How to Develop Web Reports

Gary Walters
Environmental Program Manager
Water Quality Division
EPA Air Quality Trends Report

• EPA developed an interactive web application for the Air Quality Trends
  • EPA publishes an annual air trends report in the form of an interactive web application ([https://gispub.epa.gov/air/trendsreport/2018/](https://gispub.epa.gov/air/trendsreport/2018/)). The report features a suite of visualization tools that allow the user to:
    • Learn about air pollution and how it can affect our health and environment.
    • Compare key air emissions to gross domestic product, vehicle miles traveled, population, and energy consumption back to 1970.
    • Take a closer look at how the number of days with unhealthy air has dropped since 2000 in 35 major US cities.
    • Explore how air quality and emissions have changed through time and space for each of the common air pollutants.
    • Check out air trends where you live.
    • Users can share this content across social media, with access to Facebook, Twitter, Pinterest, and other major social media sites.
GitHUB and open source

- Programming language published on GitHUB
- Open source so meaning no cost to the user
What’s Needed to Develop This Application

Infrastructure

1. Microsoft Visual Studio
3. ArcGIS or other mapping products if mapping is included
4. Photo and video editing software
5. External Facing Web Server

Personnel

1. GIS
2. Business/Program
3. Communications
4. Education
5. Administration (Policy, Legal, etc.)
6. IT (web services)
Adding features and function

Adding interactive maps:

An image (.png) of the web mapping application is created. This image is then placed in the application with a link to a web mapping application url.

This coding links the maps you see to the left

```
<a href="https://padep-1.maps.arcgis.com/apps/View/index.html?appid=9bd2f843c4a44bb1a8ae0d024c66675f" target="_blank">
  <img src="/img/streams.png" alt="View Pennsylvania Streams and Rivers" class="img-responsive">
</a>
```

The layers and attributes for the maps are provided by the program and other data sources. The interactive maps for the PA 2018 IR are ArcGIS tools and published as ArcGIS Rest Map Service. Data layers and attributes reside in PA DEP’s enterprise geodatabase.
Adding features and function

Adding accordion menus:

It was necessary to provide all data in a variety of formats for printing. This includes data tables.

The Bootstrap accordion holds a set of panes whose titles are all visible, but only one pane’s content is visible at a time. Clicking on a pane title slides the currently displayed one away and displays the clicked pane content. The first pane is the opened by default. In the Integrated Report, buttons were inserted the accordion content that are links to web mapping applications and Excel spreadsheets. When the buttons are clicked, the web mapping application will open in a new window or the Excel spreadsheet can be displayed or downloaded to the user’s PC. The code on the next slide was used to program the CATEGORY 1 panel.
Code for Accordion Menu

```html
• <div class="panel panel-info">
•   <div class="panel-heading">
•     <h4 class="panel-title">
•       <a class="accordion-toggle data-toggle="collapse" data-parent="#accordion" href="#cat1">
•         CATEGORY 1
•       </a>
•     </h4>
•   </center>
• </div>
• <div id="cat1" class="panel-collapse collapse in">
•   <div class="panel-body">
•     <span class="label label-custom">DESCRIPTION:</span>
•     Waters attaining all uses.
•   </div>
•   <p>
•     //Buttons in panel
•     <a href="https://padep-1.maps.arcgis.com/apps/View/index.html?appid=801e1ba978c24f4487e0c1a7a23b972" class="btn-sm hvr-sweep-to-right" target="_blank" title="Map of Category 1 Waters">
•       Map of Category 1 Waters
•     </a>
•     <a href="./pdfs/Category1_Streams.xlsx" class="btn-sm hvr-sweep-to-right" target="_blank" title="View and Print Category 1 Streams">
•       View and Print Category 1 Streams
•     </a>
•     <a href="./pdfs/Category1_Lakes.xlsx" class="btn-sm hvr-sweep-to-right" target="_blank" title="View and Print Category 1 Lakes">
•       View and Print Category 1 Lakes
•     </a>
•   </p>
• </div>
• </div>
```
Adding features and function

Interactive graphics were used throughout the report: Highcharts were used to aid in the visual presentation of the data.

