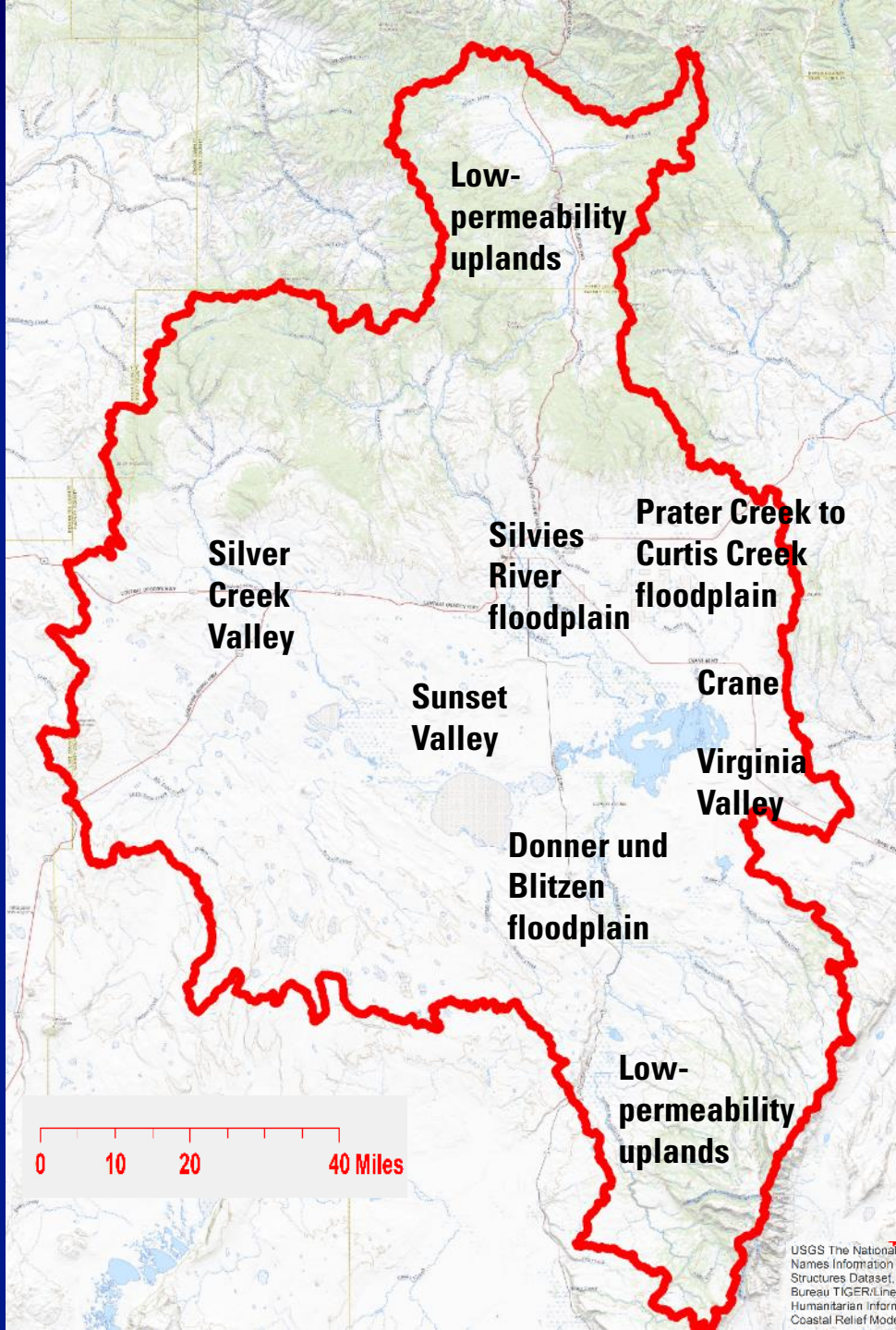


A Tour of Harney Basin Hydrology

Harney Basin Study Advisory Committee
December 12, 2019

U.S. Geological Survey/Oregon Water Resources Department

Selected areas of Harney Basin

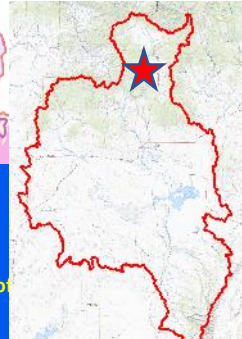
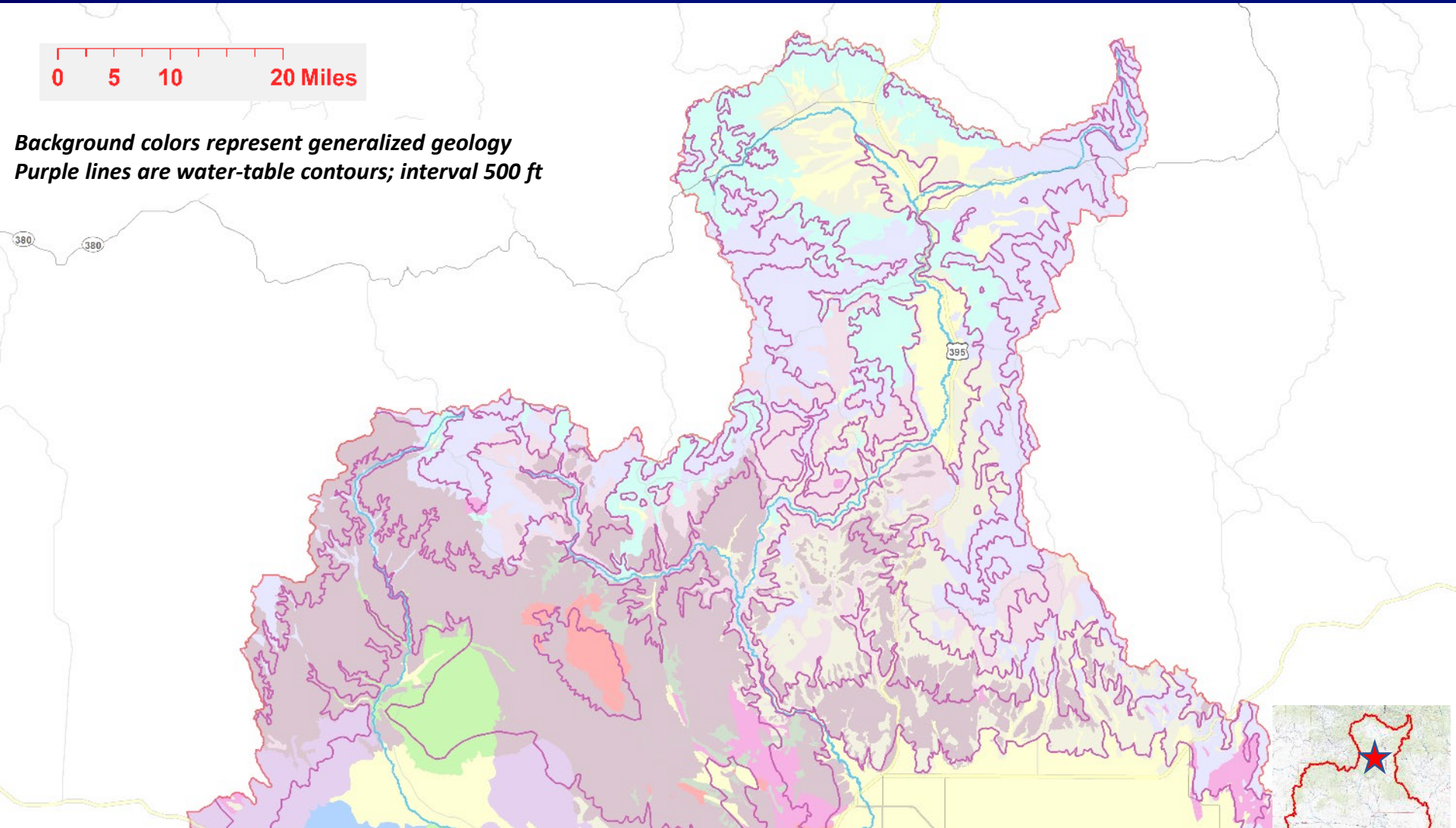


USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land-Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed August, 2013.

