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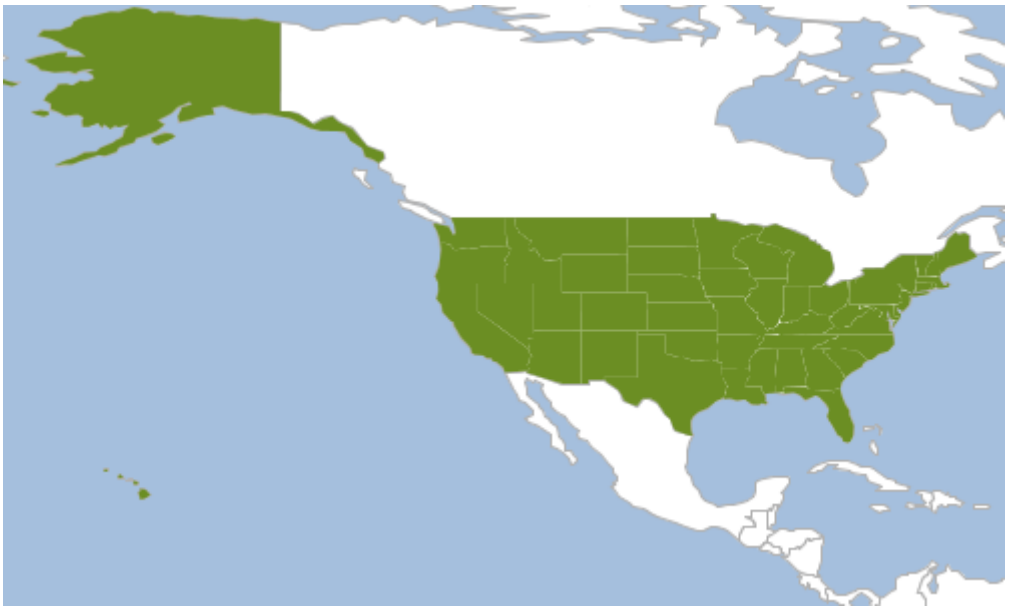
Style Recipes

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).

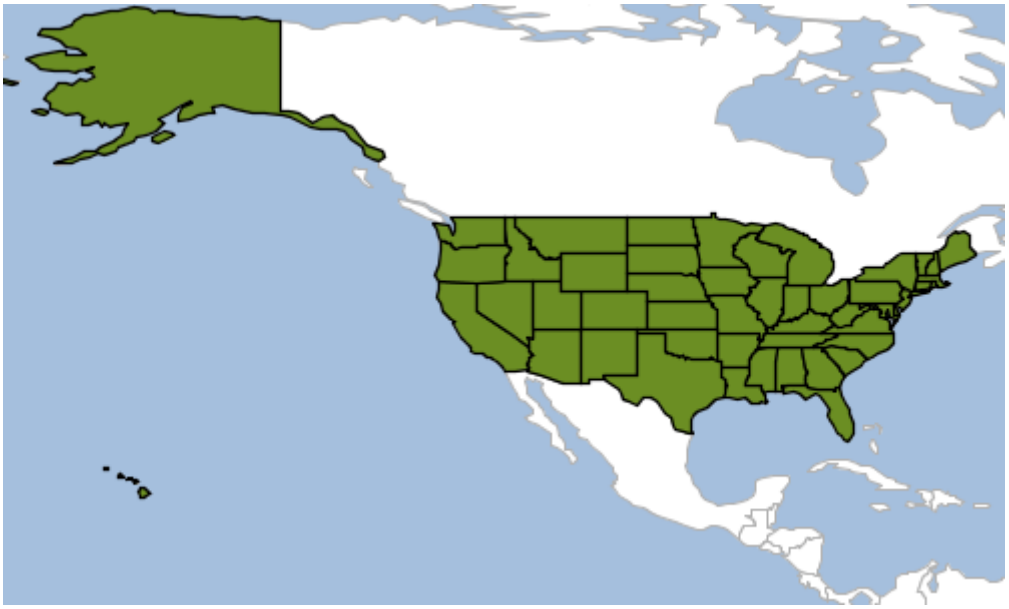
Creating Basic Styles

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



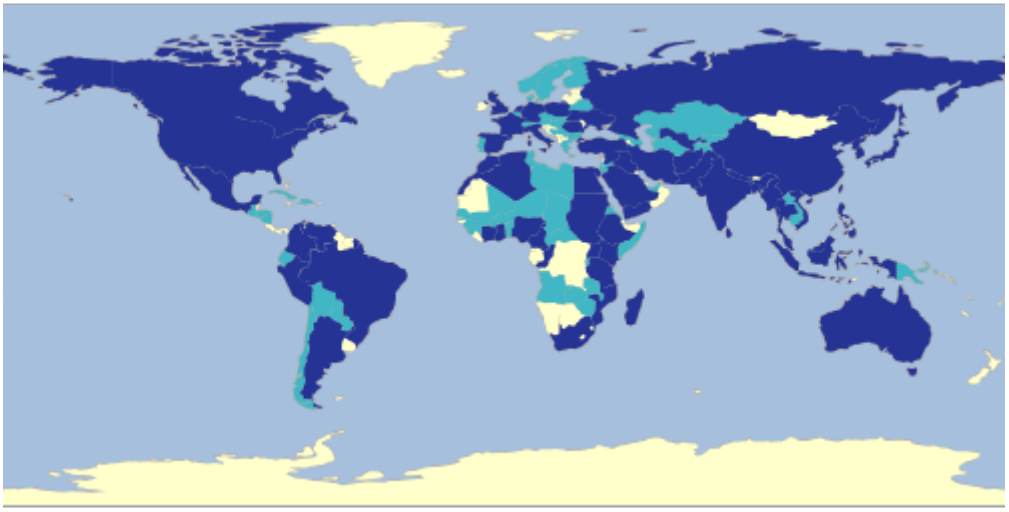
A Composite is simply two or more Symbolizers. So, a Composite would be a combination of a Stroke symbolizer (to style the boundary) and a Fill Symbolizer (to style the interior).

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



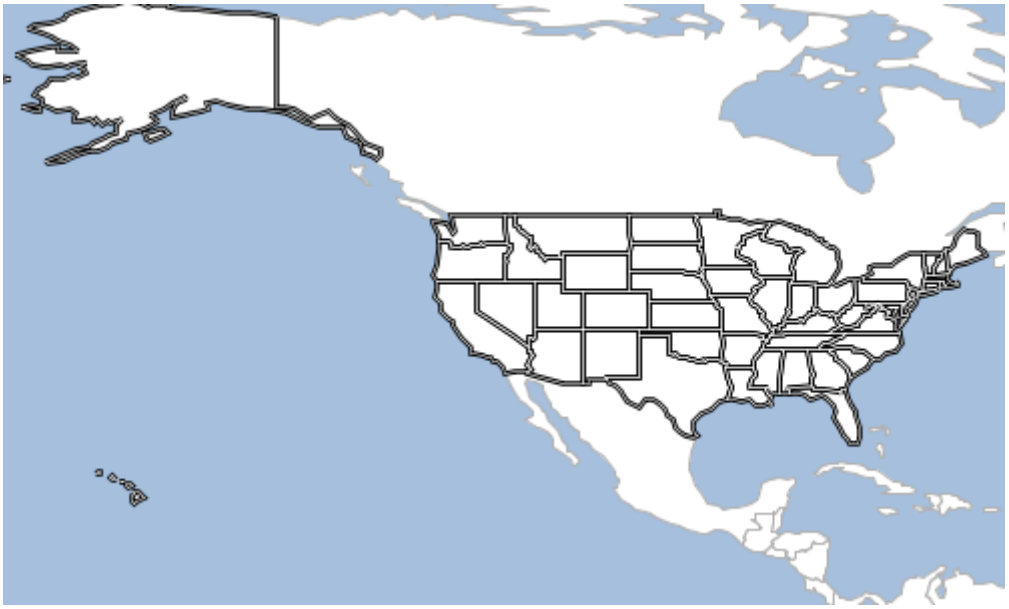
A Symbolizer can use the where method to restrict which features are styled.

```
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")
```



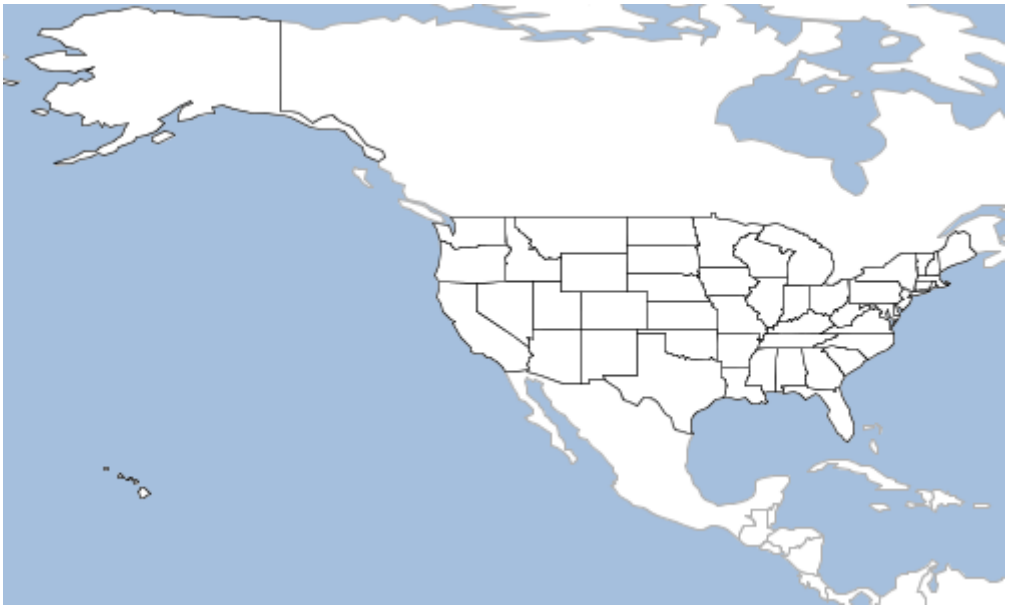
The zindex method is used to order Symbolizers on top of each other. In this recipe we use it to create line casings.

```
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

