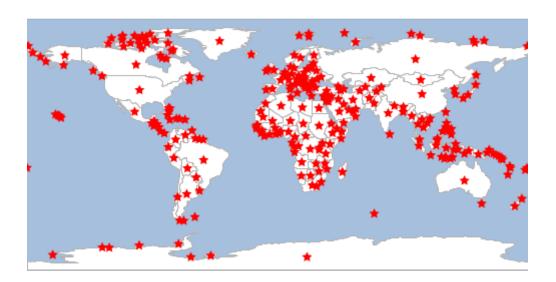
Create a Label for a Polygon Layer with underlining.



Create a Label for a Line Layer

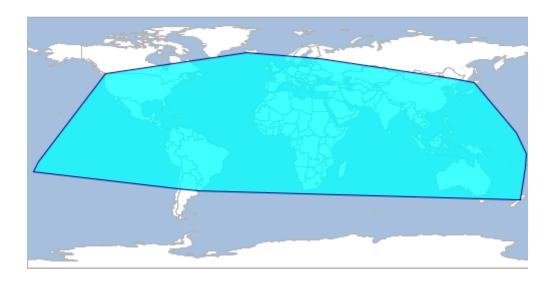


Creating Transforms



Create a rendering Transform symbolizer that styles a point layer by calculating the convex hull

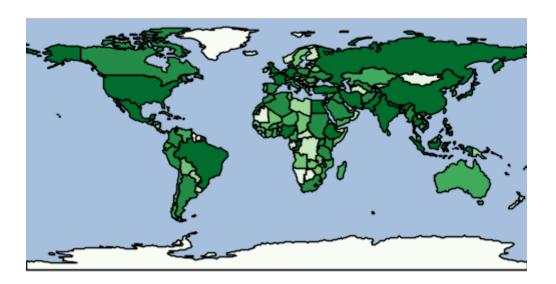
```
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer places = workspace.get("places")
Process process = new Process("convexhull",
        "Create a convexhull around the features",
        [features: geoscript.layer.Cursor],
        [result: geoscript.layer.Cursor],
        { inputs ->
            def geoms = new GeometryCollection(inputs.features.collect{ f -> f.geom})
            def output = new Layer()
            output.add([geoms.convexHull])
            [result: output]
        }
Function function = new Function(process, new Function("parameter", new Expression
("features")))
Symbolizer symbolizer = new Transform(function, Transform.RENDERING) + new Fill
("aqua", 0.75) + new Stroke("navy", 0.5)
places.style = symbolizer
```



Creating Gradients

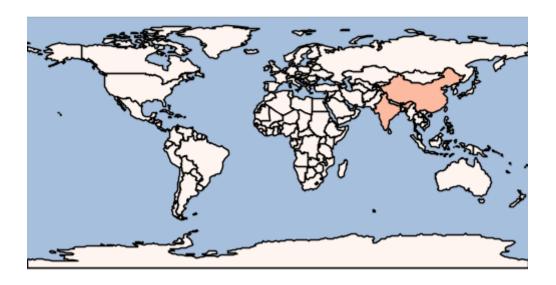
Create a Gradient Symbolizer from a Layer's Field using quantile method

```
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
```

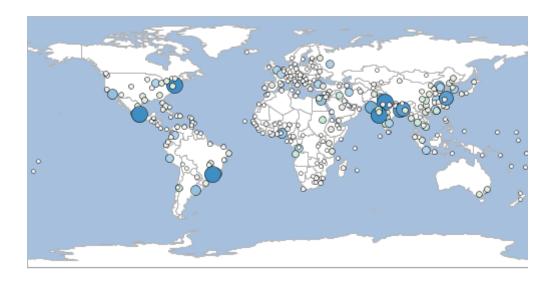


Create a Gradient Symbolizer from a Layer's Field using equal interval method

```
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
```



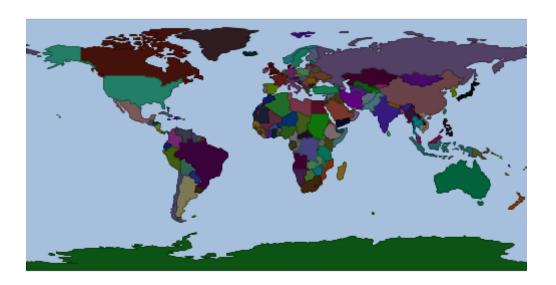
Create a custom Gradient Symbolizer between Symbolizers and values



Creating Unique Values

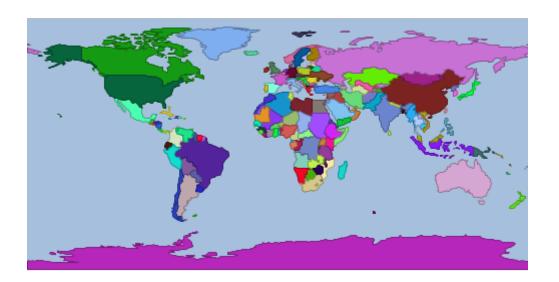
Create a Unique Values Symbolizer from a Layer's Field