Low-permeability uplands



*Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft*

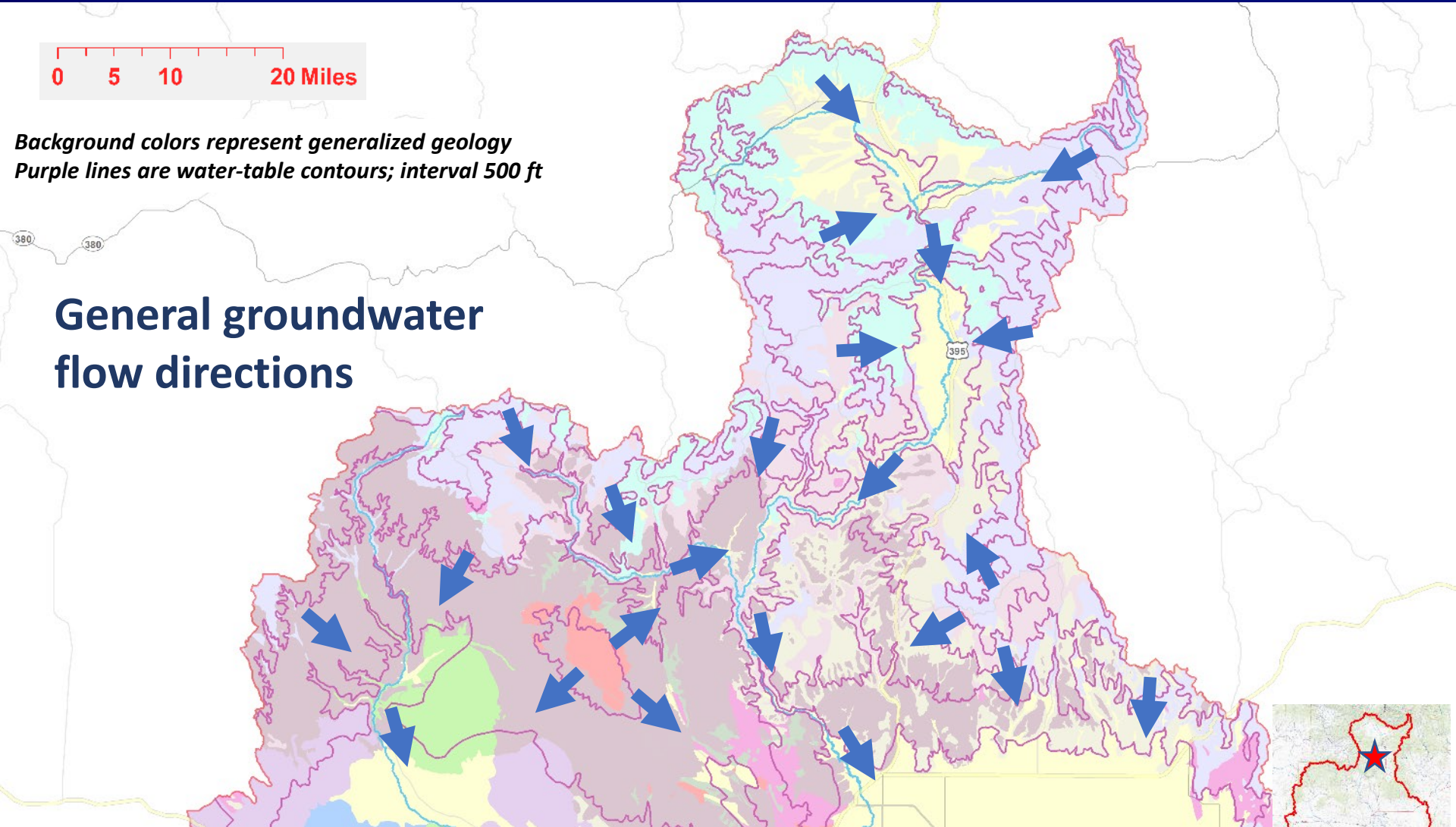


Low-permeability uplands

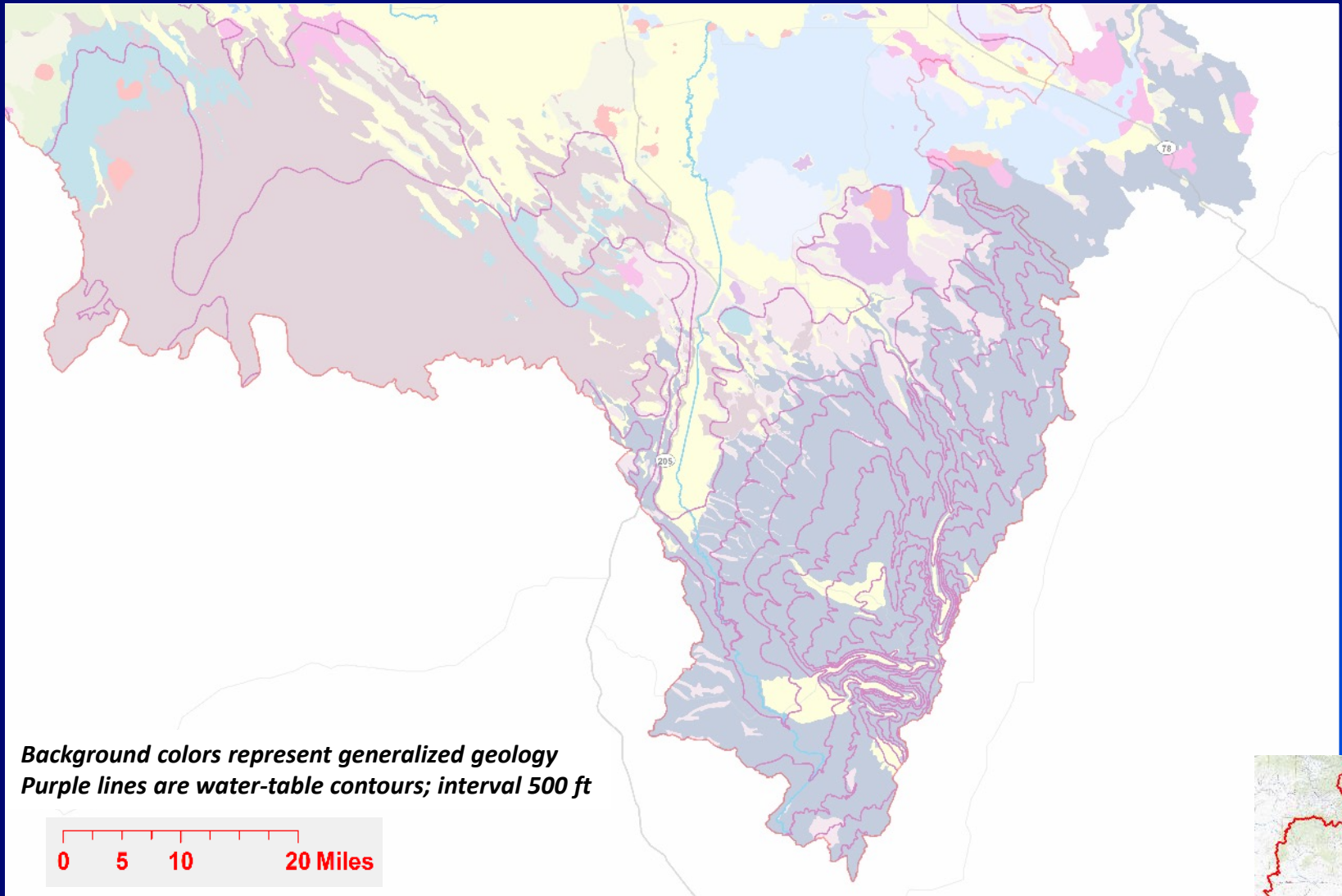
0 5 10 20 Miles

*Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft*

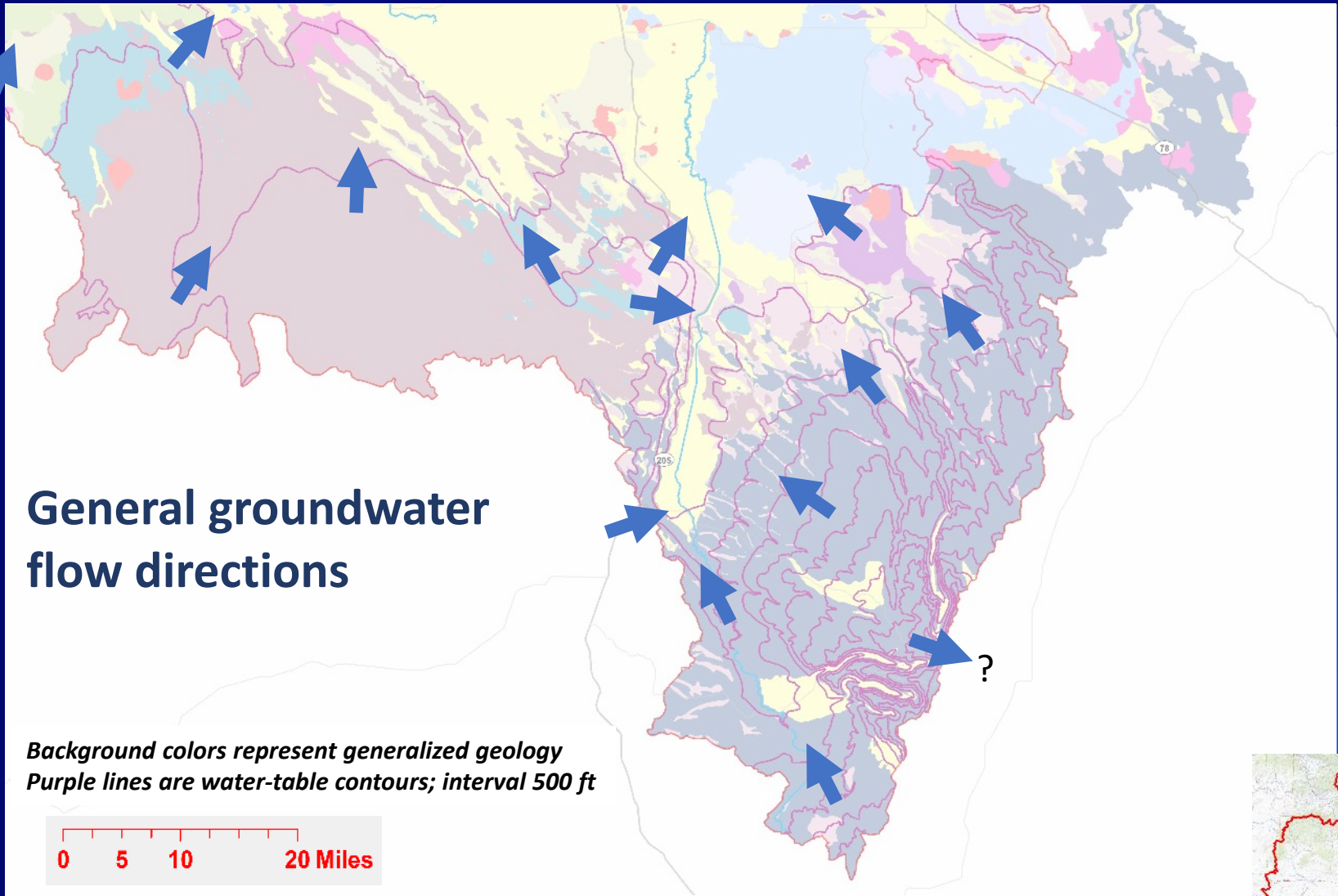
**General groundwater
flow directions**



Low-permeability uplands



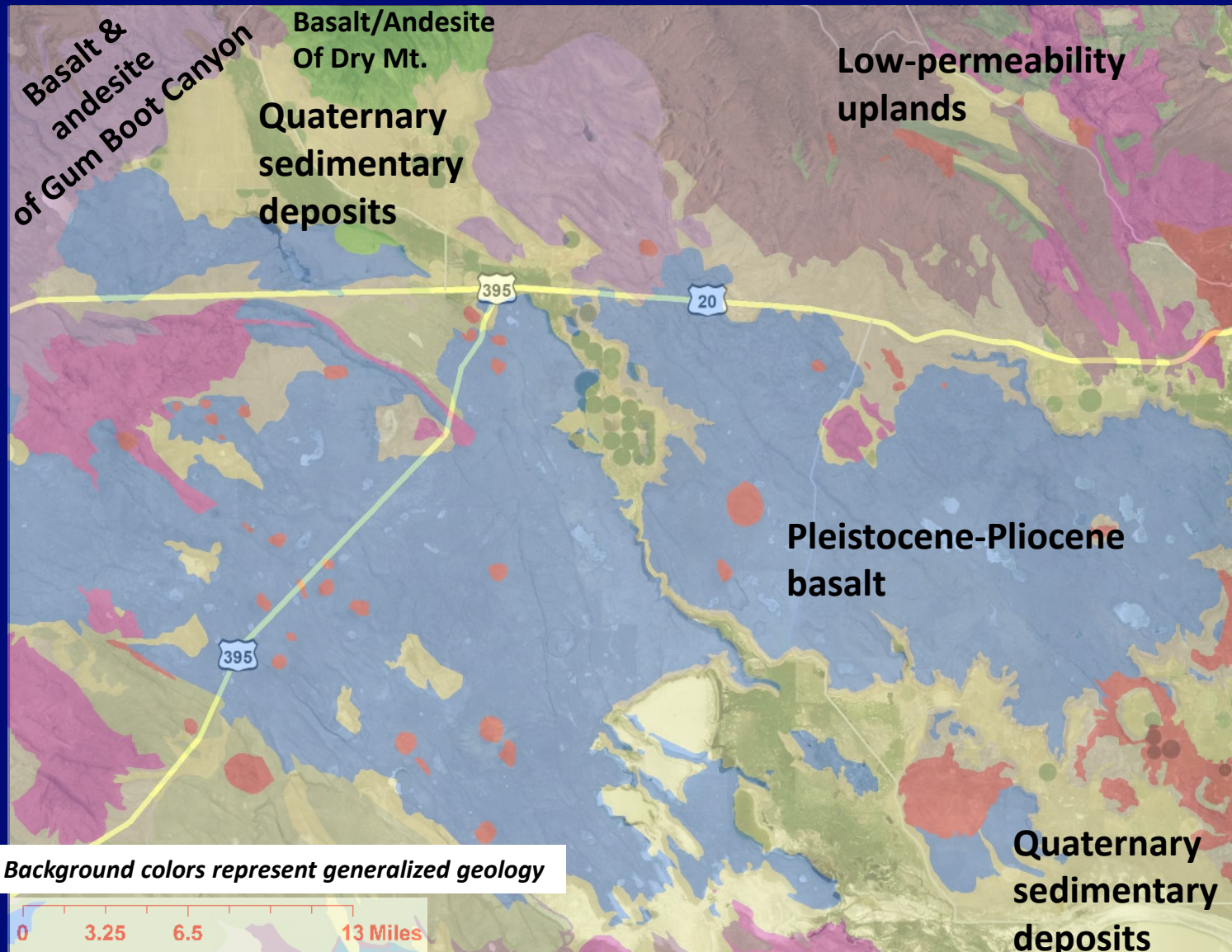
Low-permeability uplands



Silver Creek Valley

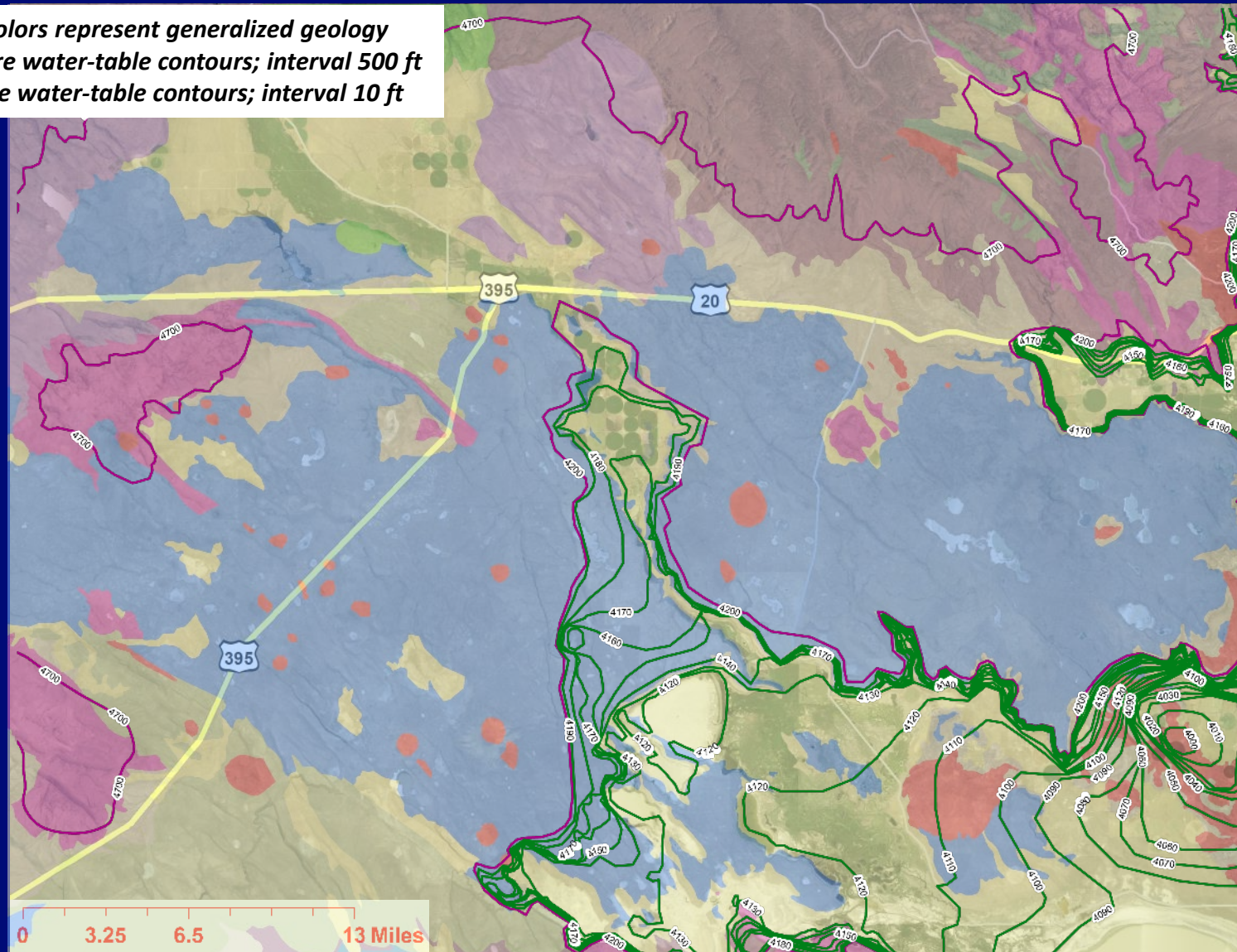