```
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

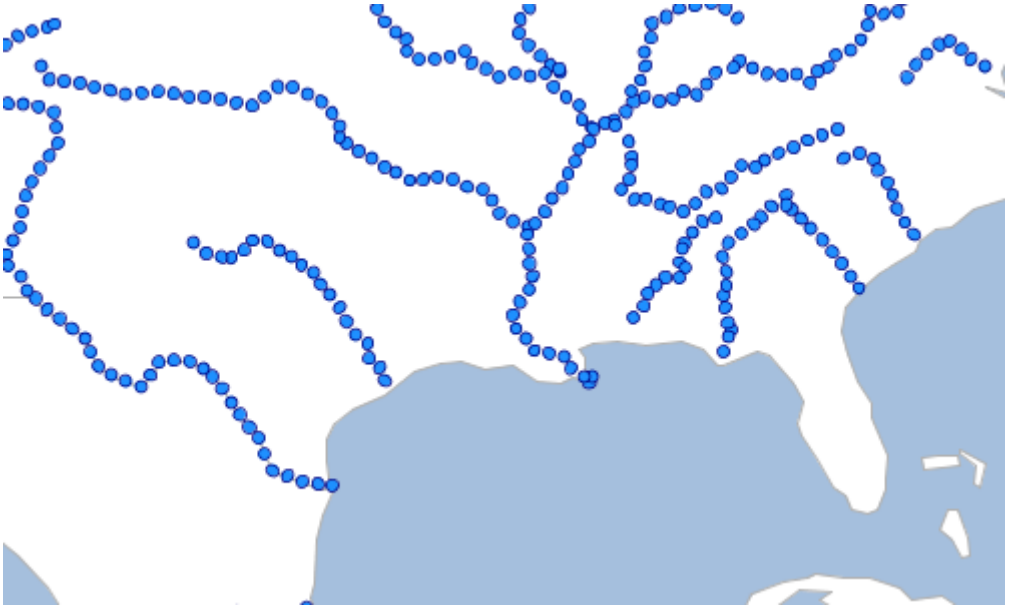
```
Stroke stroke = new Stroke("#1E90FF", 0.75, [5,5], "round", "bevel")
```