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

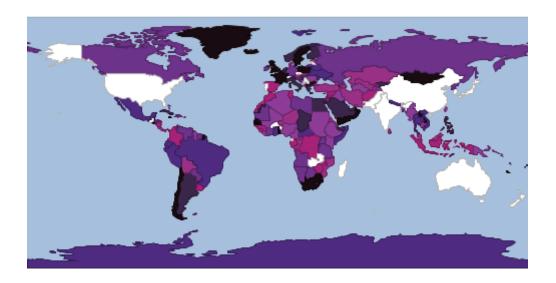


Create a Unique Values Symbolizer from a Layer's Field and a Closure

```
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
```



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

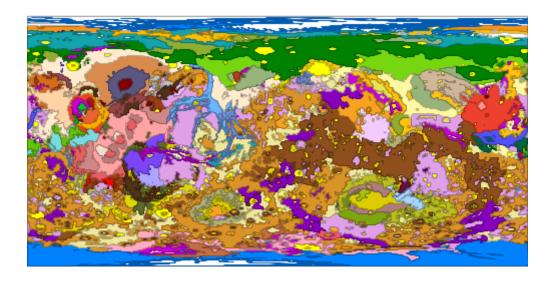


Create a Unique Values Symbolizer from a File with a color per value

```
Workspace workspace = new Directory("src/main/resources/mars")
Layer marsGeology = workspace.get("geo_units_oc_dd")

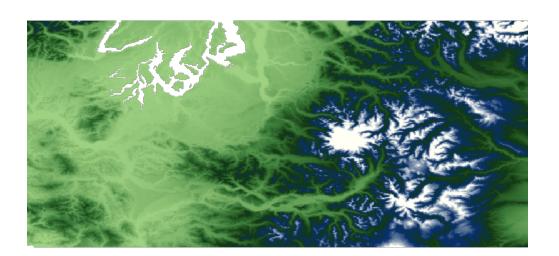
File uniqueValuesFile = new File
("src/main/resources/mars/I1802ABC_geo_units_RGBlut.txt")
UniqueValuesReader styleReader = new UniqueValuesReader("UnitSymbol", "polygon")
Symbolizer symbolizer = styleReader.read(uniqueValuesFile)
```

```
Unit,R,6,B
AHa,175,0,111
AHat,192,54,22
AHcf,150,70,72
AHh,109,13,60
AHpe,232,226,82
AHt,99,0,95
AHt3,233,94,94
Aa1,255,236,207
Aa2,145,73,76
Aa3,254,212,164
Aa4,212,109,19
Aa5,175,66,28
```

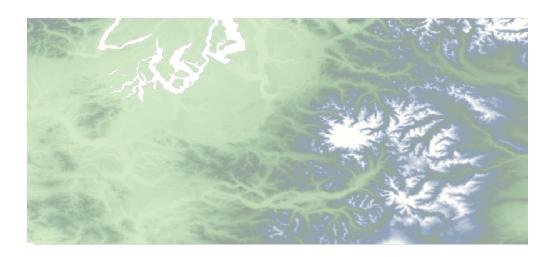


Creating Color Maps

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

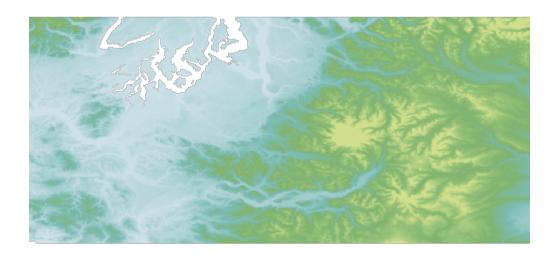


Create a ColorMap Symbolizer for a Raster using a list of Colors with opacity

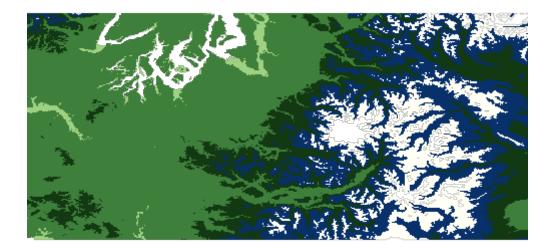


Create a ColorMap Symbolizer for a Raster using a color palette

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

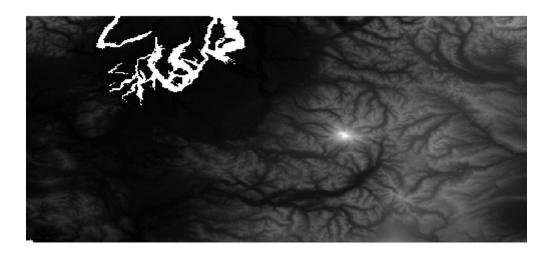


Create a ColorMap Symbolizer with intervals for a Raster using a list of Colors



Creating Channel Selection and Contrast Enhancement

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



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



Reading and Writing Styles

Style Readers and Writers are found in the 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
```