Silver Creek Valley



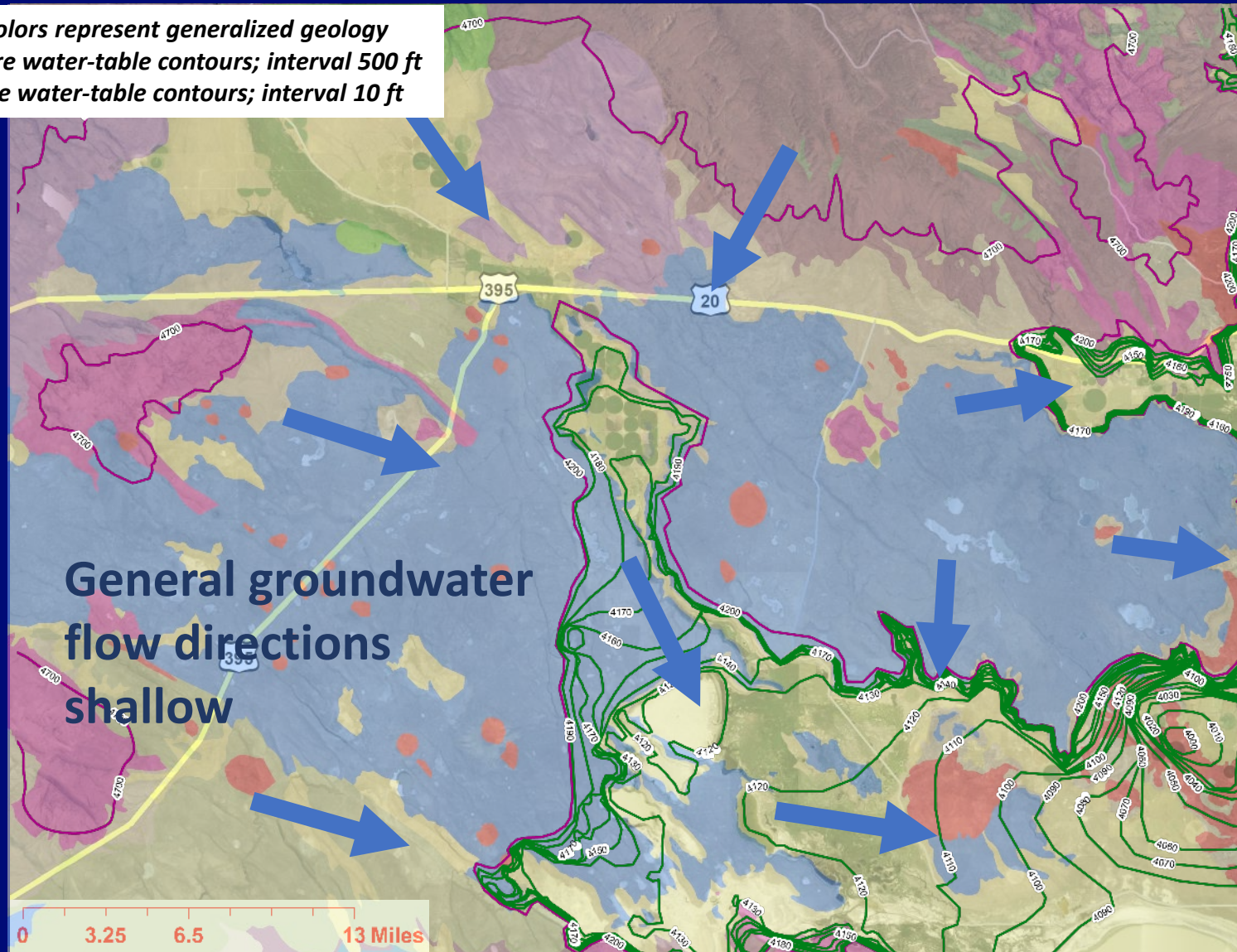
Silver Creek Valley

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Silver Creek Valley

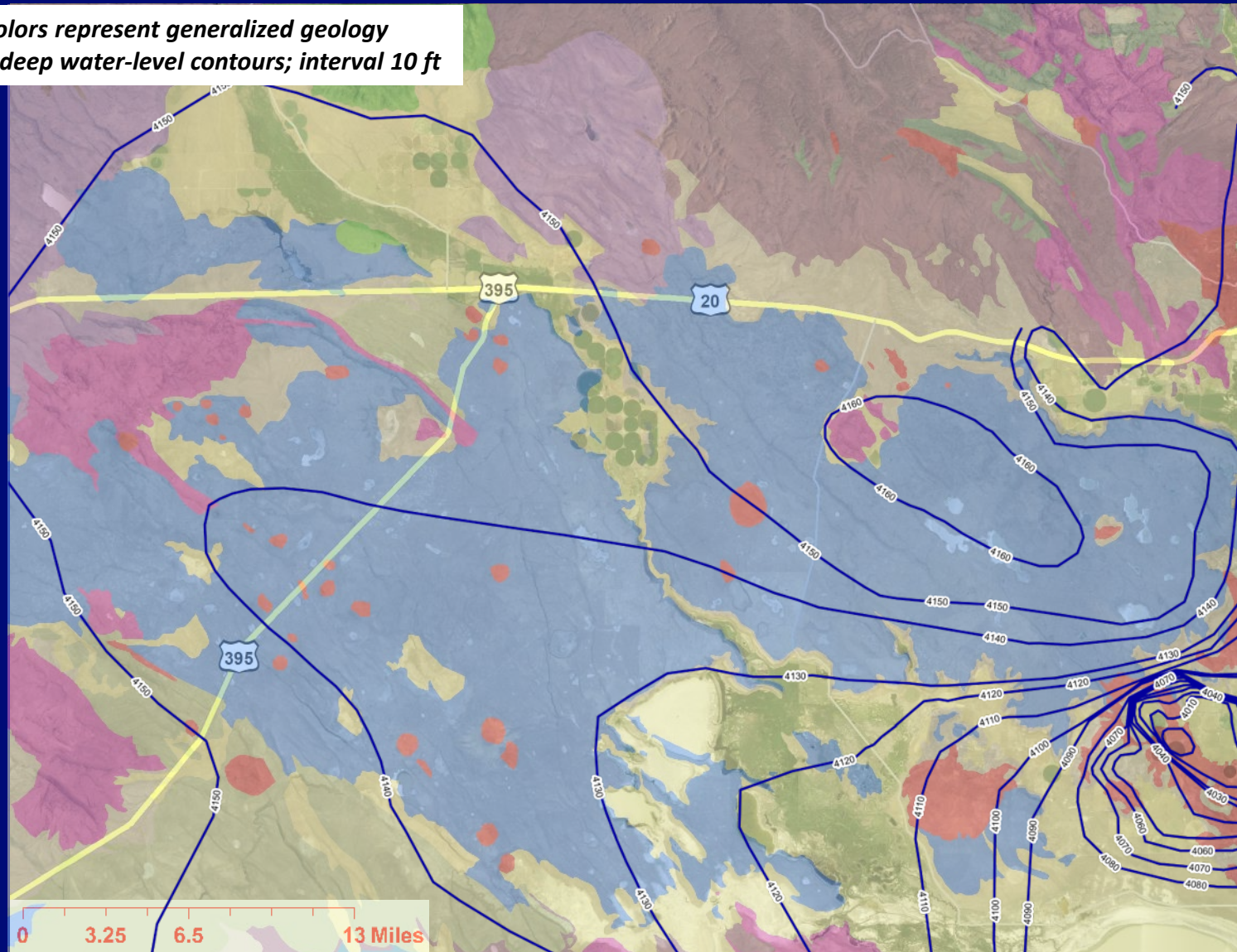
Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



General groundwater
flow directions
shallow

Silver Creek Valley

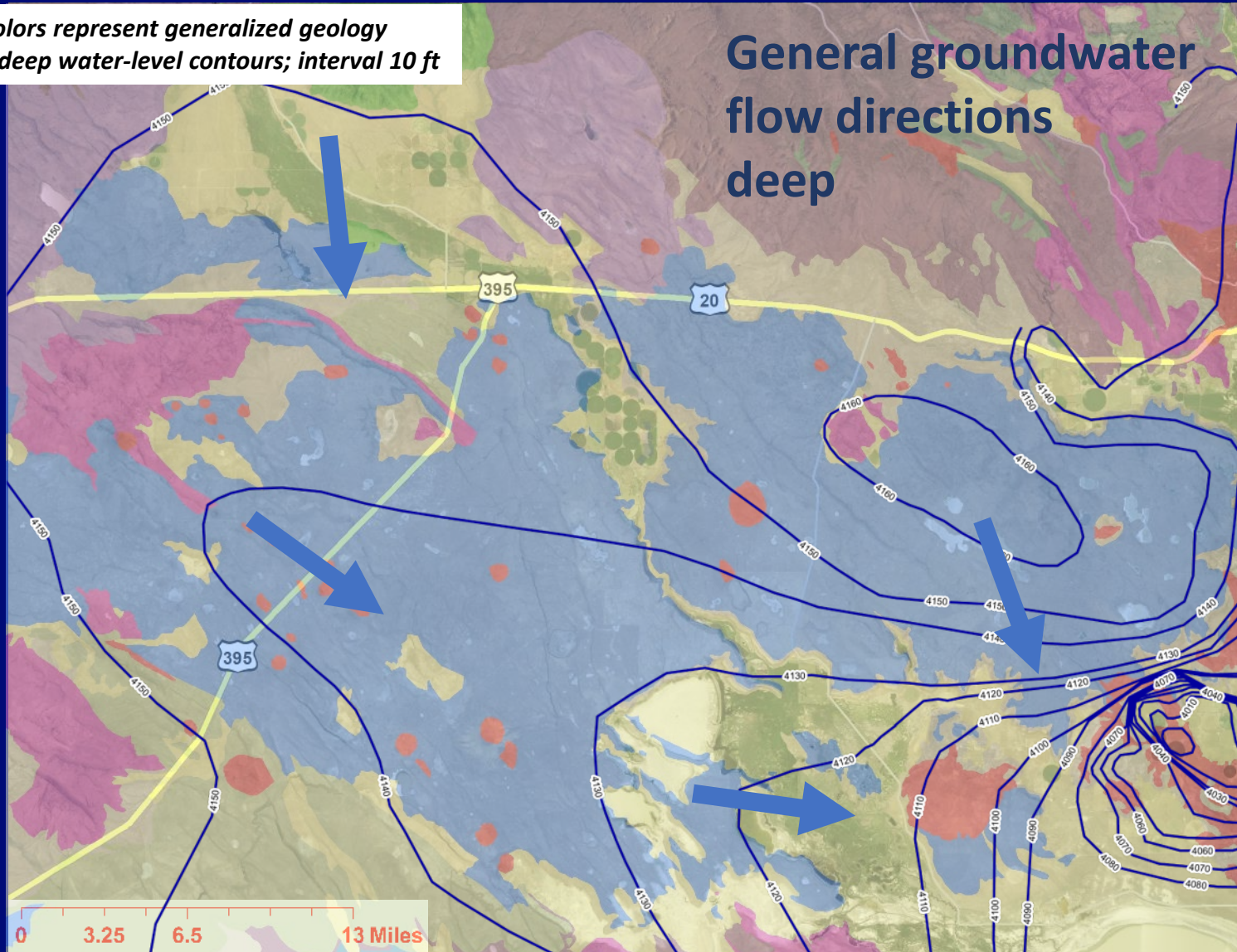
Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



Silver Creek Valley

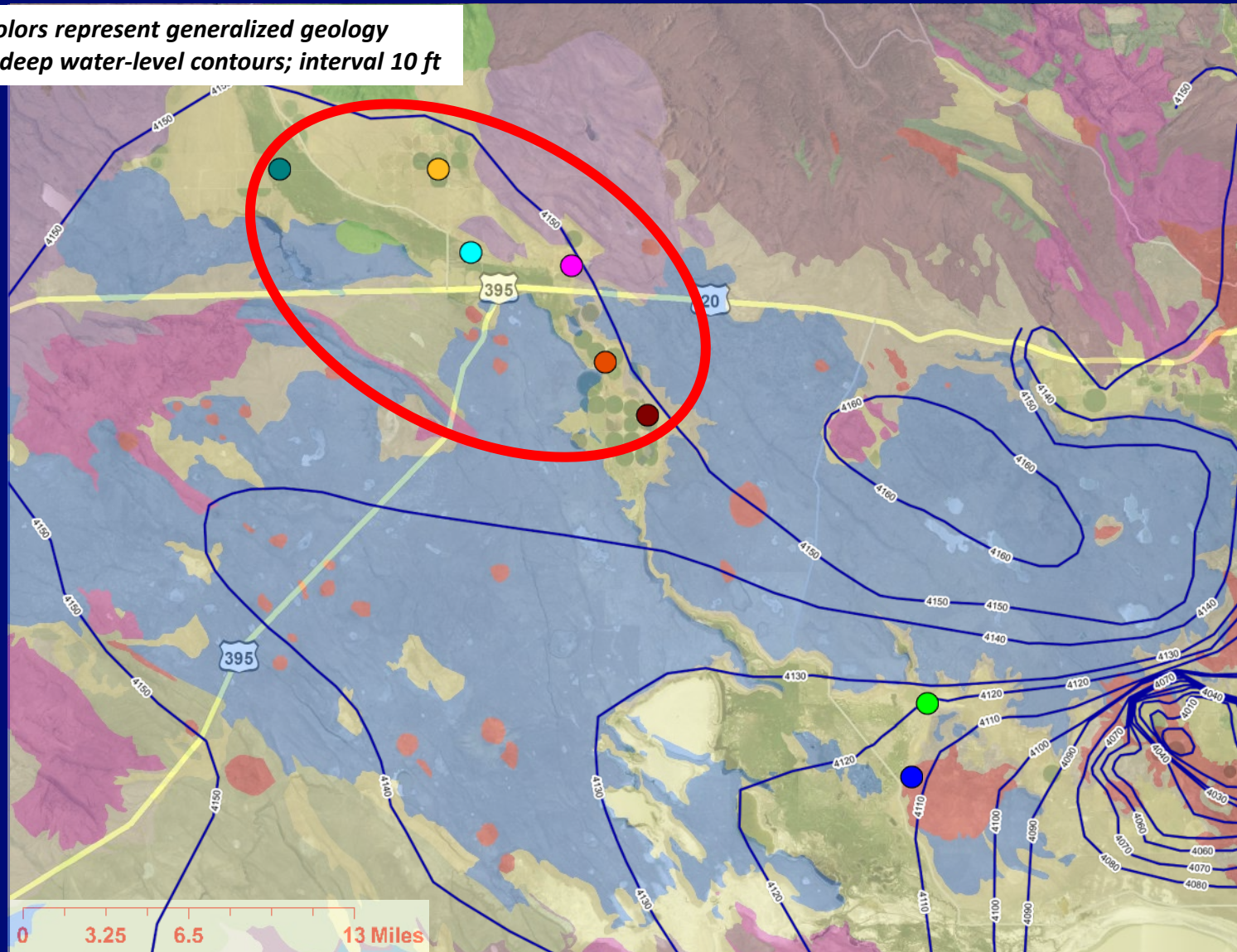
Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