Create a Stroke Symbolizer with railroad Hatching

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

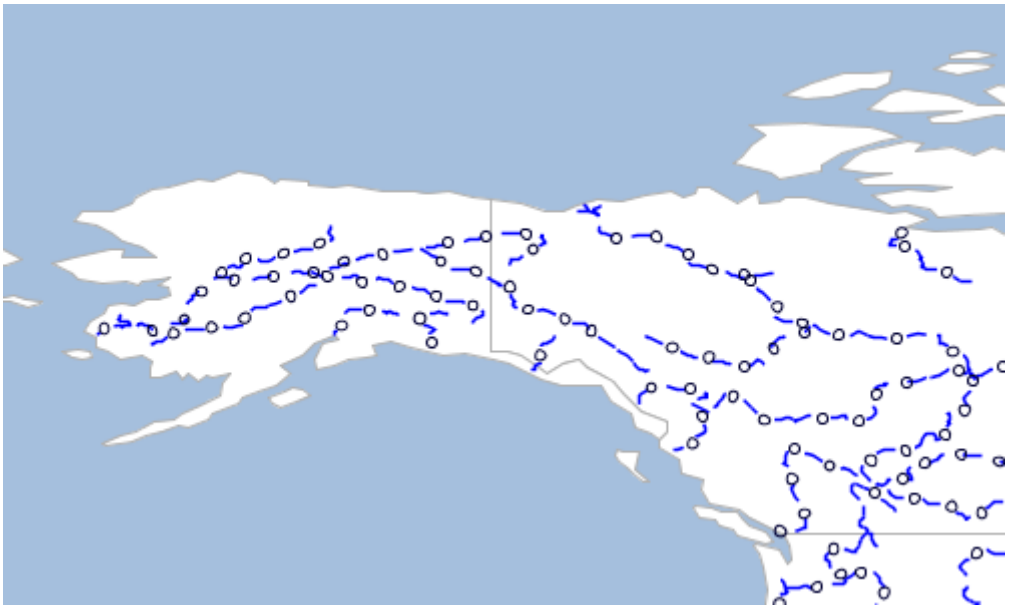
Create a Stroke Symbolizer with spaced Shape symbols

```
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

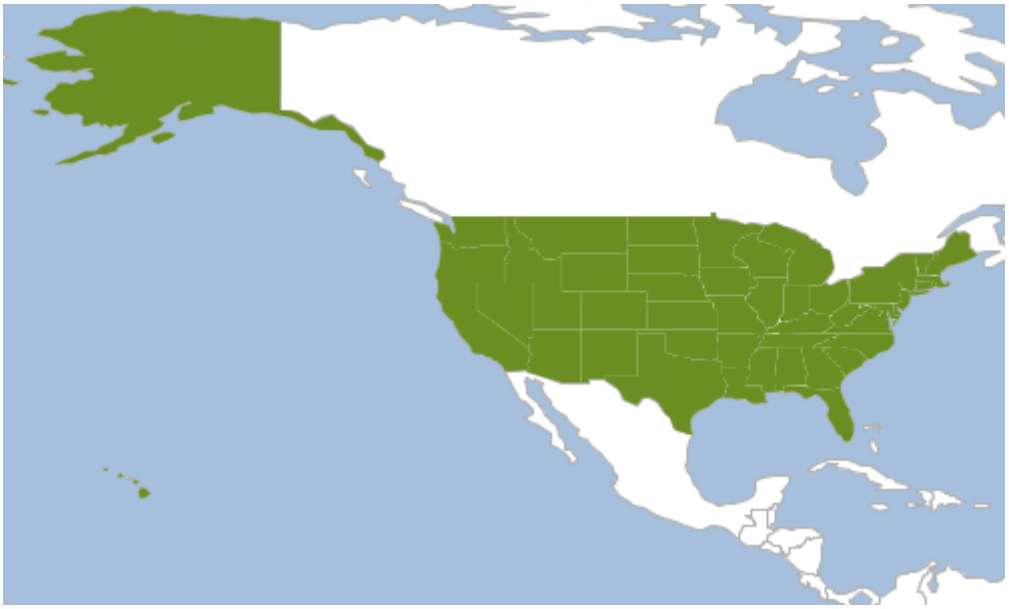
```
Symbolizer stroke = new Stroke("#0000FF", 1, [10,10]).zindex(0) + new Stroke(null, 0,
[[5,15],7.5])
        .shape(new Shape(null, 5, "circle").stroke("#000033",1)).zindex(1)
```



Creating Fills

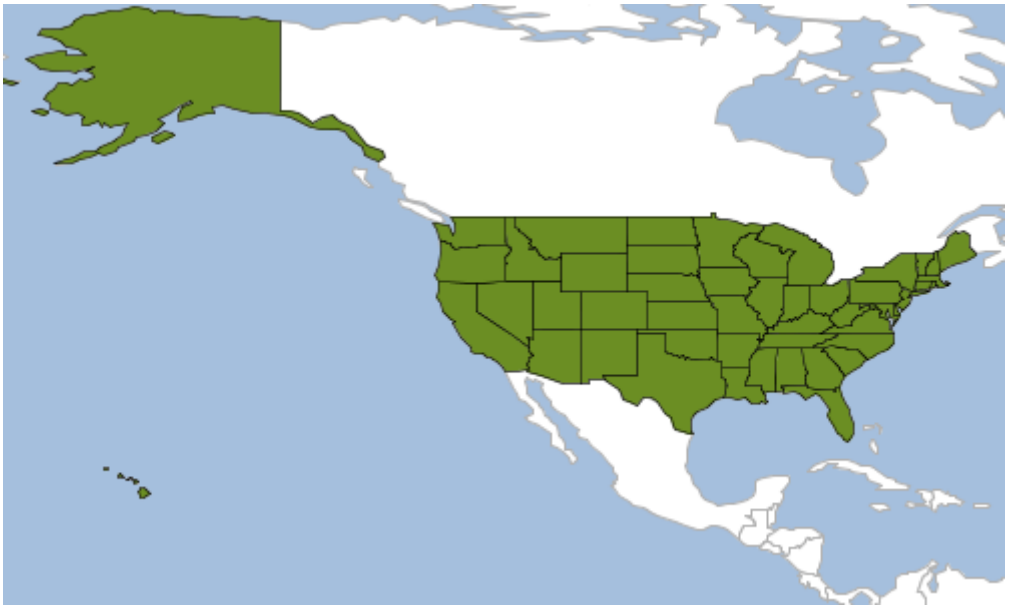
Create a Fill Symbolizer with a Color

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



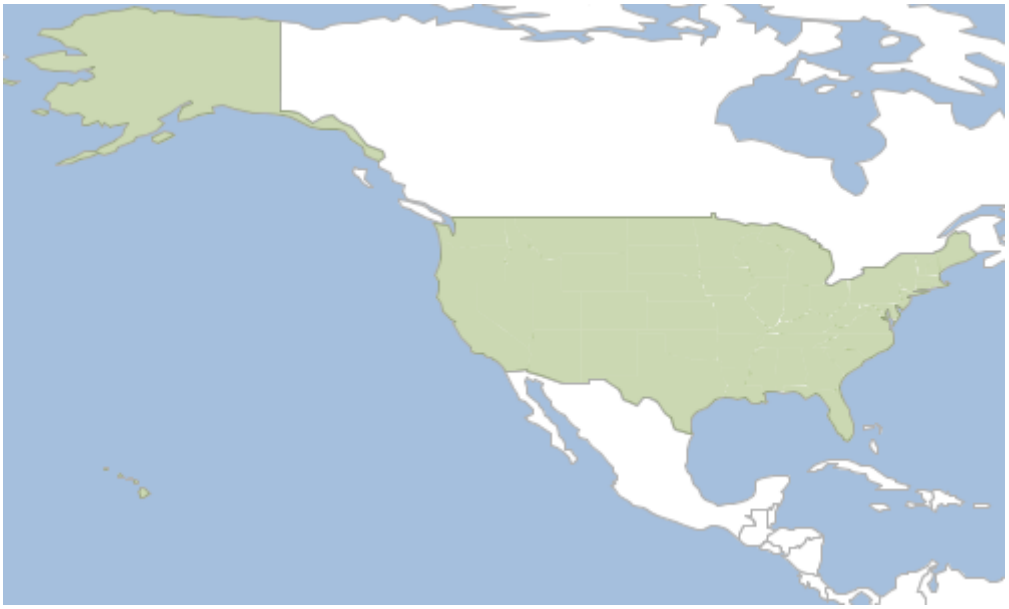
Create a Fill Symbolizer with a Color and a Stroke

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



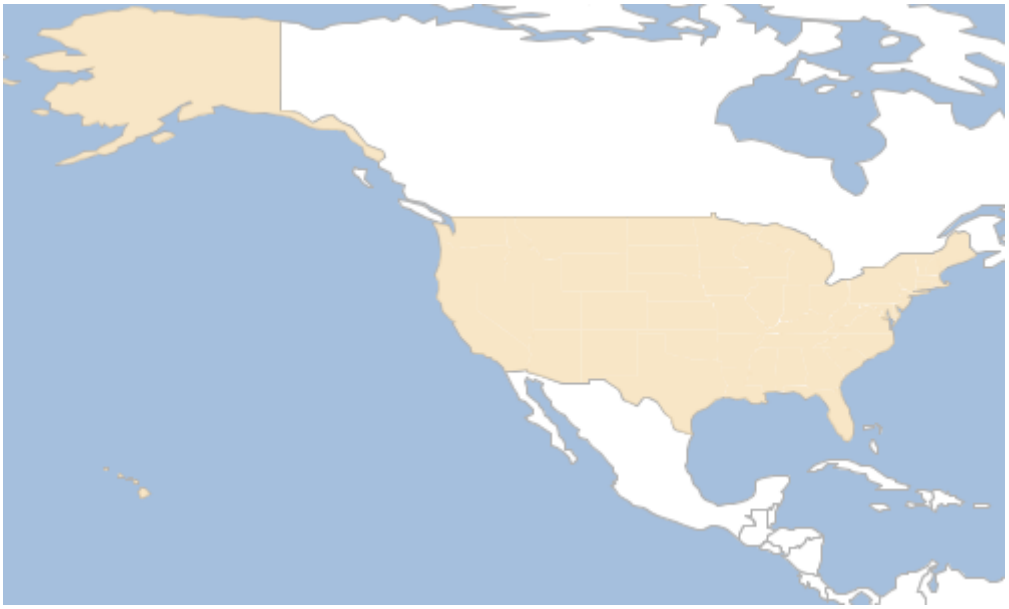
Create a Fill Symbolizer with a Color and Opacity

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



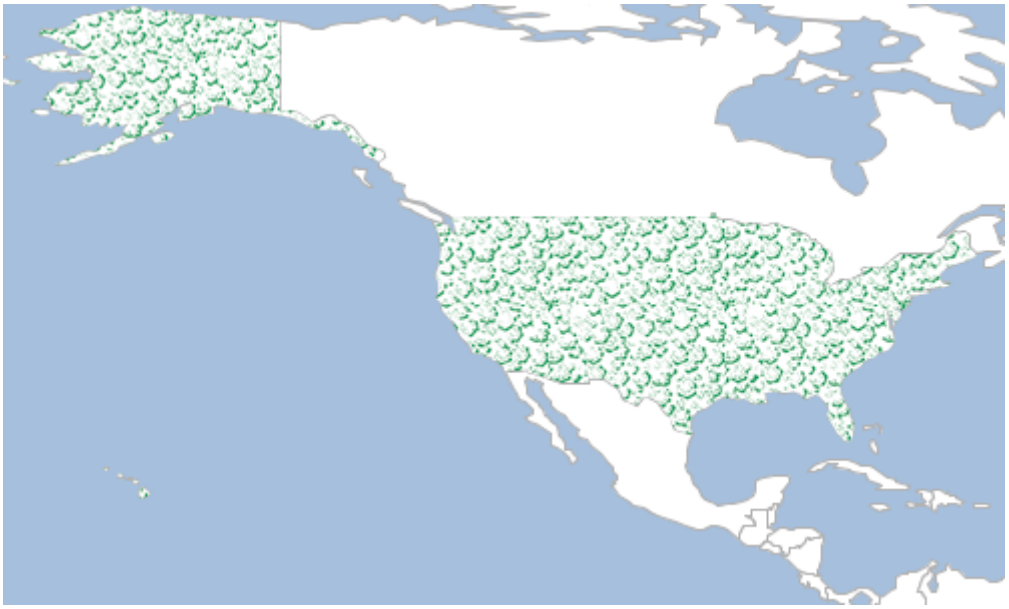
Create a Fill Symbolizer from named parameters

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



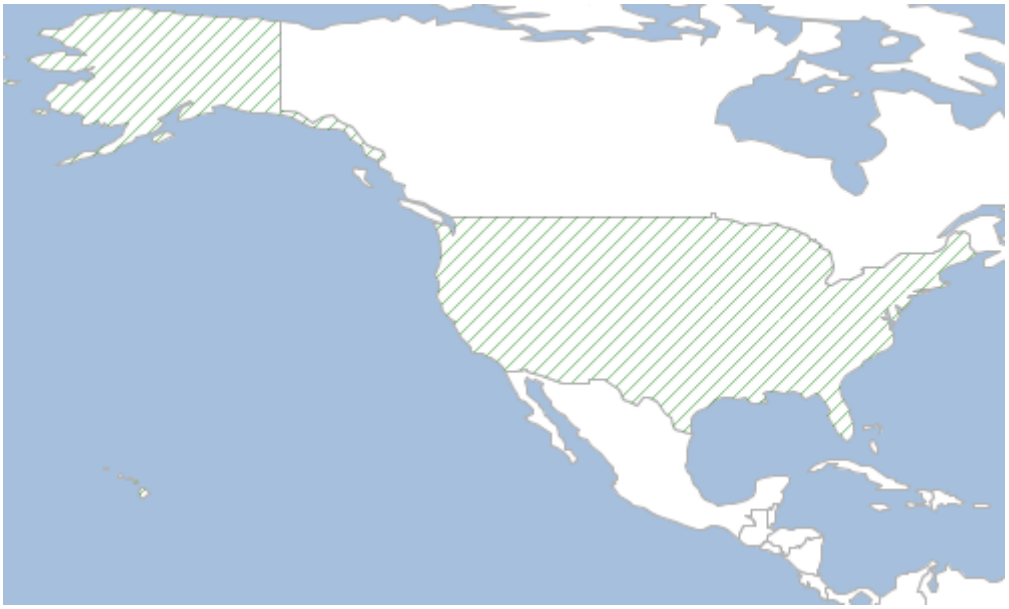
Create a Fill Symbolizer with an Icon

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