```
SLDReader
```

SLD

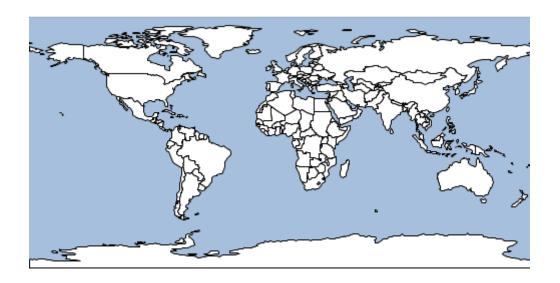
GeoScript Groovy can read and write Style Layer Descriptor (SLD) documents.

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:gml="http://www.opengis.net/gml" xmlns:ogc="http://www.opengis.net/ogc"
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:qml="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.

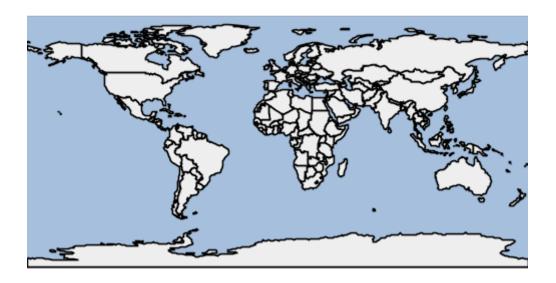
Read a Style from an CSS String

```
String css = """

* {
    fill: #eeeeee;
    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

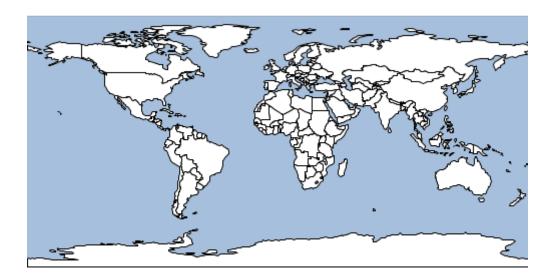
GeoScript Groovy can read and write YAML Style Layer Descriptors (YSLD) documents.

Write a Symbolizer to YSLD

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

```
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 ysld = """
name: Default Styler
feature-styles:
- name: name
 rules:
 - scale: [min, max]
    symbolizers:
    - polygon:
        fill-color: '#FFFFFF'
    - line:
        stroke-color: '#000000'
        stroke-width: 0.5
0.00\,0
        YSLDReader reader = new YSLDReader()
        Style style = reader.read(ysld)
        Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
        Layer countries = workspace.get("countries")
        countries.style = style
```



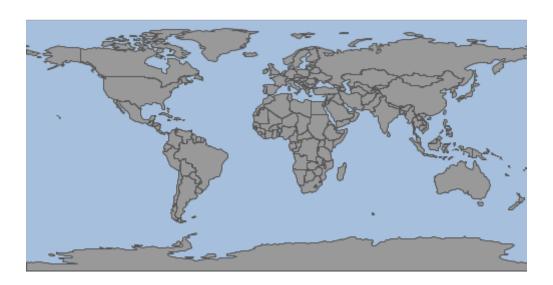
Simple Style Reader

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

```
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)

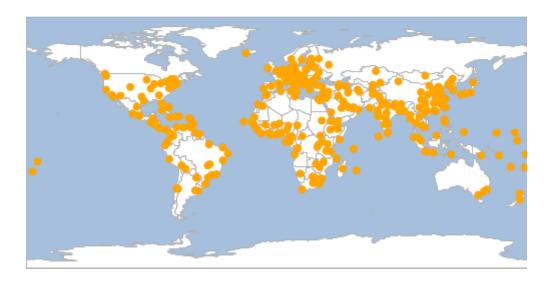
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
countries.style = style
```



Read a Style with shape properties from a Simple Style String

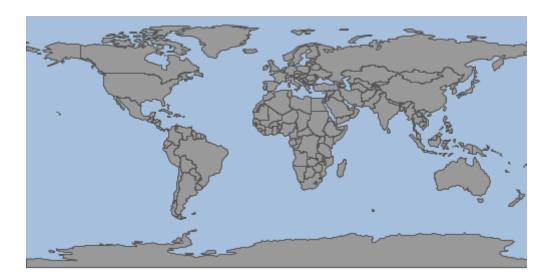
```
String str = "shape-type=circle shape-size=8 shape=orange"
SimpleStyleReader reader = new SimpleStyleReader()
Style style = reader.read(str)
println style

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



```
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
```

```
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
```