General groundwater
flow directions
deep

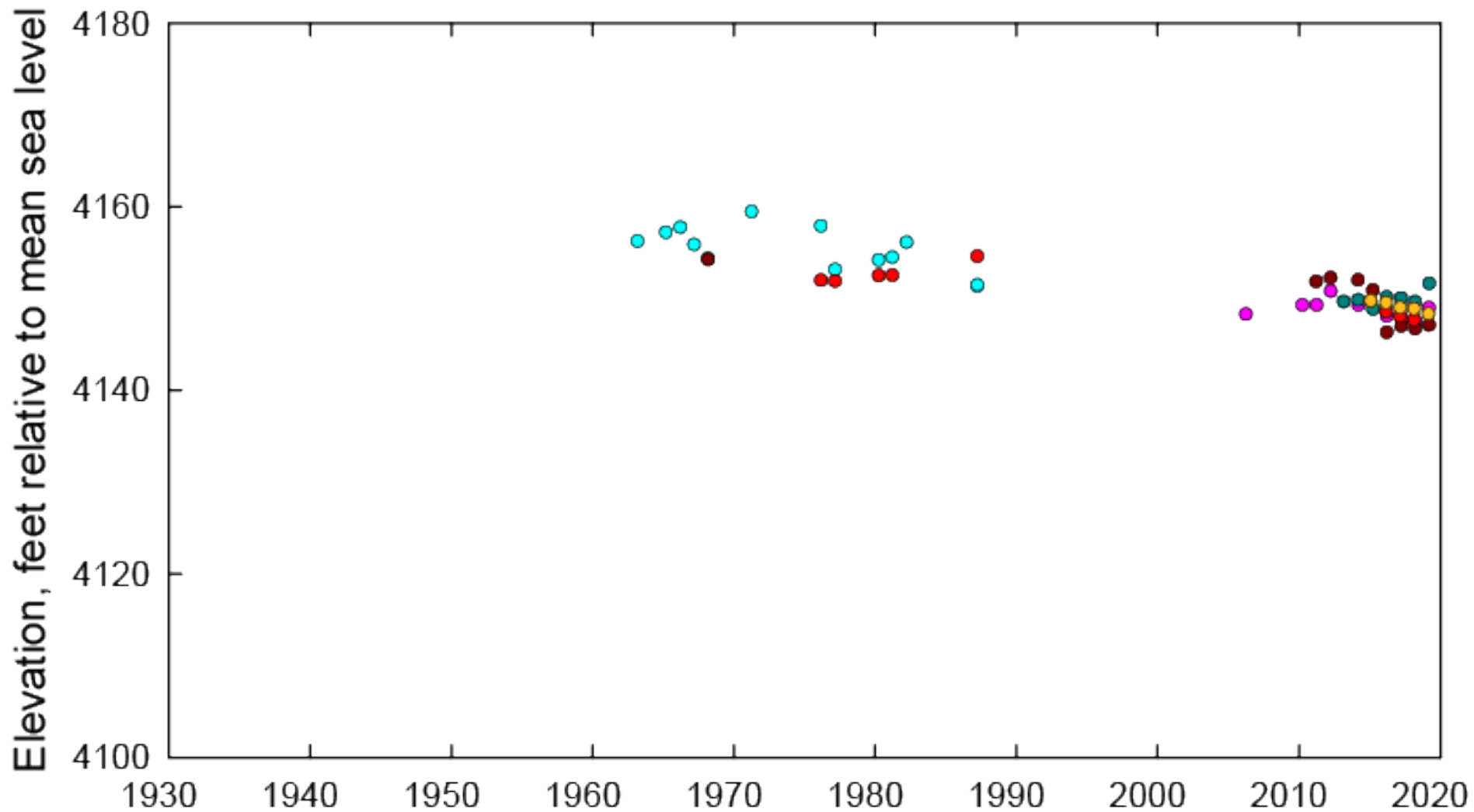


Silver Creek Valley

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

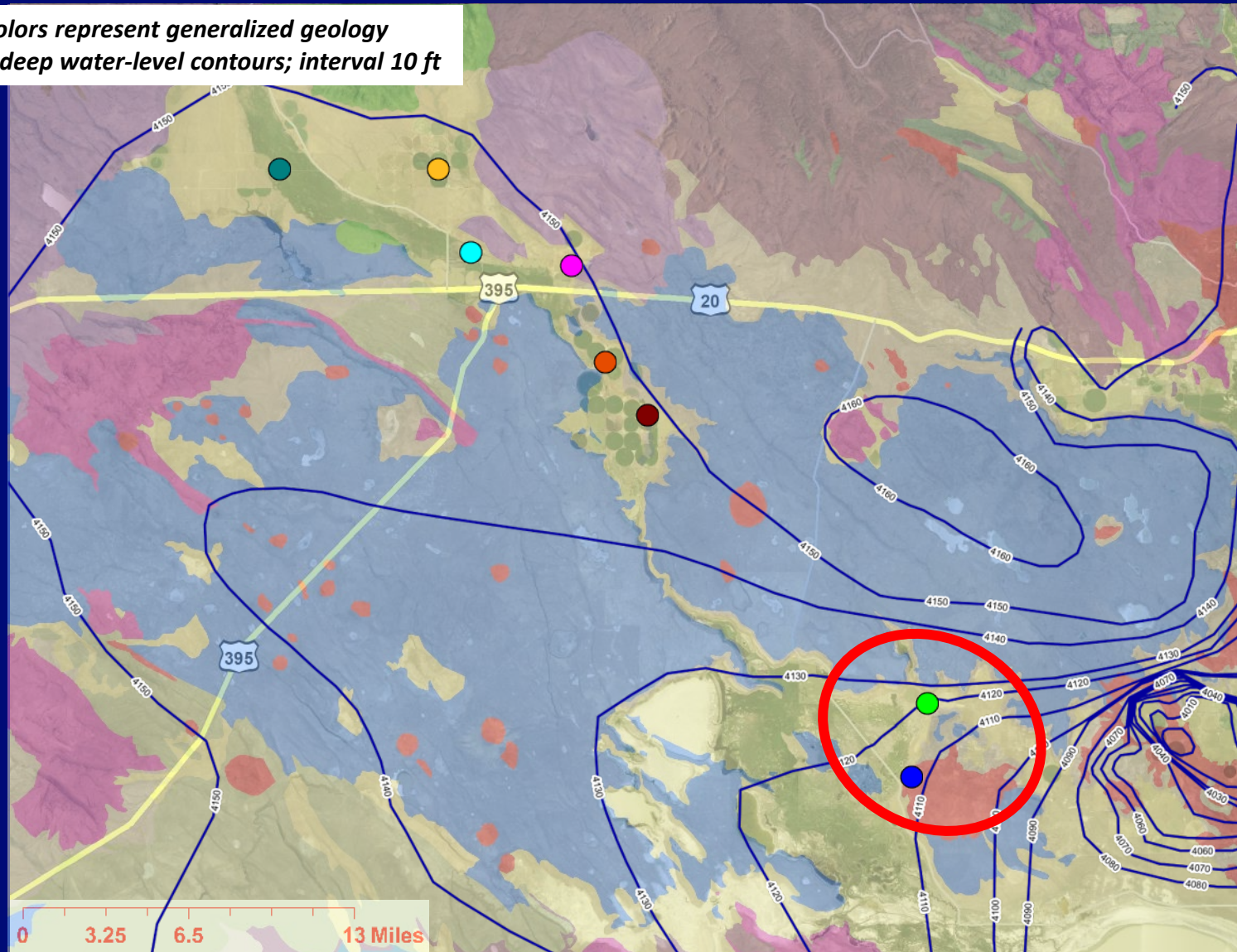


Silver Creek Valley

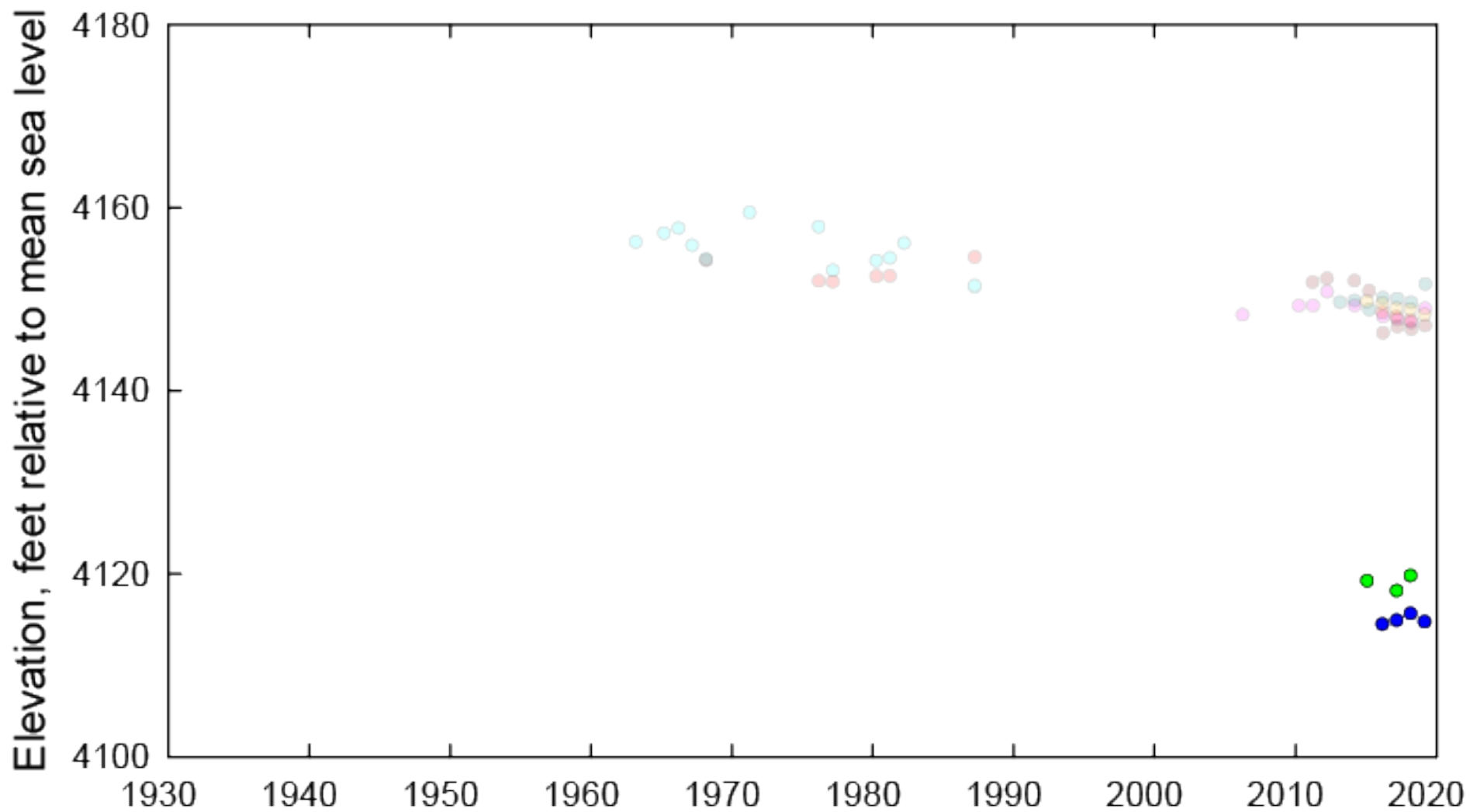


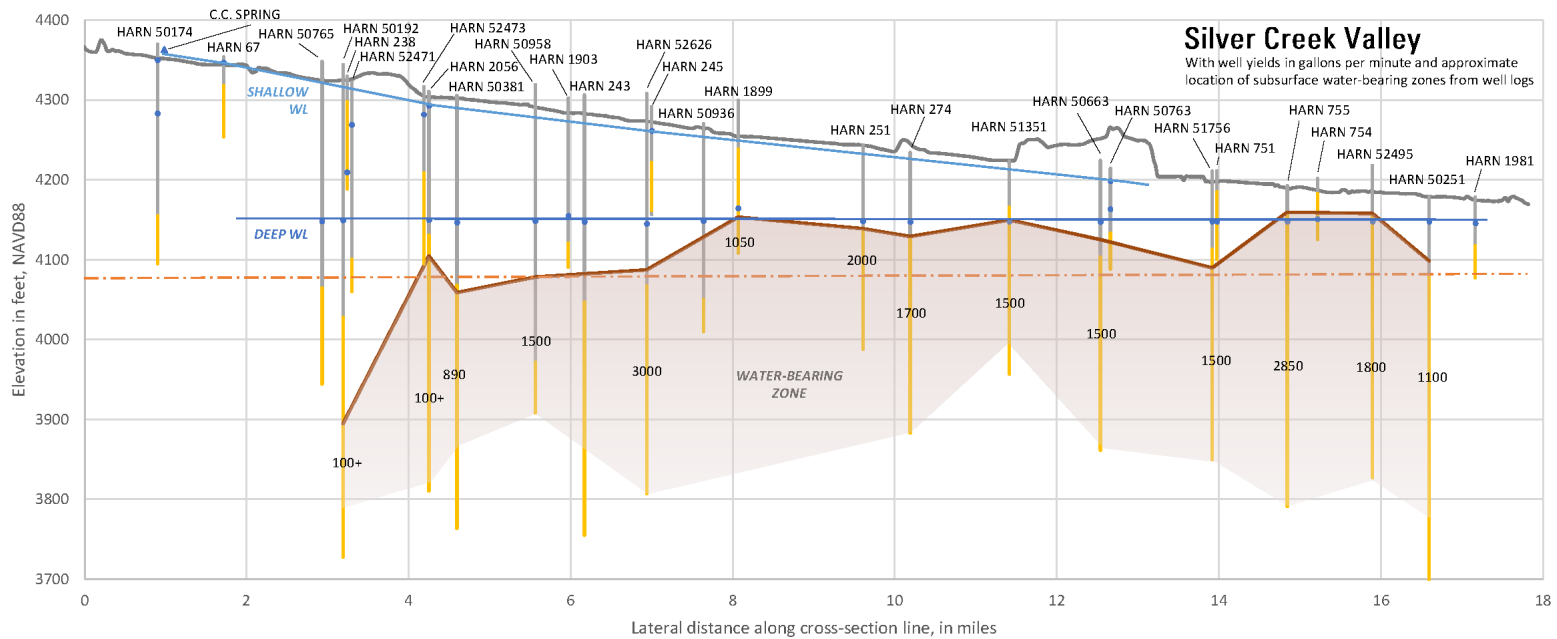
Silver Creek Valley

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