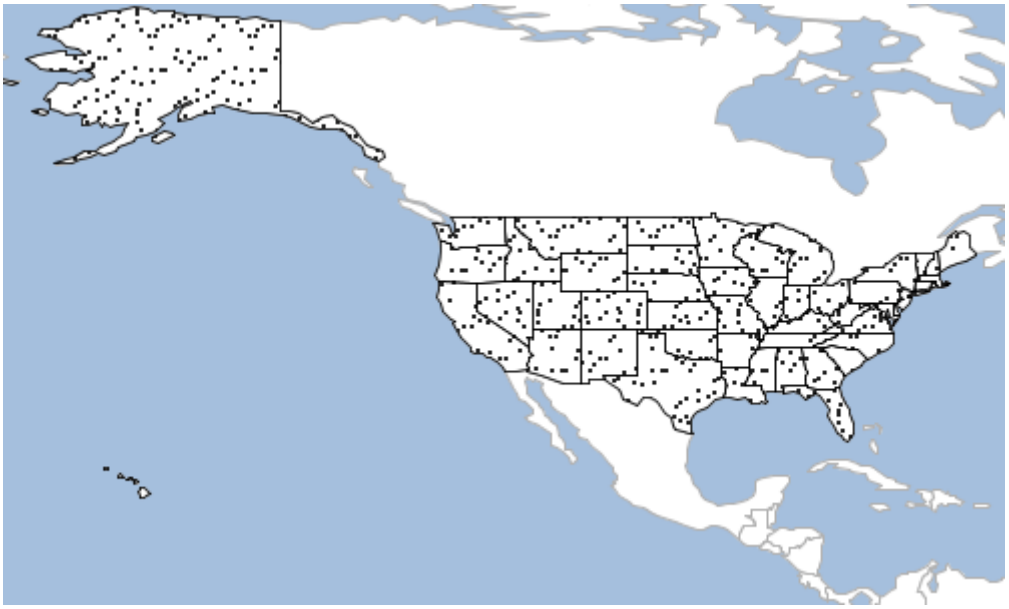
Create a Fill Symbolizer with a Hatch

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



Create a Fill Symbolizer with a random fill

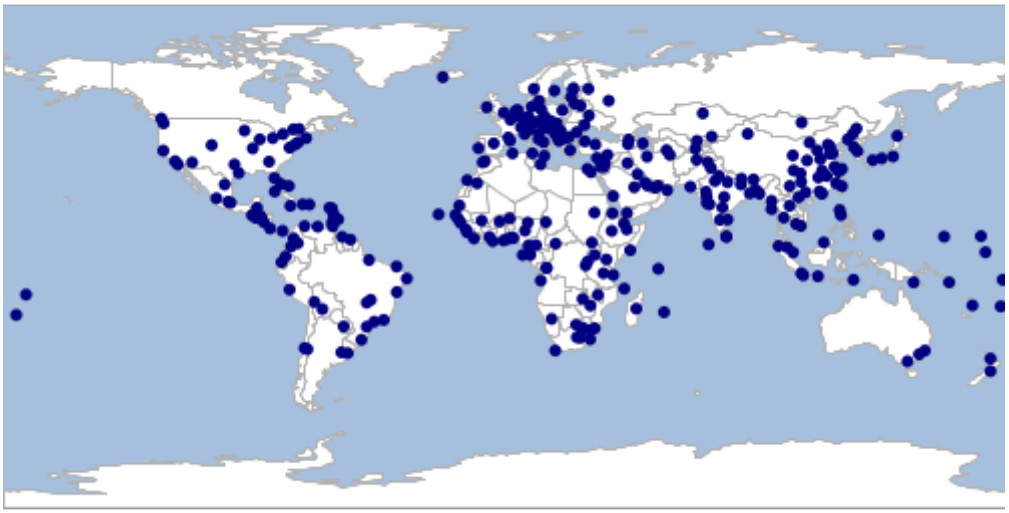
```
Symbolizer symbolizer = new Fill("white").hatch("circle", new Fill("black"), 2).
random(
    random: "free",
    seed: 0,
    symbolCount: 50,
    tileSize: 50,
    rotation: "none"
) + new Stroke("black", 0.25)
```



Creating Shapes

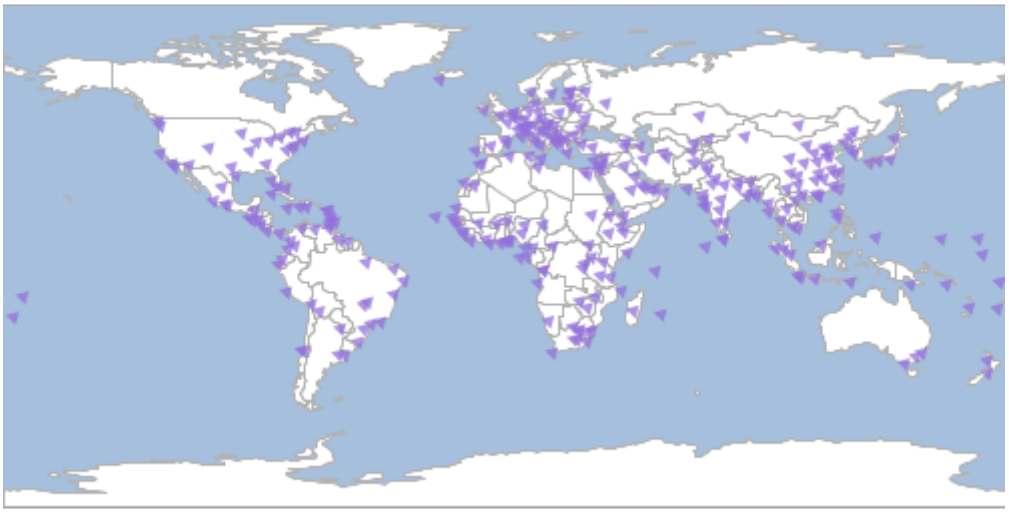
Create a Shape Symbolizer with a Color

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



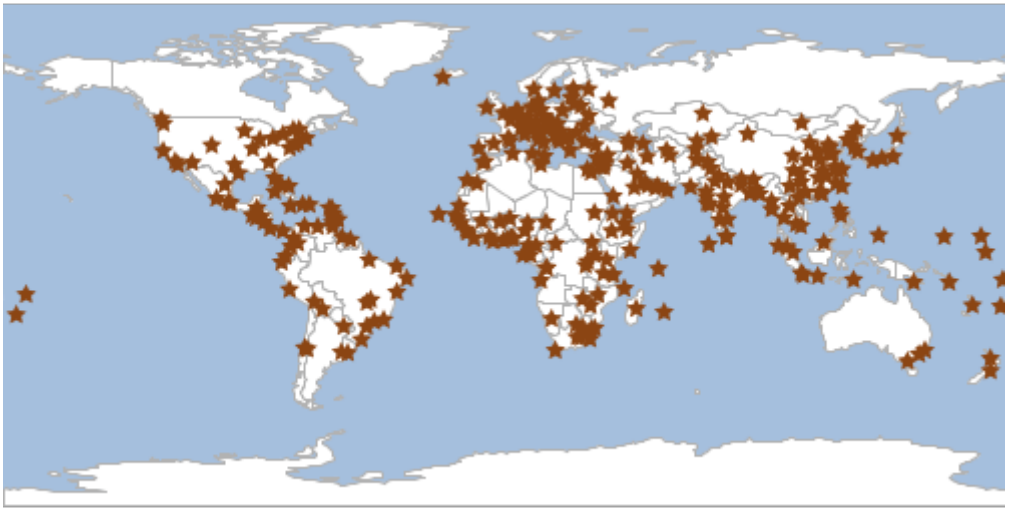
Create a Shape Symbolizer with a color, size, type, opacity and angle

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



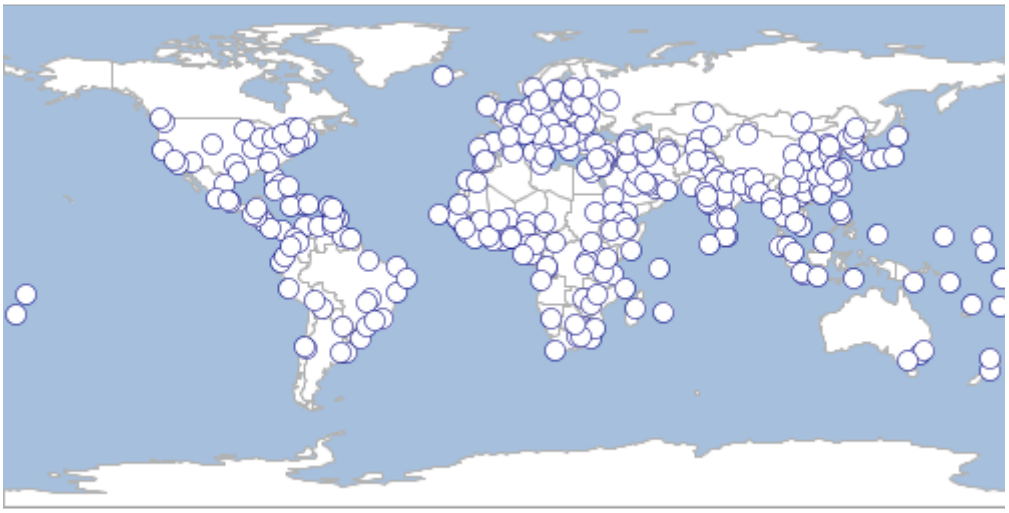
Create a Shape Symbolizer with named parameters

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



Create a Shape Symbolizer with Stroke outline

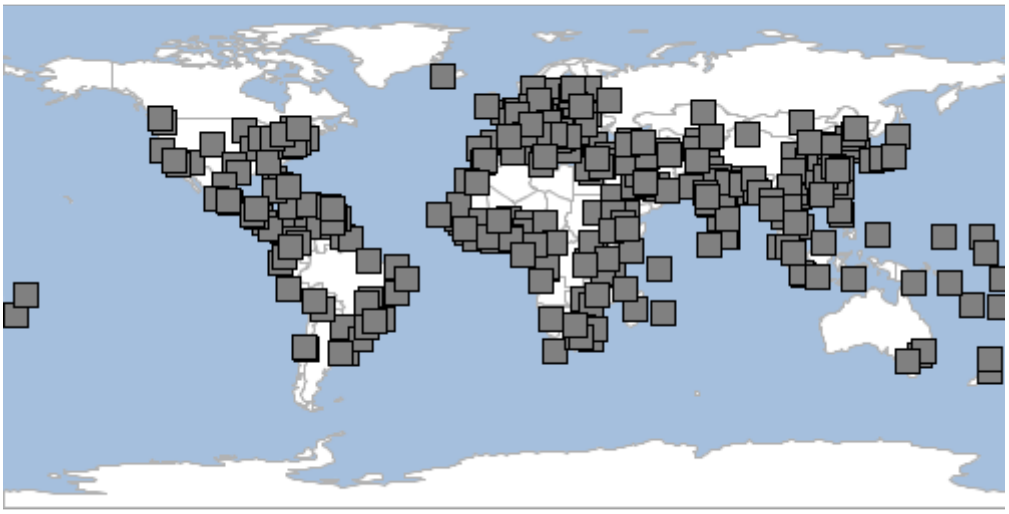
```
Symbolizer symbolizer = new Shape("white", 10).stroke("navy", 0.5)
```



Creating Icons

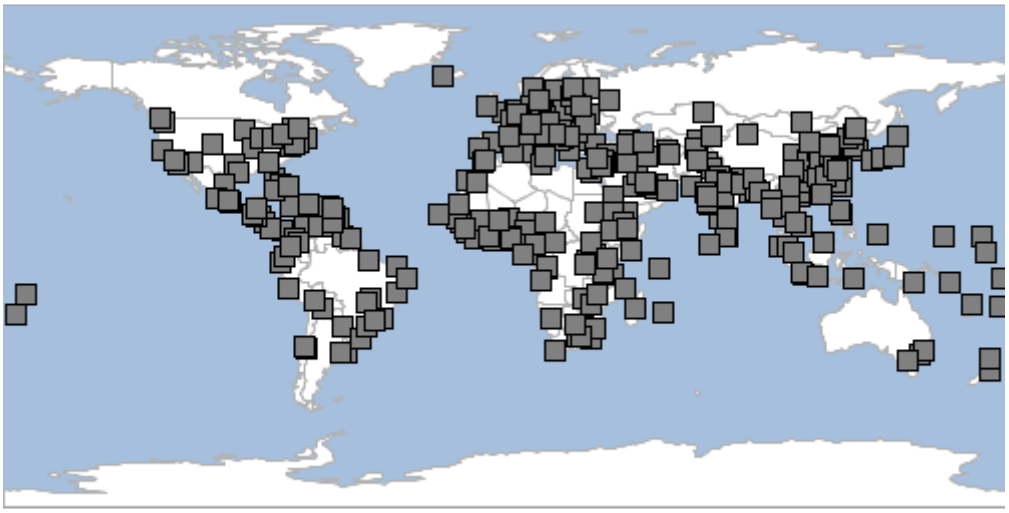
Create an Icon Symbolizer