Functionality seen is integral to Highcharts. What you see at the left is a tab container that displays the HTML page containing the high chart.

The Highcharts export data module enables exporting the chart data to CSV or XLS table formats. The XLS converter is limited and only creates a HTML string that is passed for download, which works but creates a warning before opening.

The link for export module is [https://www.highcharts.com/docs/export-module/export-module-overview](https://www.highcharts.com/docs/export-module/export-module-overview)

The next five slides contain the programming code for this chart.
Code for Stream Assessment Status (Miles) Chart
Code for Stream Assessment Status (Miles) Chart

```javascript
  yAxis:
    { 
      min: 0,
      reversed: false,
      title: {
        text: '',
        style: {
          color: '#FFFFFF',
        } 
      },
      tickInterval: 10,
      labels: {
        style: {
          color: '#FFFFFF',
        },
        formatter: function () {
          return 100 * this.value / $(this.axis.tickPositions).last()[0] + '%';
        }
      },
    },
  legend: {
    itemDistance: 45,
    itemMarginBottom: 8,
    margin: 5,
    reversed: true,
    itemStyle: {
      color: '#FFFFFF'
    },
    itemHoverStyle: {
      color: 'green'
    },
  },
  tooltip: {
    useHTML: 10,
    reversed: true,
    formatter: function () {
      var tip1 = 'test';
      var tip2 = 'test2';
      var tip3 = 'test3';
      this.points.reduce(function (s, point) {
        tip1 = point.key + '<br/>' + '
        if (point.key == 'Recreation') {
          tip3 = '100% Goal: All stream miles within Pennsylvania'
        } 
        if (point.key == 'Fish Consumption') {
          tip3 = '100% Goal: Streams miles that have high recreational fishing potential and where fishing for subsistence is likely'
        } 
        if (point.key == 'Aquatic Life') {
          tip3 = '100% Goal: All stream miles within Pennsylvania'
        } 
        if (point.key == 'Water Supply') {
          tip3 = '100% Goal: Stream miles with public surface water supply withdraws'
        } 
      });
```
jQuery.each(this.points, function (i, point) {
    var val = Highcharts.numberFormat(point.y, 3);
    var color = this.series.color;
    if (tip2 != 'test2') {
        tip2 += '<span style="color:' + point.series.color + '">' + point.series.name + ': </span>'
            + Highcharts.numberFormat(point.y, '0') + ' miles (' + Highcharts.numberFormat(point.percentage, '0') + ' %) '<br/>
    } else {
        tip2 = '<span style="color:' + point.series.color + '">' + point.series.name + ': </span>'
            + Highcharts.numberFormat(point.y, '0') + ' miles (' + Highcharts.numberFormat(point.percentage, '0') + ' %) '<br/>
    }
});
return tip1 + tip2 + tip3;
},
style: {
    color: '#FFFFFF',
},
backgroundColor: '#000',
shared: !0
},
exporting:
{ enabled: true, scale: 2, sourceWidth: 800, sourceHeight: 550, filename: "StreamAssessmentStatus", allowHTML: !0, buttons: {
    contextButton: {
        menuItems: [{
            textKey: 'printChart',
            onclick: function () {
                this.print();
            }
        }, {
            separator: true
        }]
    }
},
Code for Stream Assessment Status (Miles) Chart

```javascript
  textKey: 'downloadPNG',
  onclick: function () {
    this.exportChart();
  },
  textKey: 'downloadJPEG',
  onclick: function () {
    this.exportChart({
      type: 'image/jpeg'
    });
  },
  textKey: 'downloadPDF',
  onclick: function () {
    this.exportChart({
      type: 'application/pdf'
    });
  },
  textKey: 'downloadSVG',
  onclick: function () {
    this.exportChart({
      type: 'image/svg+xml'
    });
  },
  separator: true
  textKey: 'downloadCSV',
  onclick: function () {
    this.downloadCSV();
  },
  textKey: 'downloadXLS',
  onclick: function () {
    this.downloadXLS();
  },
  textKey: 'openInCloud',
```