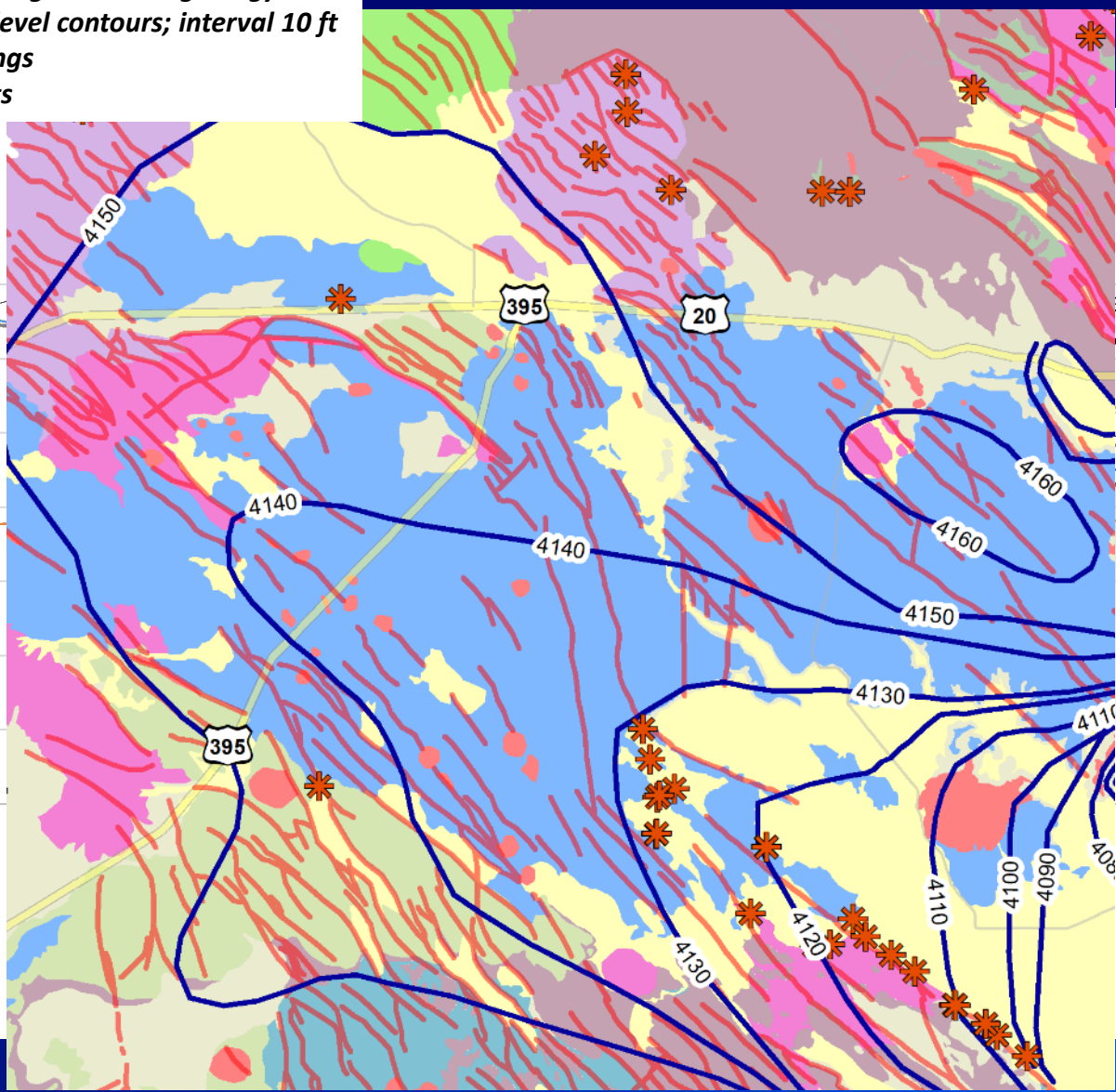
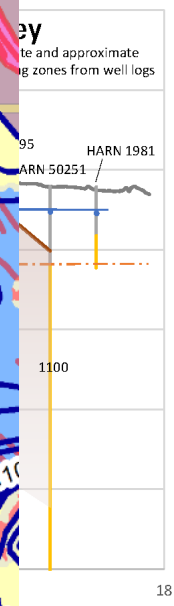
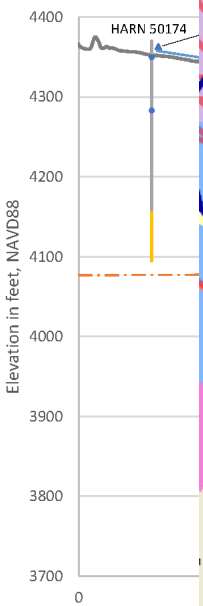


Silver Creek Valley

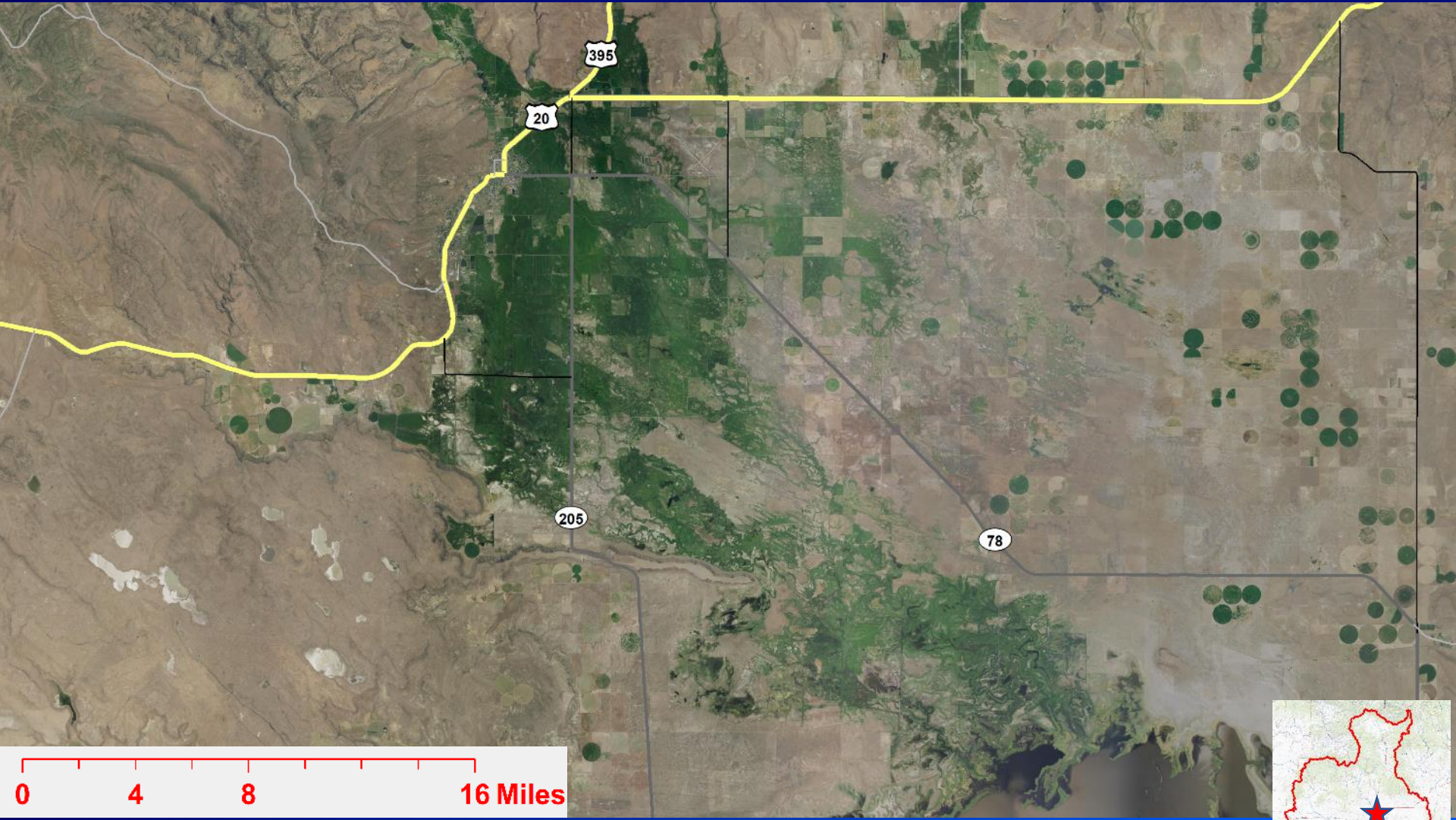




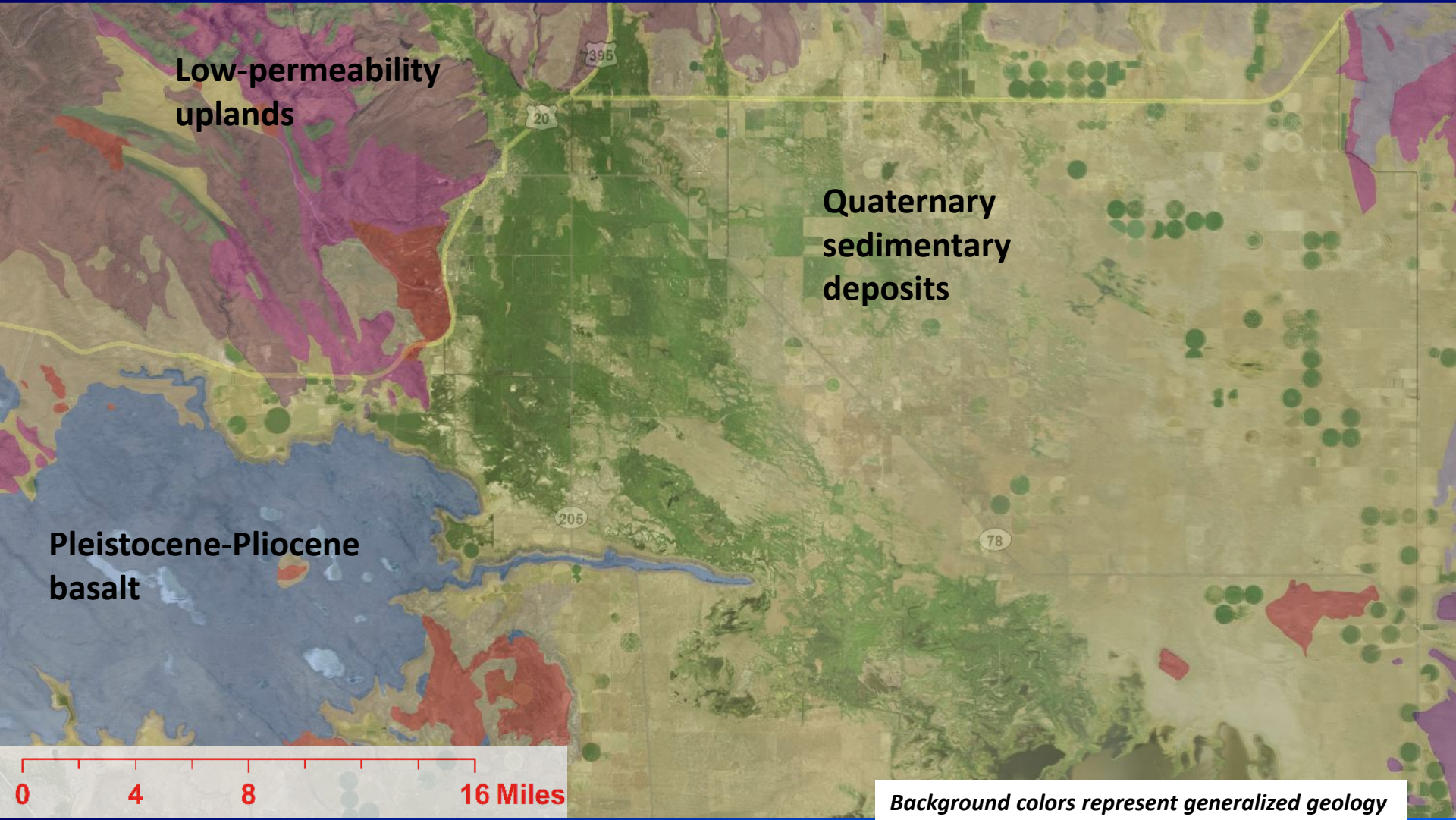
Background colors represent generalized geology
 Blue lines are deep water-level contours; interval 10 ft
 Red stars are mapped springs
 Red lines are mapped faults