```
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

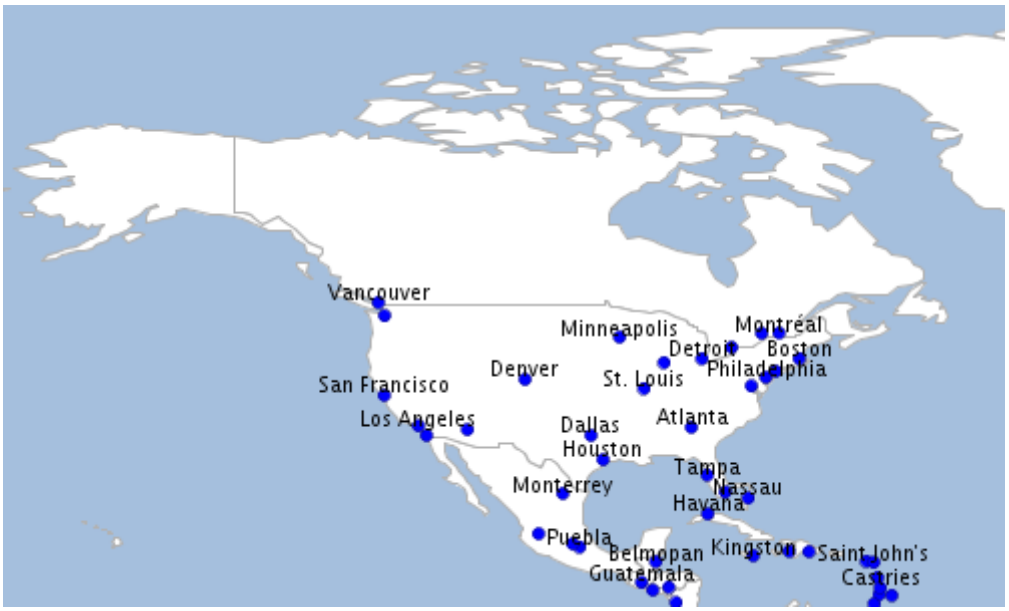
Create a Label for a Point Layer

```
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 Point Layer with a Font

```
Symbolizer symbolizer = new Shape("blue", 6).stroke("navy", 0.5) + new Label("NAME"
).point(
        [0.5,0.5],
        [0, 5.0],
        0
) + new Font(
        "normal",   ①
        "bold",     ②
        12,         ③
        "Arial"     ④
)
```

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

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

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.

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

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

```
Symbolizer symbolizer = new Fill("white") + new Stroke("black", 0.1) + new Label
("NAME_1")
        .point(anchor: [0.5,0.5])
        .polygonAlign("mbr")
        .wordSpacing(8)
        .characterSpacing(5)
```

Create a Label for a Polygon Layer with underlining.

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

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"))
```

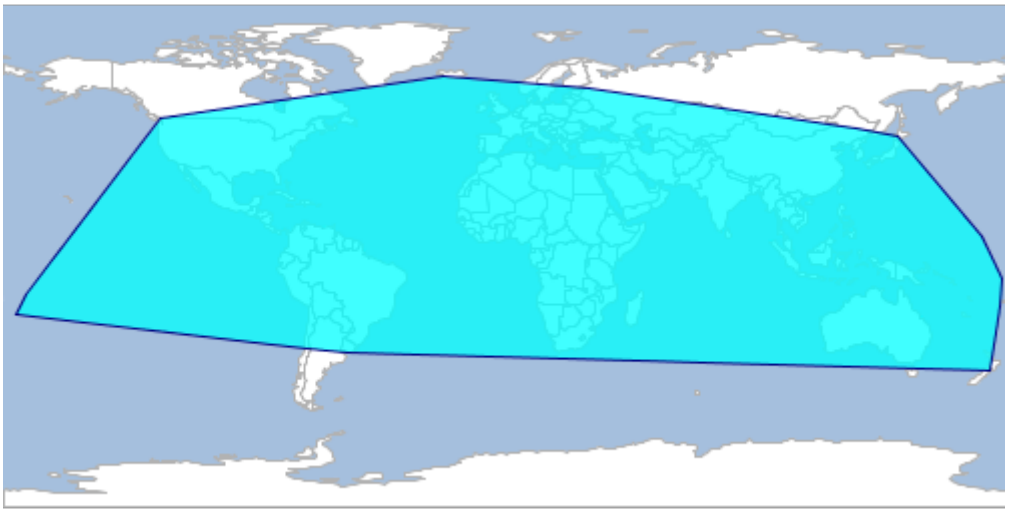
Creating Transforms

Create a normal Transform symbolizer that styles a polygon as a point by calculating it's centroid

```
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
Symbolizer symbolizer = new Transform("centroid(the_geom)") +
        new Shape(color: "red", size: 10, type: "star")
countries.style = symbolizer
```

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

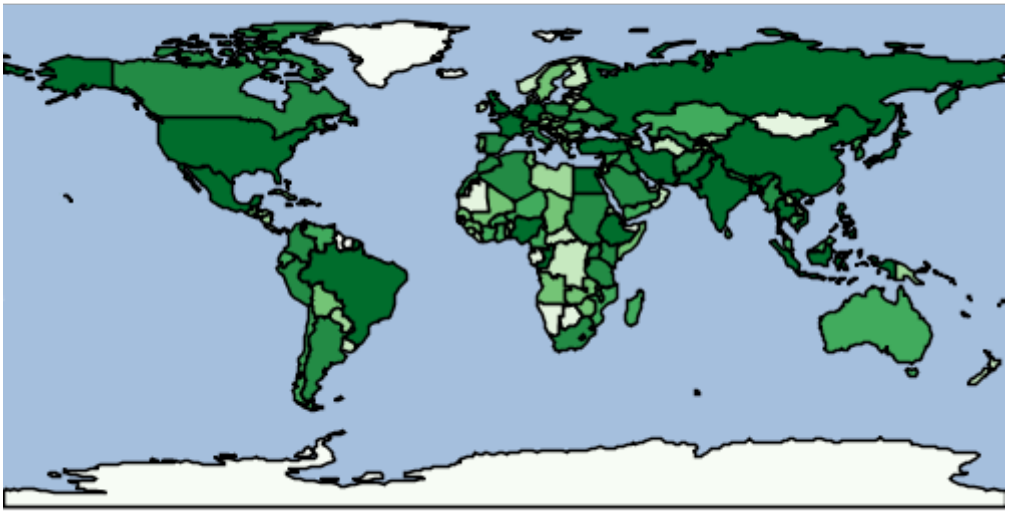
```
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer places = workspace.get("places")
Process process = new Process("convexhull",
        "Create a convexhull around the features",
        [features: geoscript.layer.Cursor],
        [result: geoscript.layer.Cursor],
        { 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

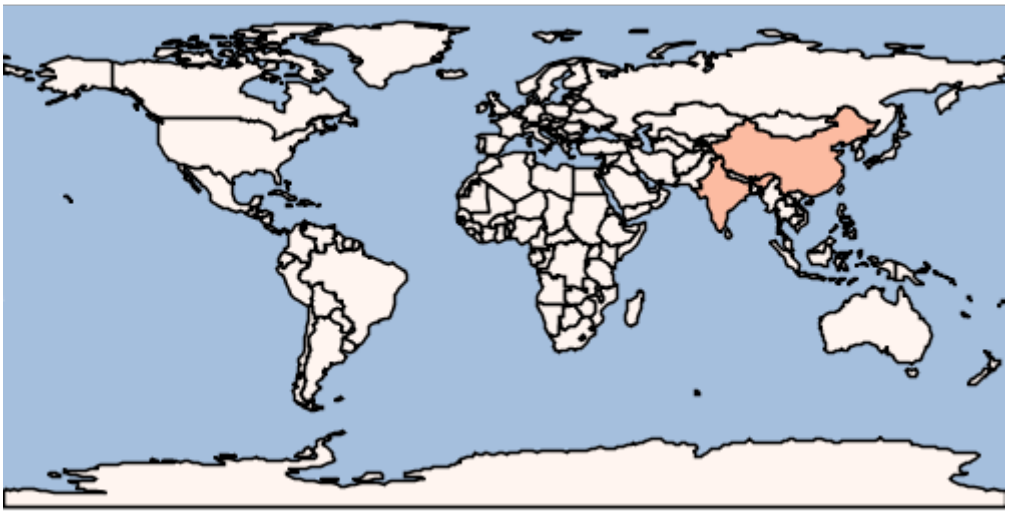
Create a Gradient Symbolizer from a Layer's Field using quantile method

```
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
```



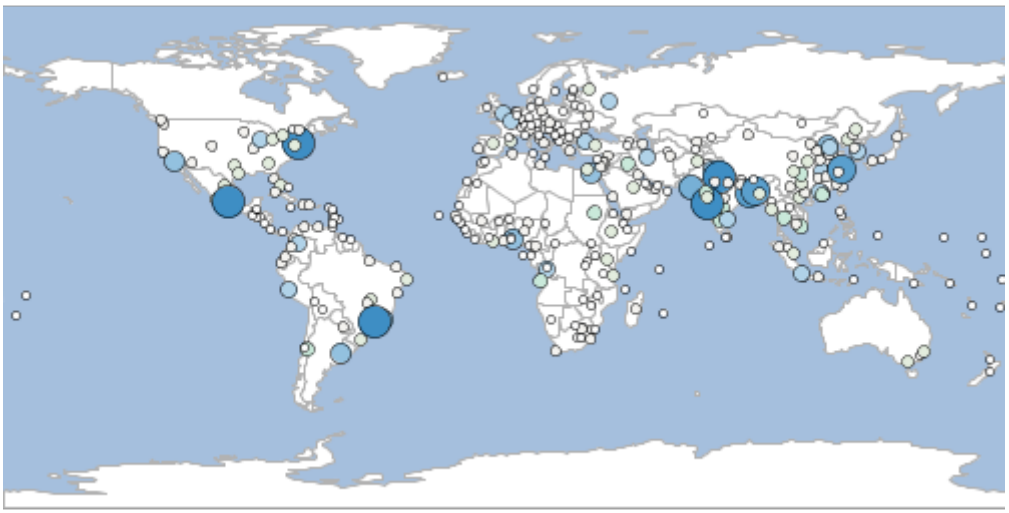
Create a Gradient Symbolizer from a Layer's Field using equal interval method