Code for Stream Assessment Status (Miles) Chart

```html
onclick: function () {
    this.openInCloud();
}

},

data: {
    csv: data,
    startRow: 0,
    endRow: 10,
    //endColumn: 1,
    firstRowAsNames: true
},

plotOptions: {
    series: {
        stacking: 'percent',
        datalabels: {
            formatter: function () {
                // display only if larger than 1
                return this.y > 1 ? Highcharts.numberFormat(this.y, "0") : null;
            },
            enabled: true,
            align: 'center',
            color: '#FFFFFF',
            style: {
                fontWeight: 'bold',
                textOutline: 'none'
            }
        }
    }
};

</script>
</body>
</html>
```
Printing and Exporting Formats

When you click on the icon you will see the menu for printing the chart and for exporting the image or downloading the data behind the graphic.
Interactive graphics were used throughout the report: Maps and dropdown menus for parameters were used graphically provide data.

This is accomplished through use of ArcGIS mapping and javascript programming in the report. When the user selects the parameter of interest, the javascript code loads the web mapping application into the container displaying the map the user has selected.

The next slide contains the programming code.
Code for Ground Water Data Mapping

- `<div class="col-md-5 col-lg-5 col-lg-offset-1 wow fadeInRight" data-wow-duration="2s" data-wow-delay=".4s">
  - `<div class="form-group">
    - `<label for="toxicSelection"><strong>Use the dropdown menu to select a parameter of interest.</strong></label>`
    - `<select class="form-control form-control-caret" id="toxicSelection" onchange="jsDropDown('groundwater_maps','Groundwater',this.value)">
      - `<option>Chloride</option>
      - `<option>Iron</option>
      - `<option>Manganese</option>
      - `<option>selected>Nitrate</option>
      - `<option>Sulfate</option>
      - `<option>Total Dissolved Solids</option>
    </select>`
  - `</div>`
  - `<div id="toxics-map-container" class="embed-responsive embed-responsive-4by3">
    - `<iframe id="groundwater_maps" src="Groundwater/Nitrate.html" class="embed-responsive-item"></iframe>`
  - `</div>`
- `function jsDropDown (imgid,folder,newimg){
  document.getElementById(imgid).src= folder + "/" + newimg + ".html";
}`
Compatibility with Other Devices

One of the features of this programming code is the versatility to be displayed on a variety of devices. Below are examples of how the report appears on phones, tablets and laptops.
Bootstrap Tool

- Bootstrap is an open source toolkit for developing responsive, mobile-first websites with HTML, CSS, and JavaScript. Bootstrap is free to download and use.
- It provides basic style definitions for all HTML elements. In addition, developers can take advantage of CSS classes defined in Bootstrap to customize the appearance of their content.
- Bootstrap comes with several jQuery plugins. Each Bootstrap component consists of HTML structure, CSS declarations, and sometimes JavaScript code.
- The basic layout component is called a “Container”
- Every element on the page is placed on the container
- Using the Bootstrap Fluid Container, Bootstrap will figure out how wide the screen is and response by resizing your HTML elements.
- With this responsive design, there is no need to design a mobile version of your website.
- You can add Bootstrap to any app by adding the following code at the top of your HTML.

```html
<!-- Bootstrap Core CSS -->
<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/twitter-bootstrap/3.4.0/css/bootstrap.min.css" integrity="sha256-H0KfTigpUV+0/5tn2HXC0CPwhhDhWgSawJdnFd0CGCo=" crossorigin="anonymous" />
```
Place cursor on element and right click. Select Inspect element from popup.