Silvies River floodplain

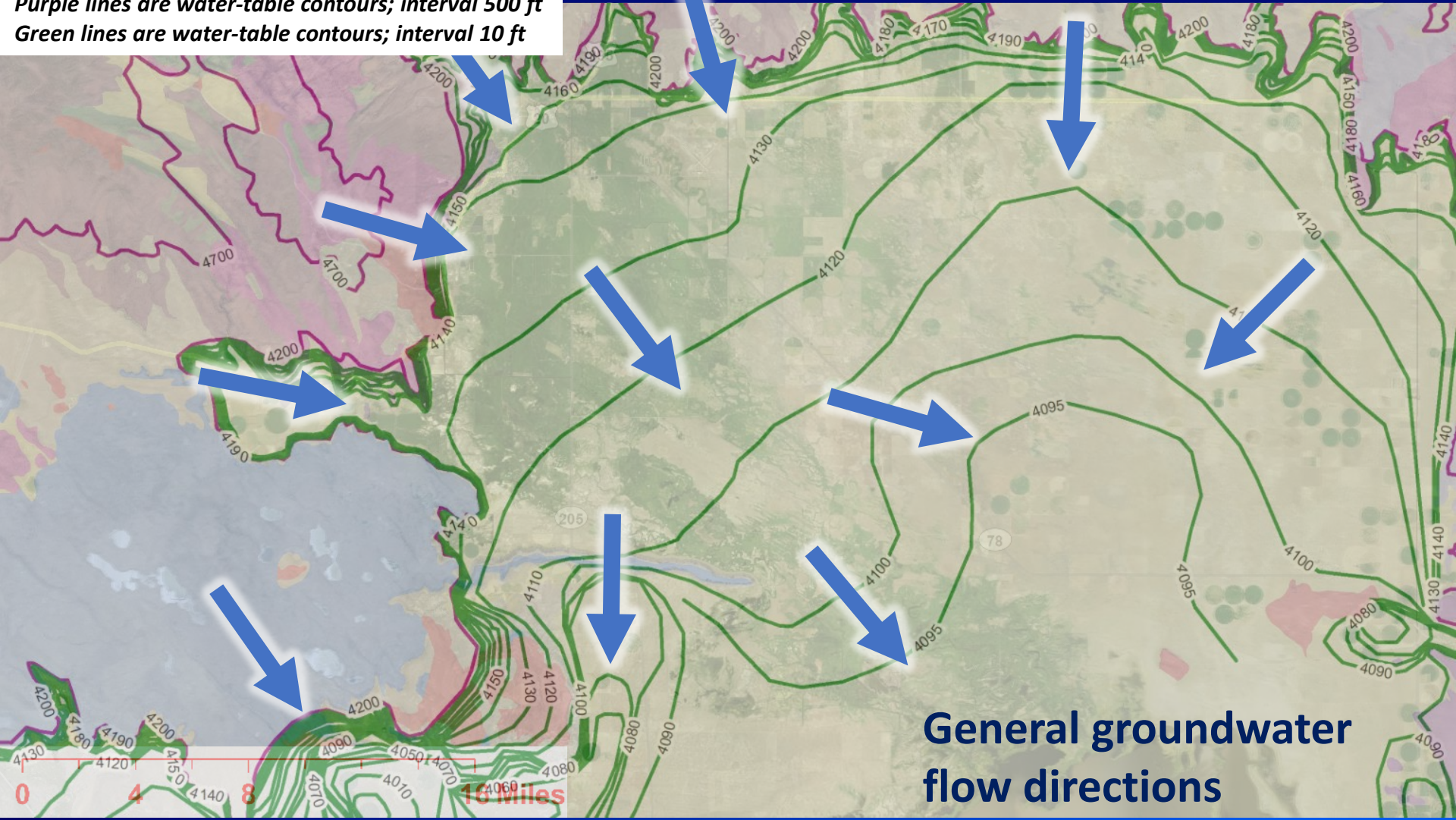


Silvies River floodplain



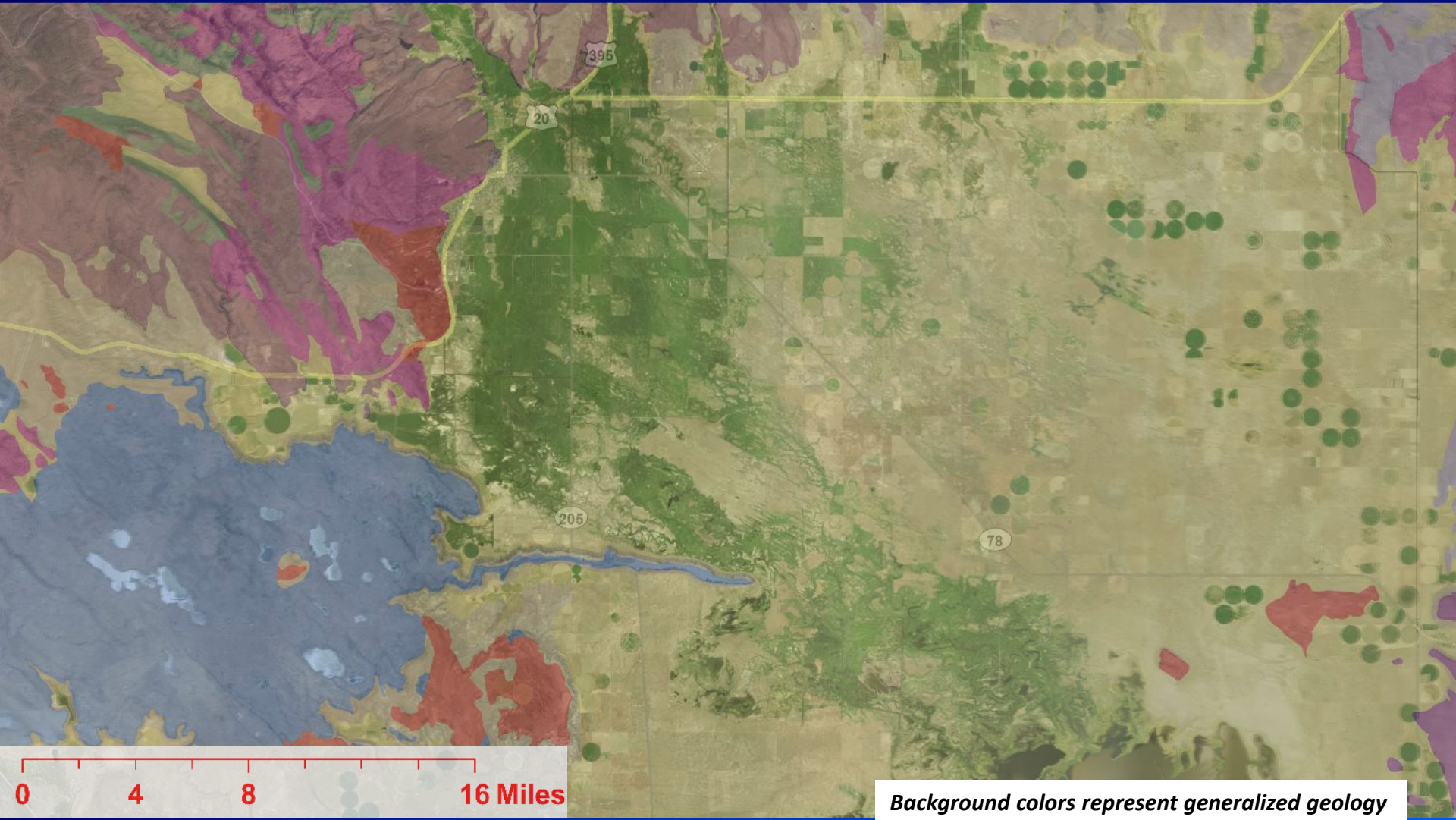
Silvies River floodplain

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



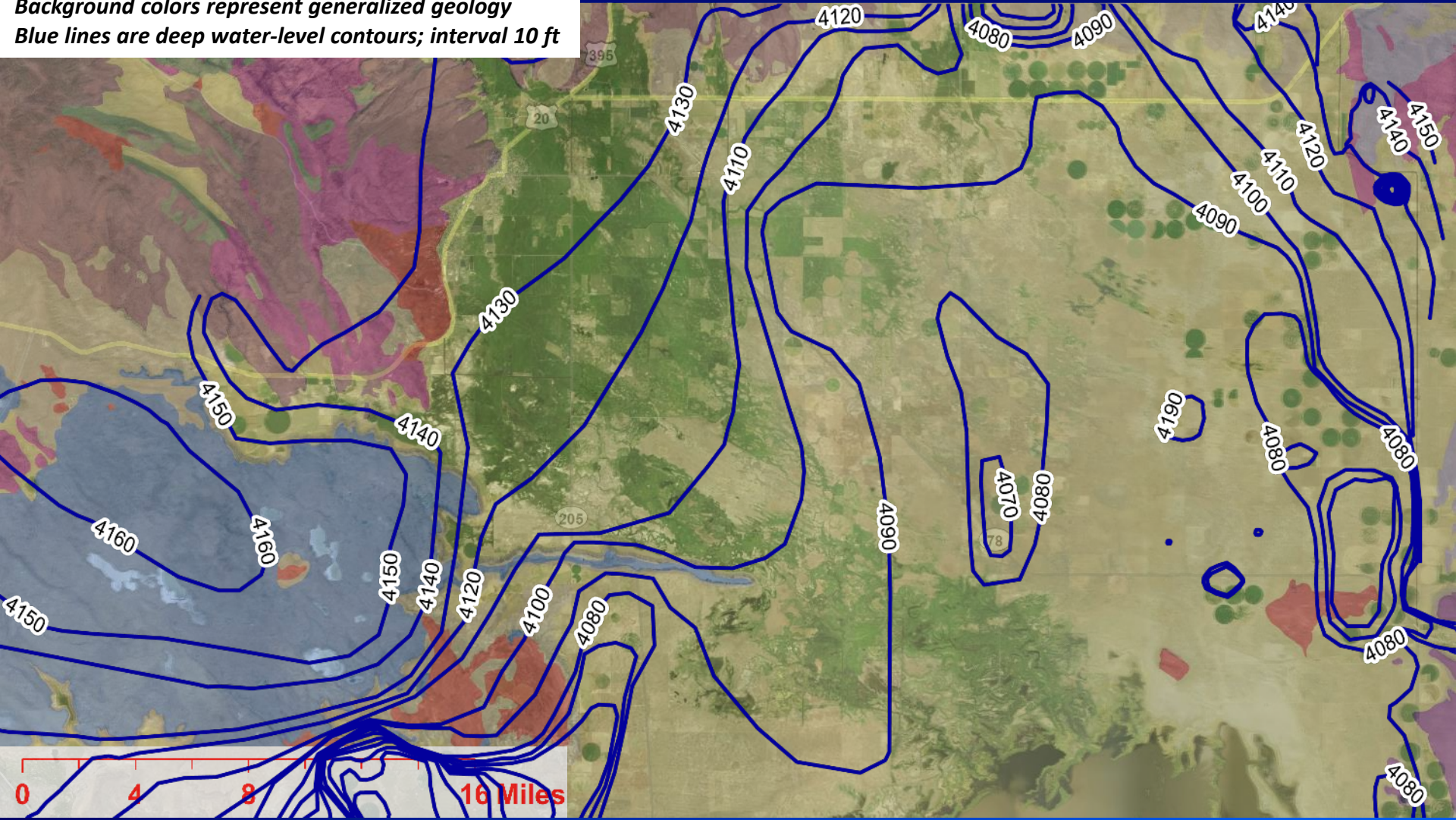
**General groundwater
flow directions**

Silvies River floodplain



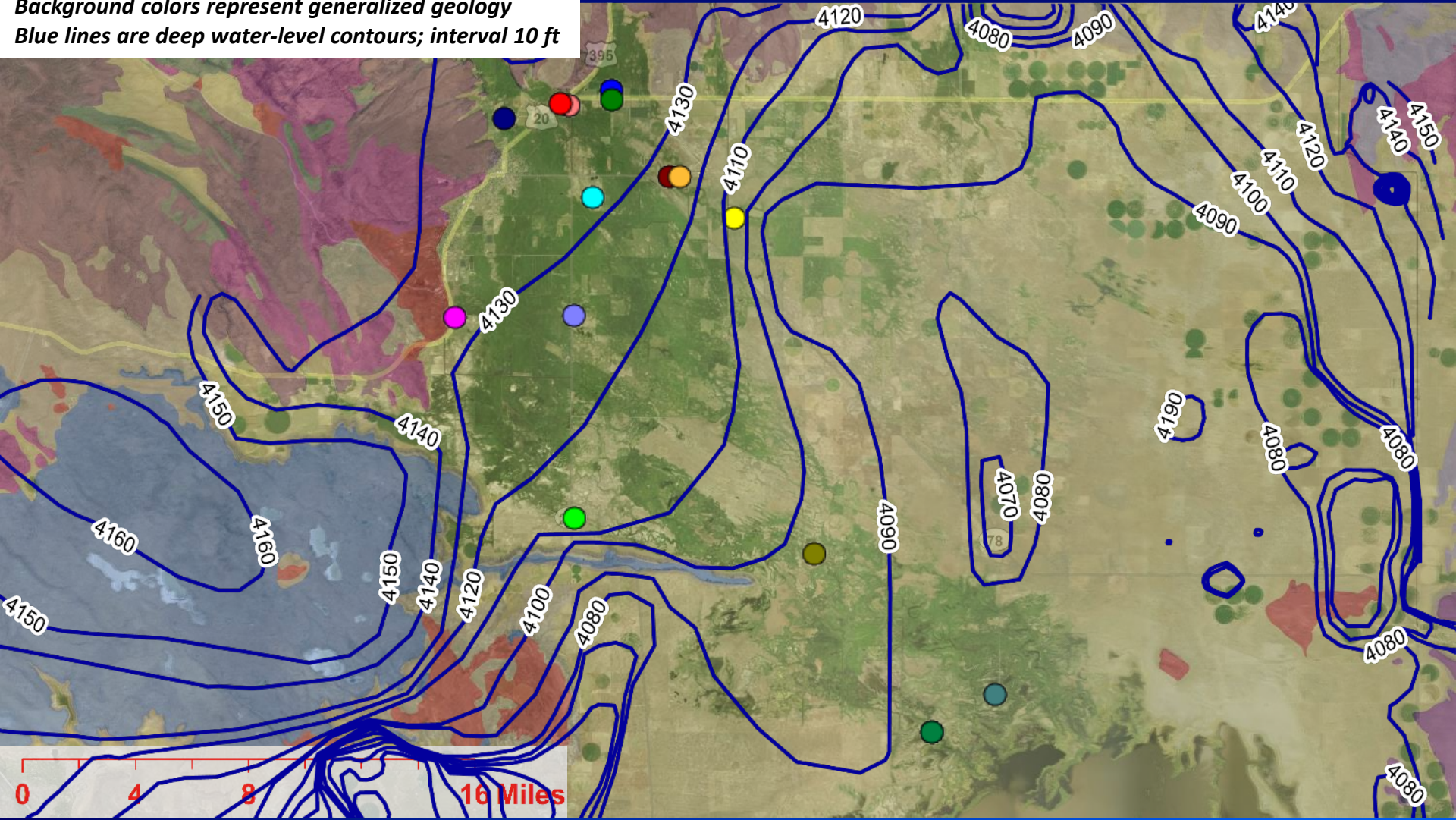