```
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

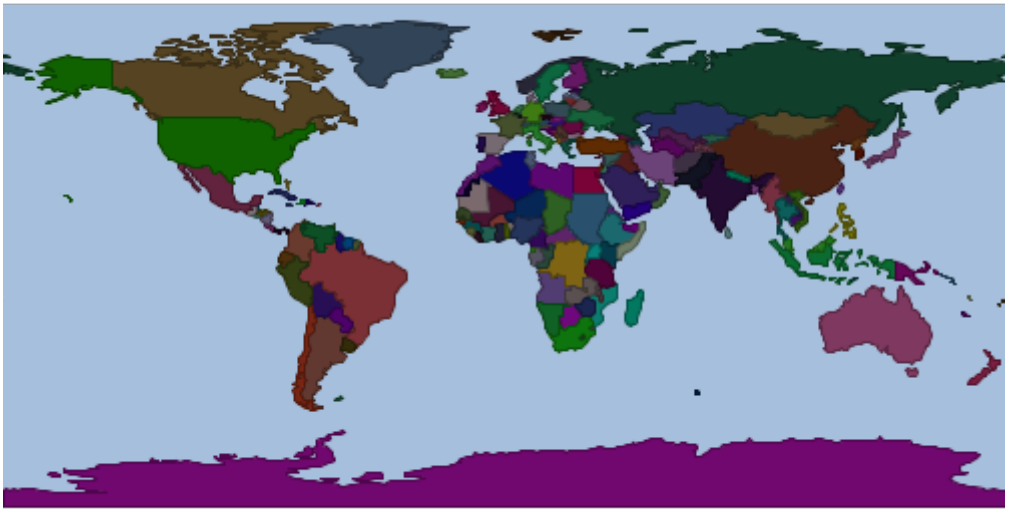
```
Gradient gradient = new Gradient(
        new Property("POP2020"),
        [0, 10000, 20000, 30000],
        [
                new Shape("white", 4).stroke("black", 0.5),
                new Shape("#b0d2e8", 8).stroke("black", 0.5),
                new Shape("#3e8ec4", 16).stroke("black", 0.5),
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



Creating Unique Values

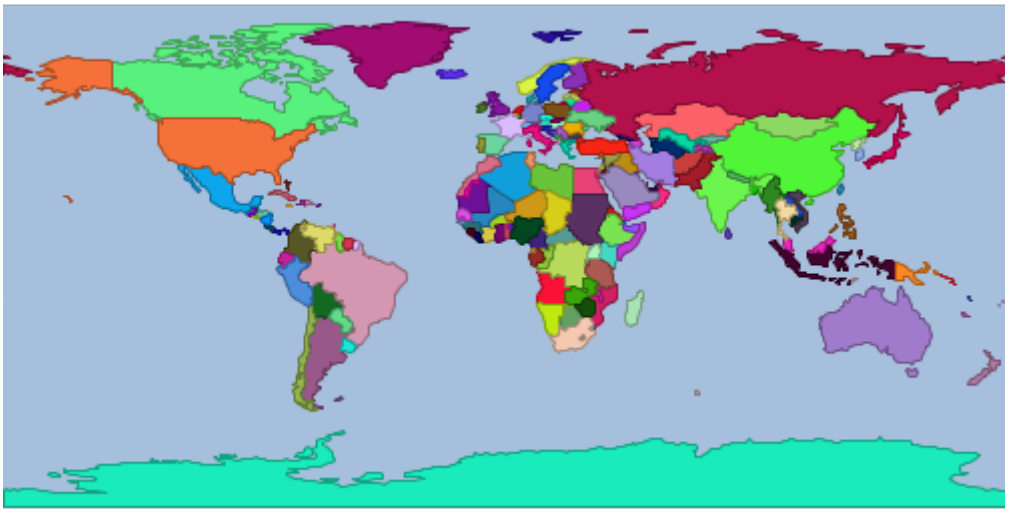
Create a Unique Values Symbolizer from a Layer's Field

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



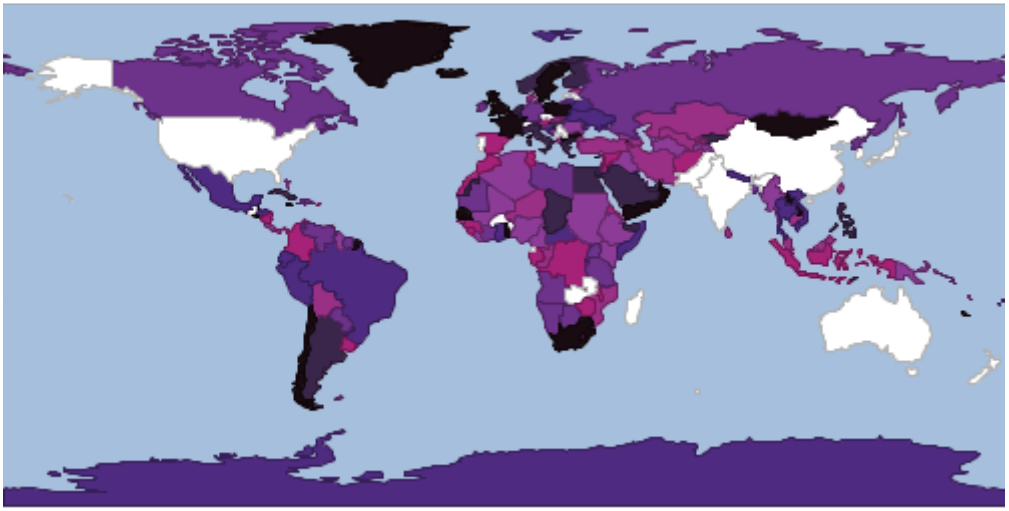
Create a Unique Values Symbolizer from a Layer's Field and a Closure

```
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

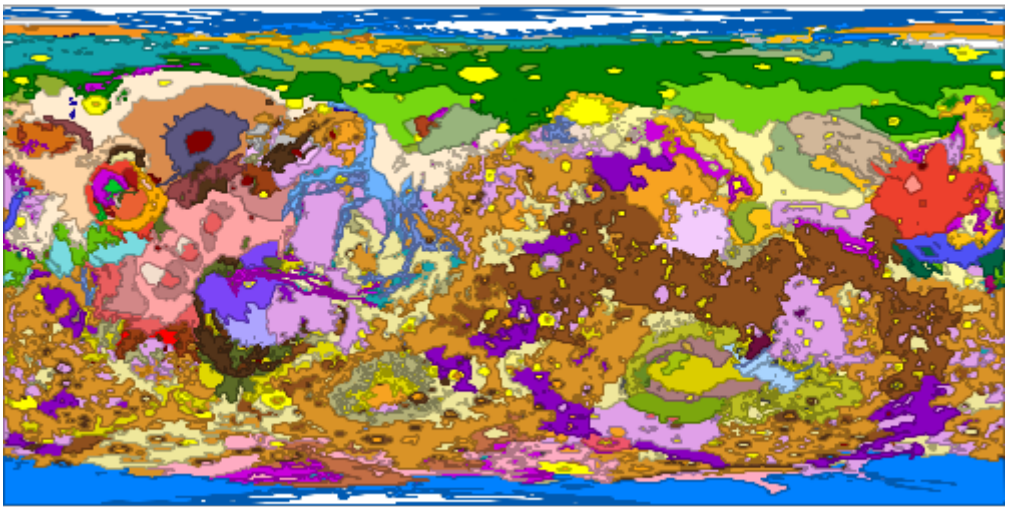
```
Workspace workspace = new GeoPackage('src/main/resources/data.gpkg')
Layer countries = workspace.get("countries")
UniqueValues uniqueValues = new UniqueValues(countries, "NAME",
"LightPurpleToDarkPurpleHeatMap")
countries.style = uniqueValues
```



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)
```

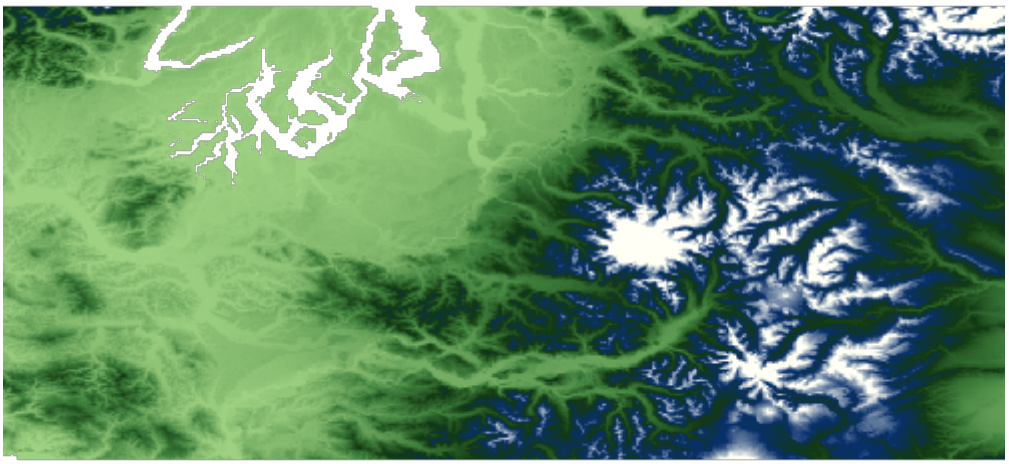
```
Unit,R,G,B
AHa,175,0,111
AHat,192,54,22
AHcf,150,70,72
AHh,109,13,60
AHpe,232,226,82
AHt,99,0,95
AHt3,233,94,94
Aa1,255,236,207
Aa2,145,73,76
Aa3,254,212,164
Aa4,212,109,19
Aa5,175,66,28
```



Creating Color Maps

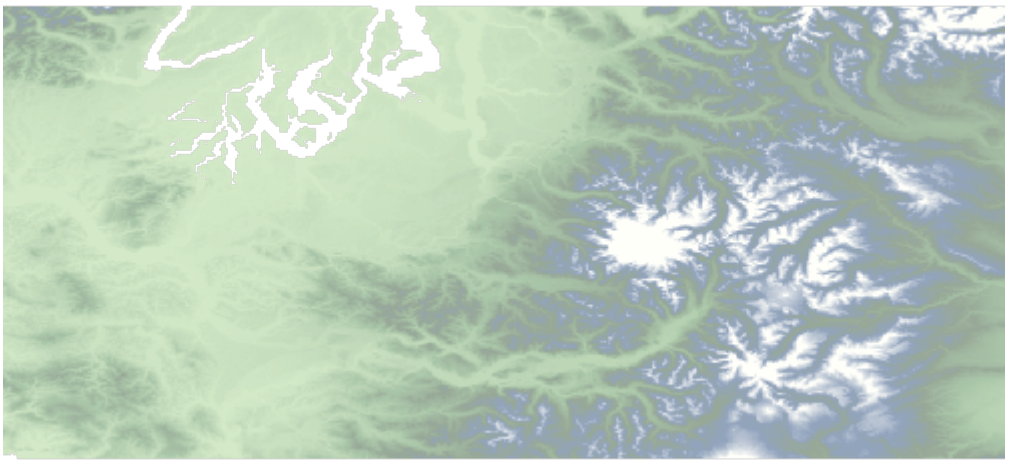
Create a ColorMap Symbolizer for a Raster using a list of Colors

```
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: "#fffff5", quantity:1820],
])
raster.style = colorMap
```



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

```
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: "#fffff5", quantity:1820],
]).opacity(0.25)
raster.style = colorMap
```



Create a ColorMap Symbolizer for a Raster using a color palette

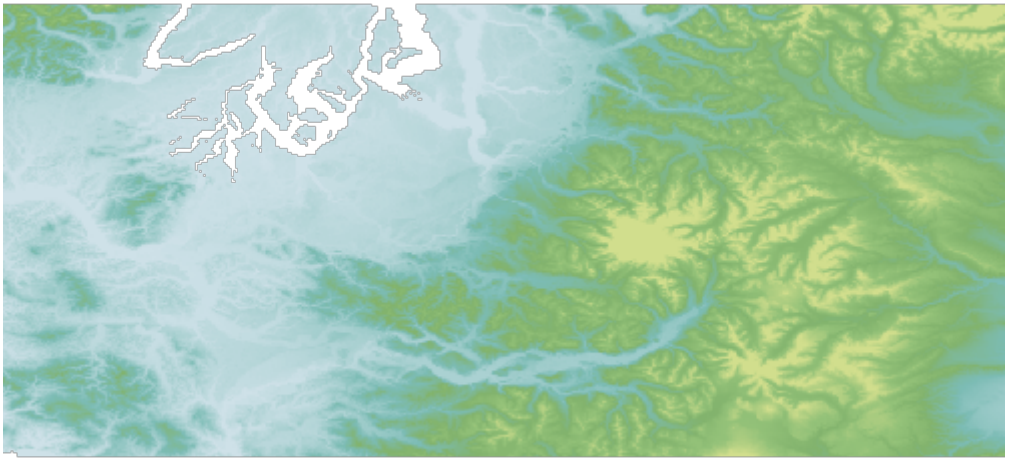
```
Format format = new GeoTIFF(new File('src/main/resources/pc.tif'))
Raster raster = format.read()
ColorMap colorMap = new ColorMap(
        25,             ①
        1820,           ②
        "MutedTerrain", ③
        5               ④
)
println colorMap
raster.style = colorMap
```

① min value

② max value

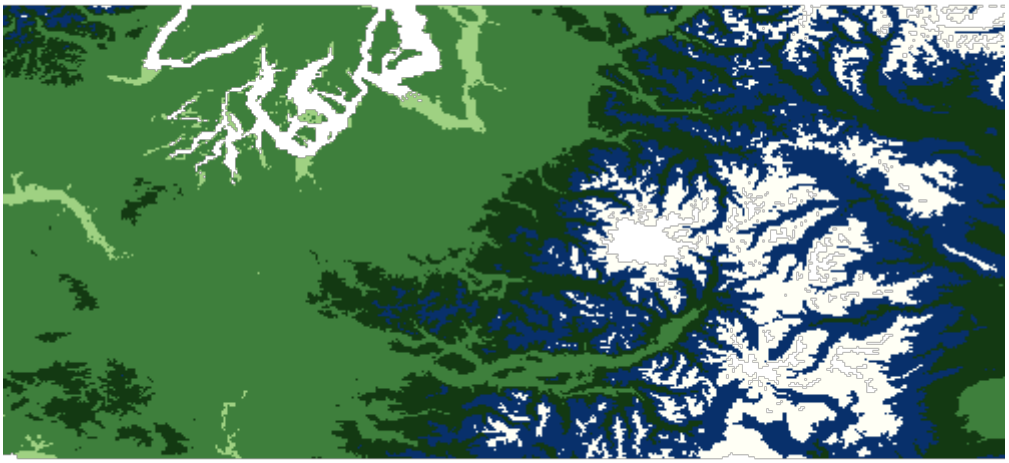
③ color palette name

④ number of categories



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

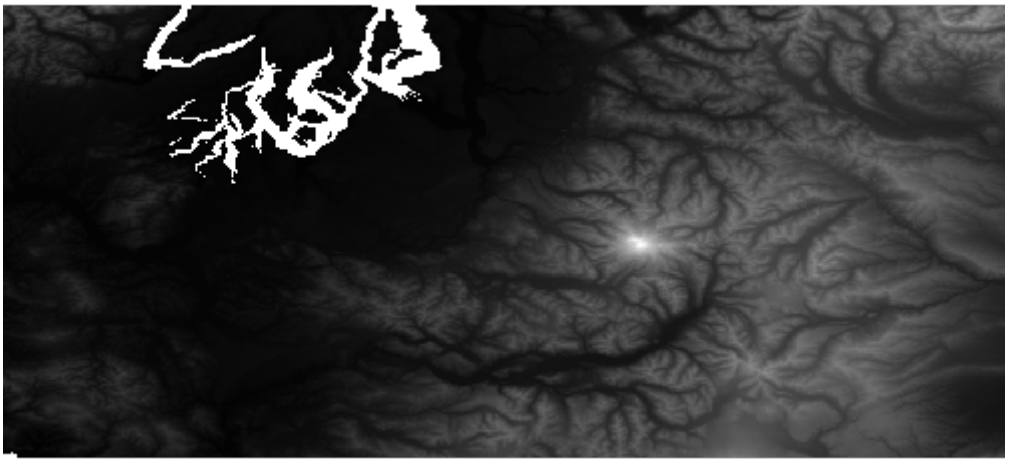
```
Format format = new GeoTIFF(new File('src/main/resources/pc.tif'))
Raster raster = format.read()
ColorMap colorMap = new ColorMap([
        [color: "#9fd182", quantity:25],
        [color: "#3e7f3c", quantity:470],
        [color: "#133912", quantity:920],
        [color: "#08306b", quantity:1370],
        [color: "#fffff5", quantity:1820],
], "intervals", true)
raster.style = colorMap
```



Creating Channel Selection and Contrast Enhancement

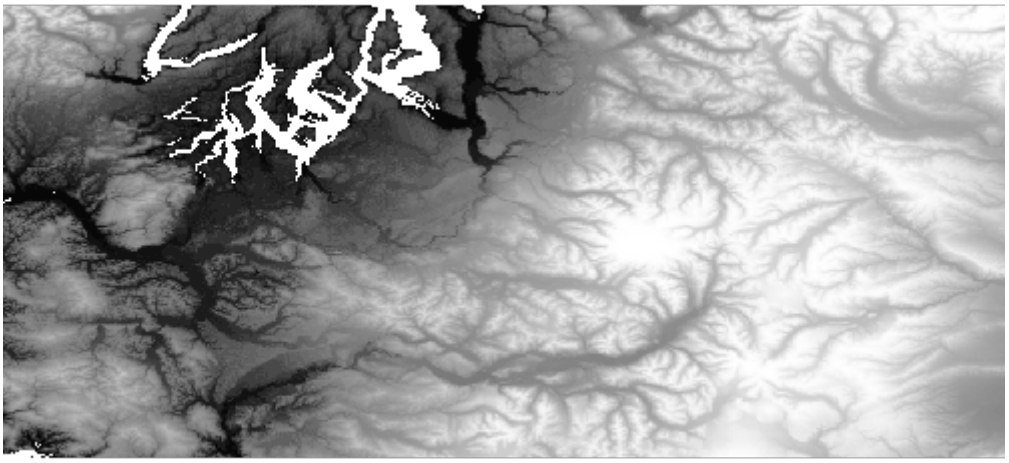
Create a Raster Symbolizer using ChannelSelection and ContrastEnhancement using the normalize method

```
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** 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.