Silvies River floodplain

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



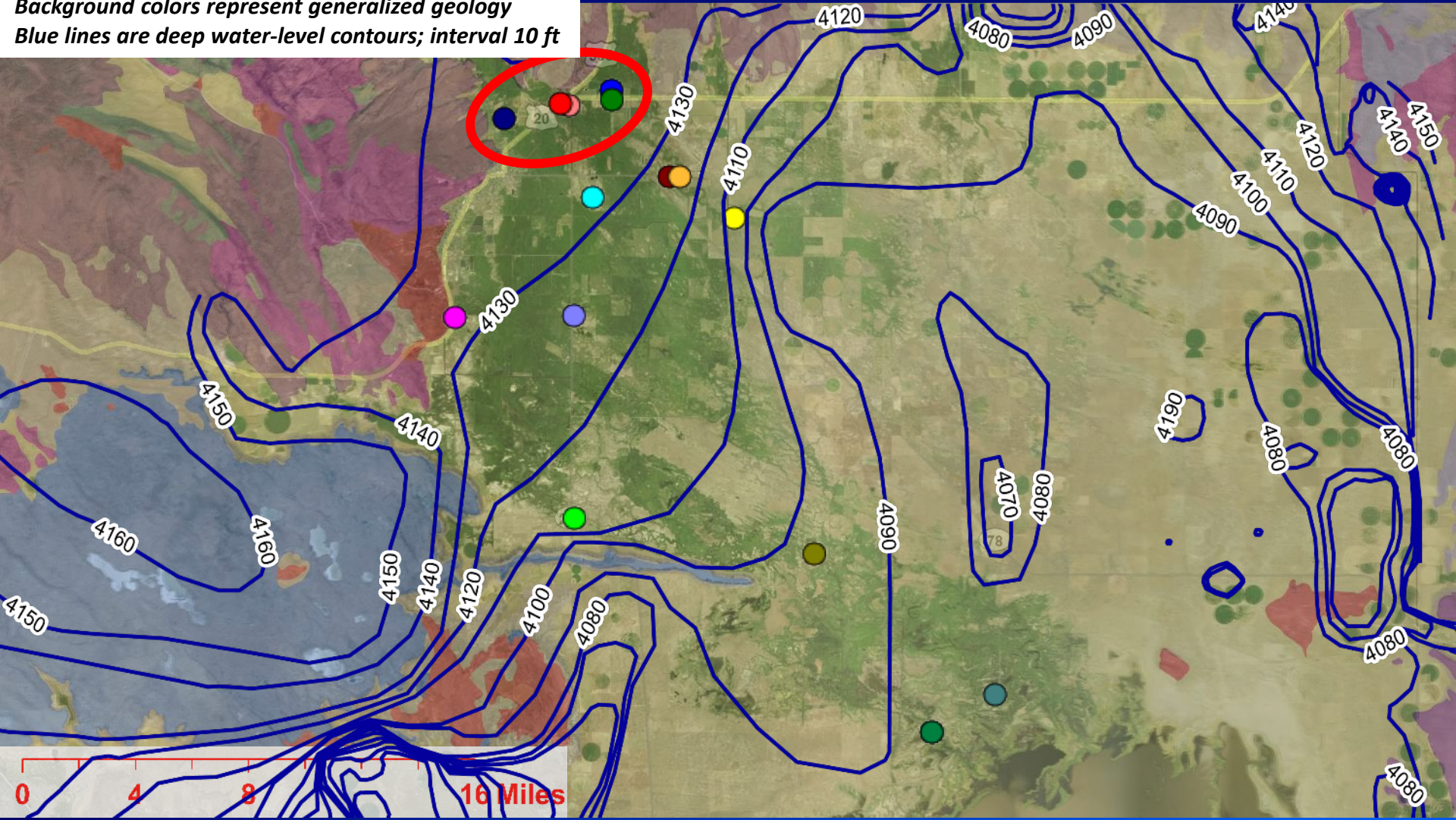
Silvies River floodplain

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Blue lines are deep water-level contours; interval 10 ft



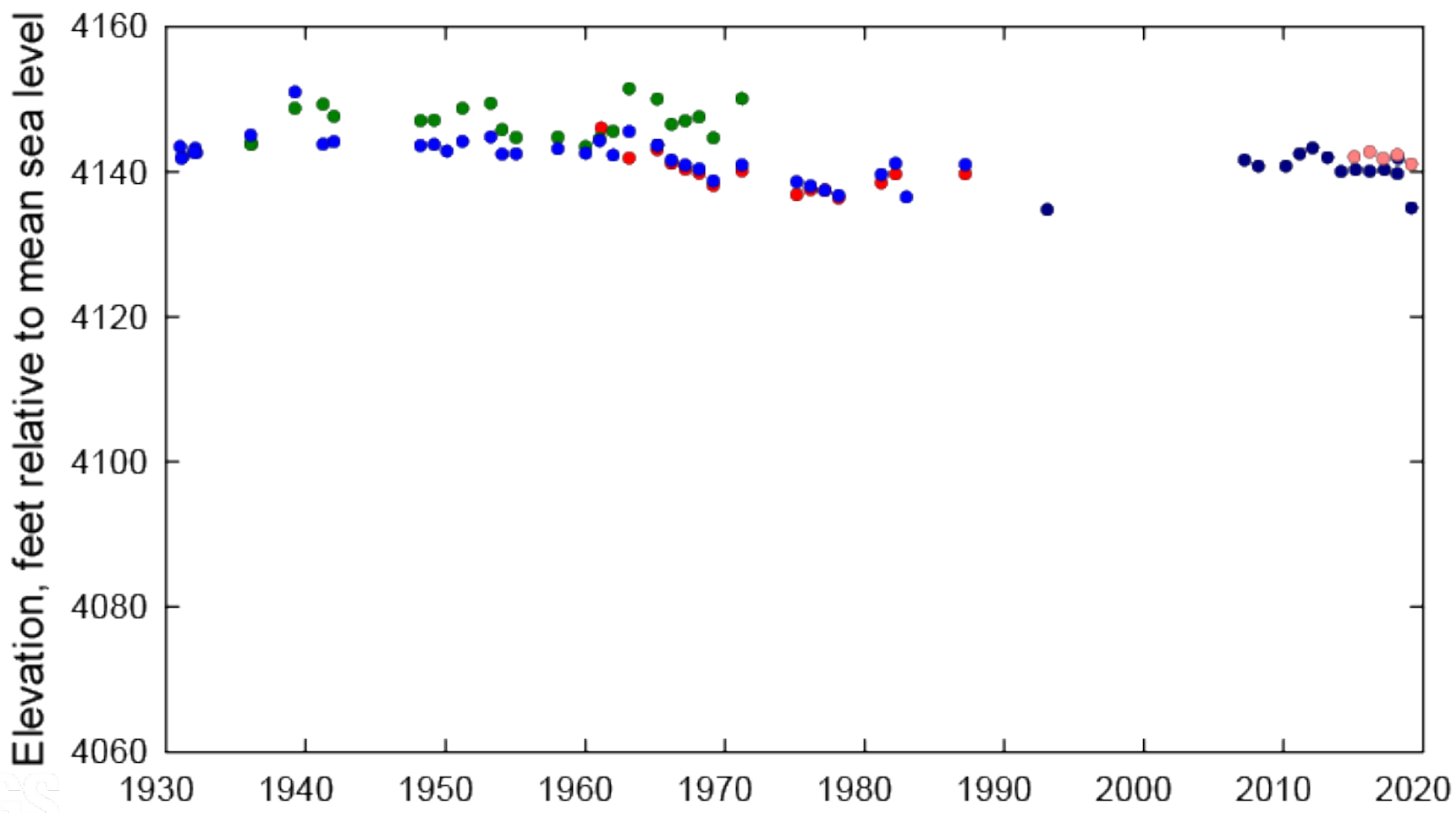
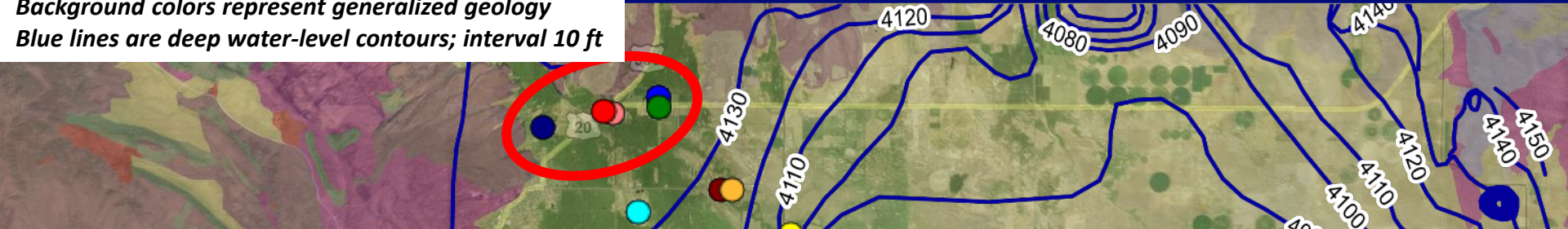
Silvies River floodplain