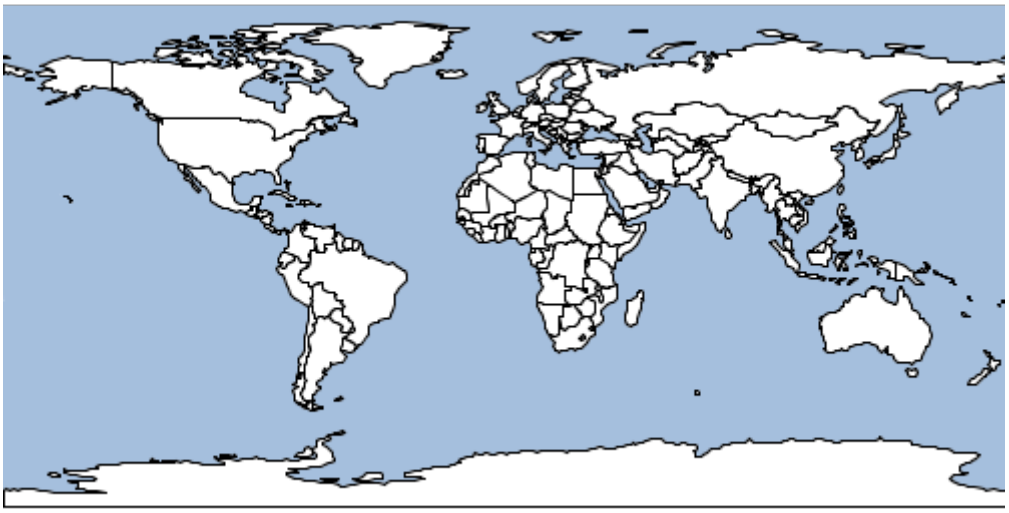
Write a Symbolizer to SLD

```
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>
```

Read a Style from an SLD String

```
        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
```

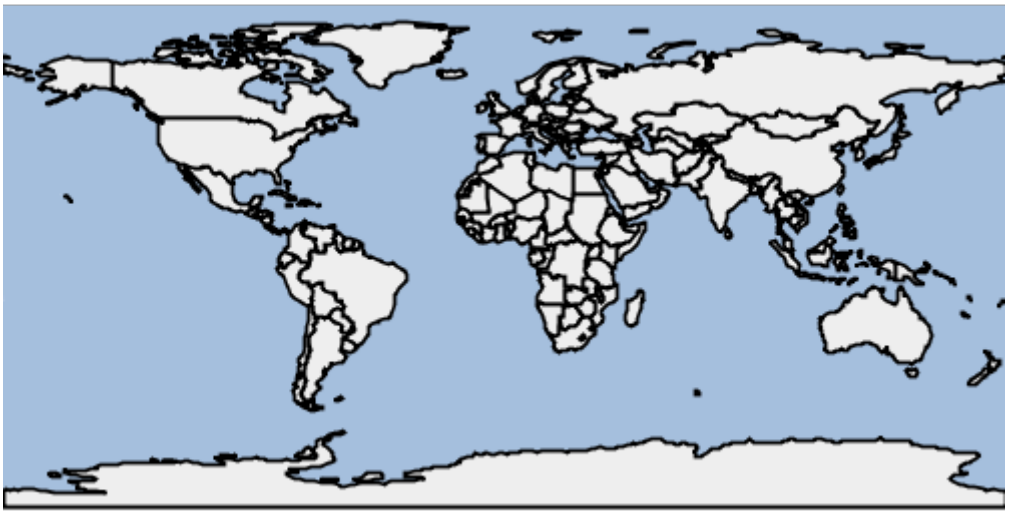


CSS

GeoScript Groovy can only read CSS documents.

Read a Style from an CSS String

```
        String css = """
* {
   fill: #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.

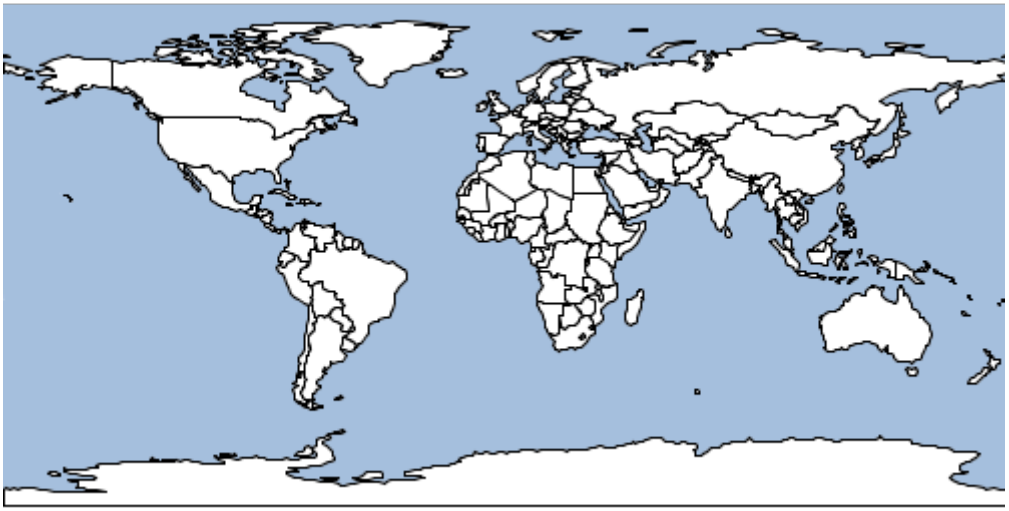
Write a Symbolizer to YSLD

```
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
```

Read a Style from an YAML Style Layer Descriptors (YSLD) String

```
        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
"""
        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
```



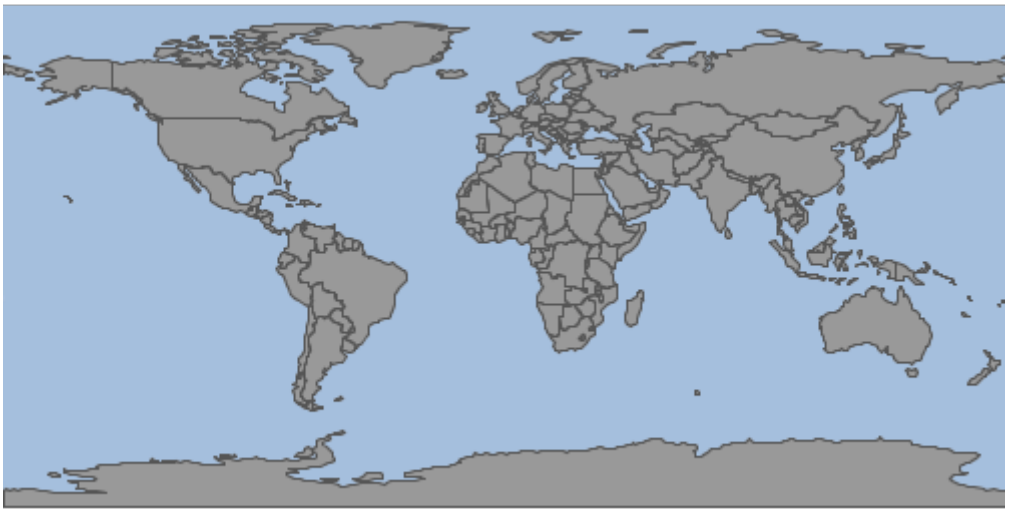
Simple Style Reader

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

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
```

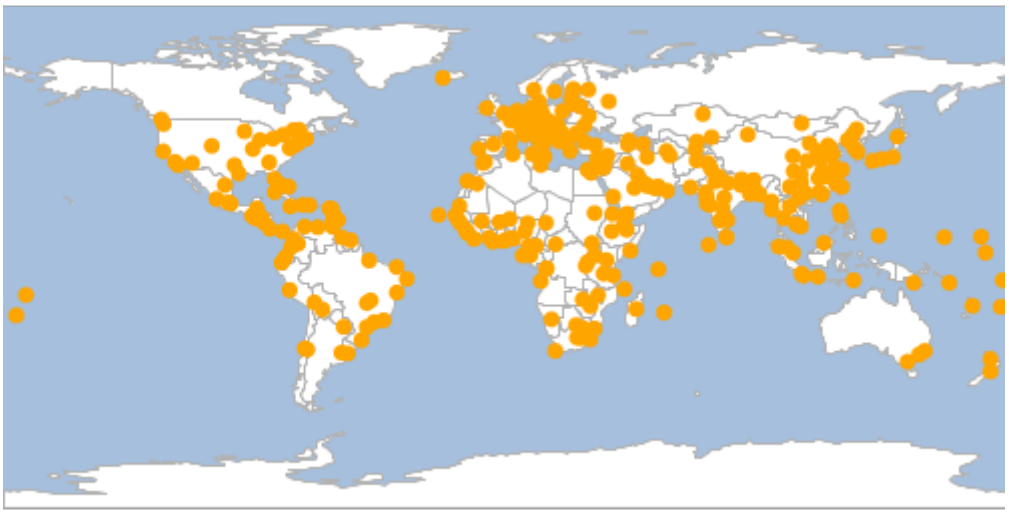


Read a Style with fill, stroke, and label properties from a Simple Style String

```
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
```

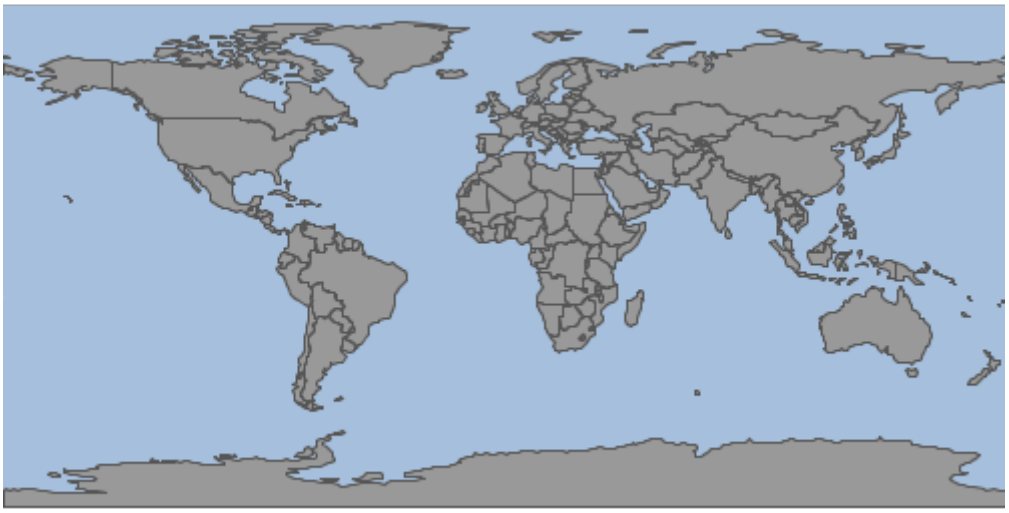
Read a Style with shape properties from a Simple Style String

```
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
```