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



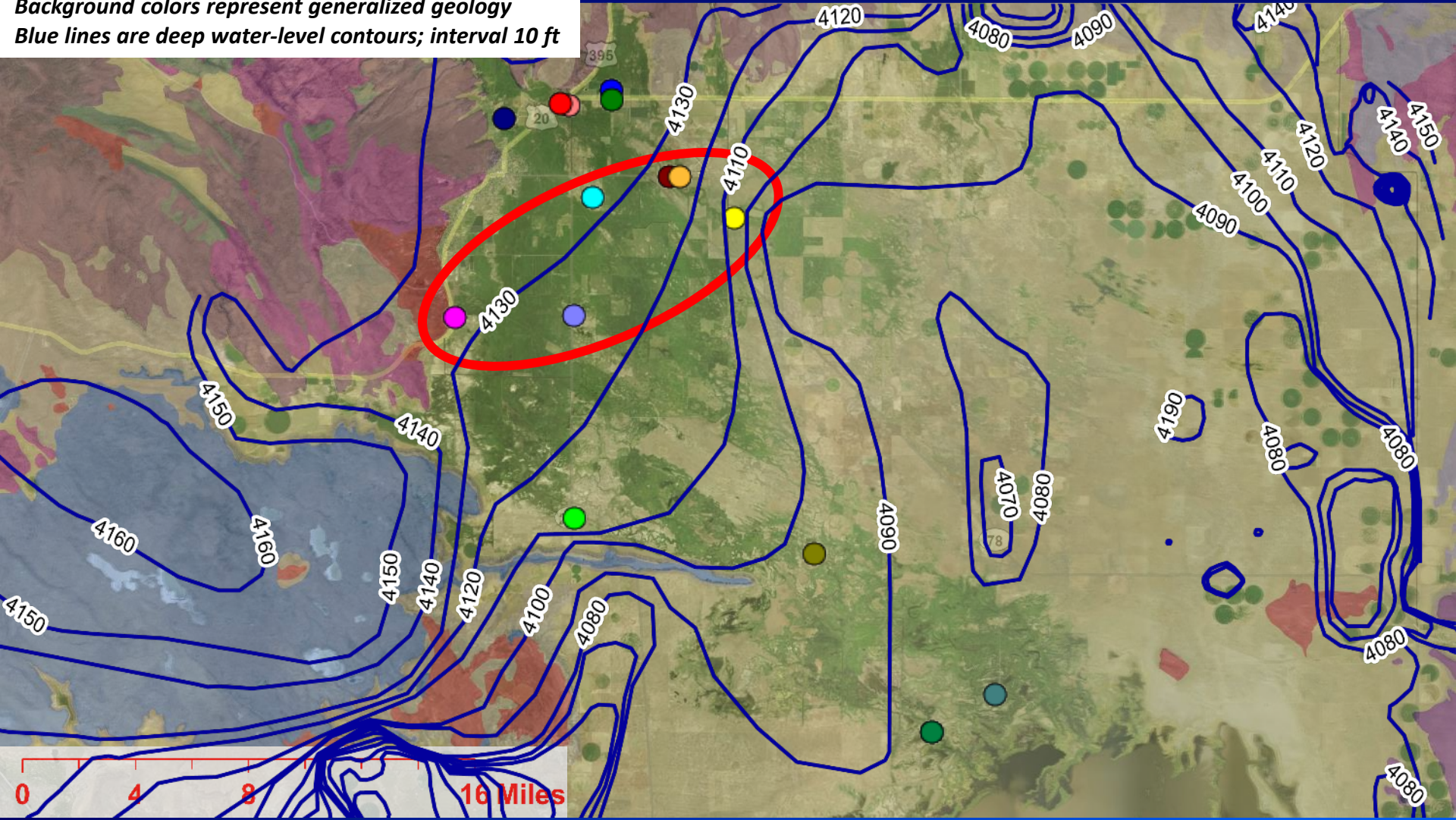
Silvies River floodplain

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



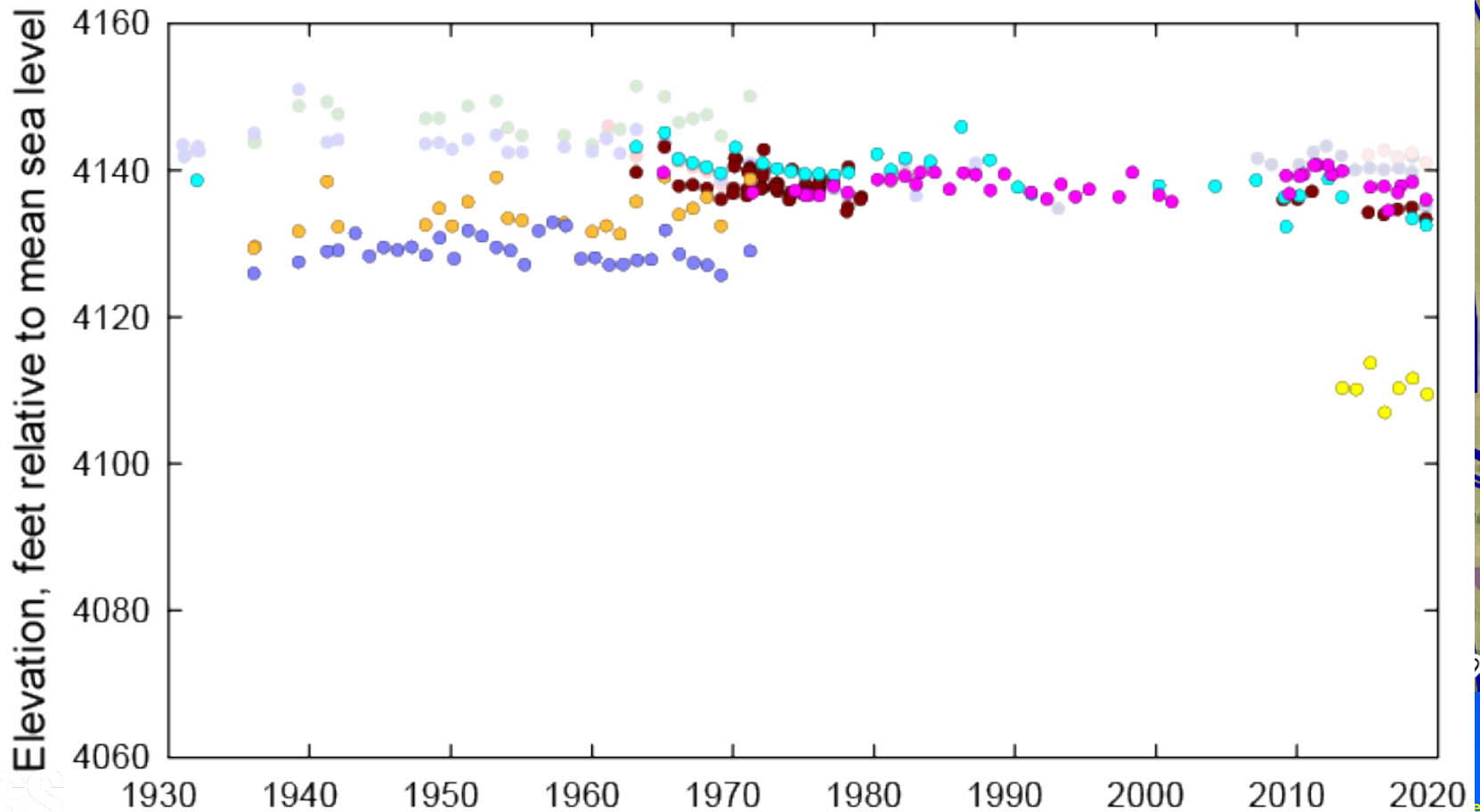
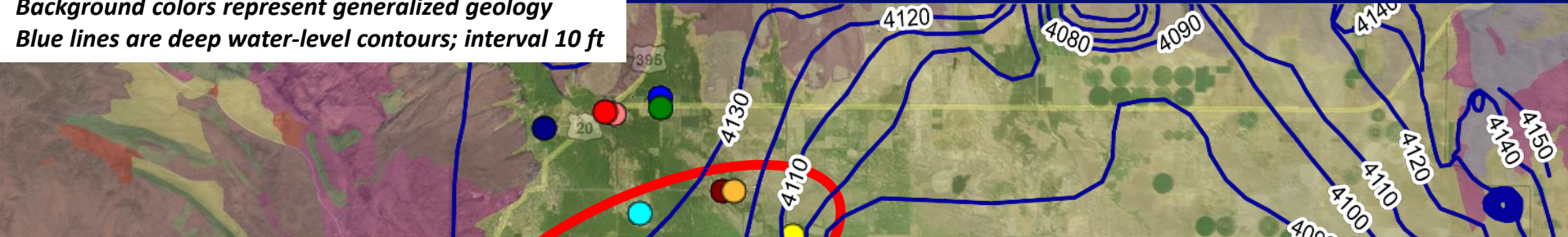
Silvies River floodplain

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



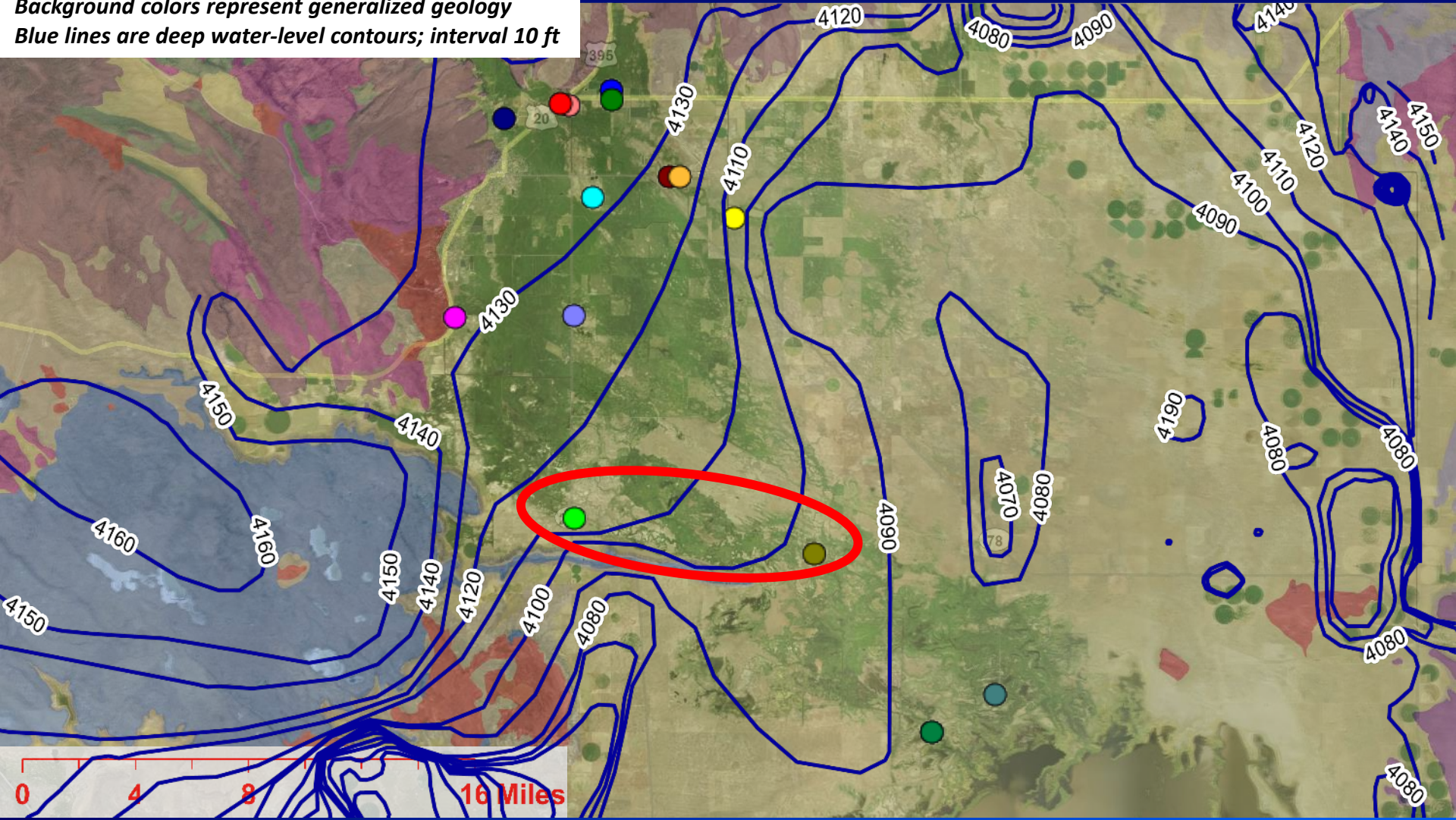
Silvies River floodplain

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



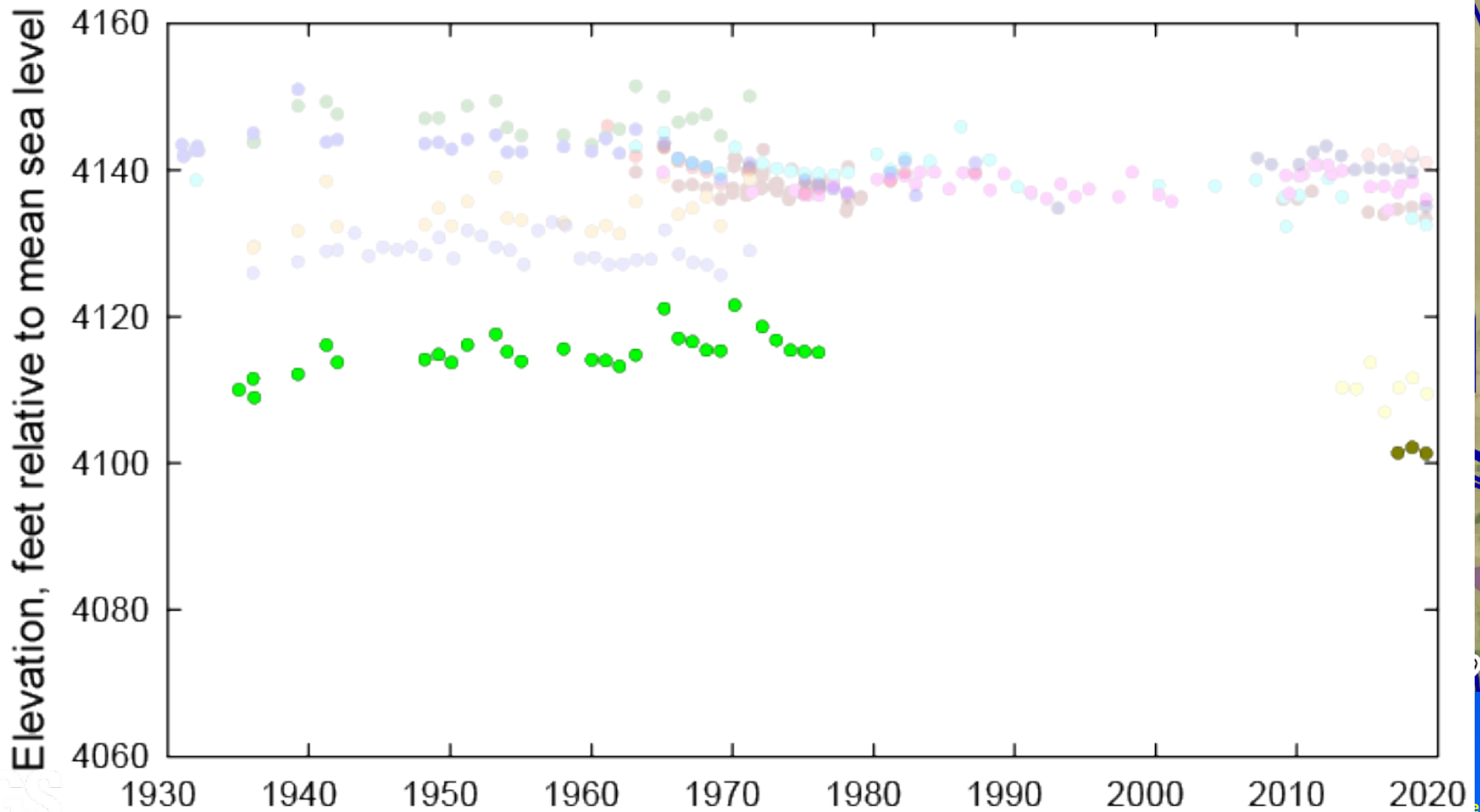
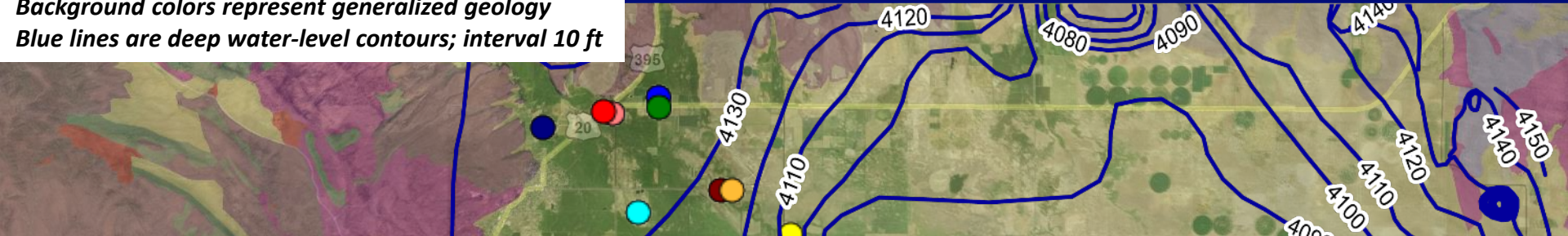
Silvies River floodplain

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



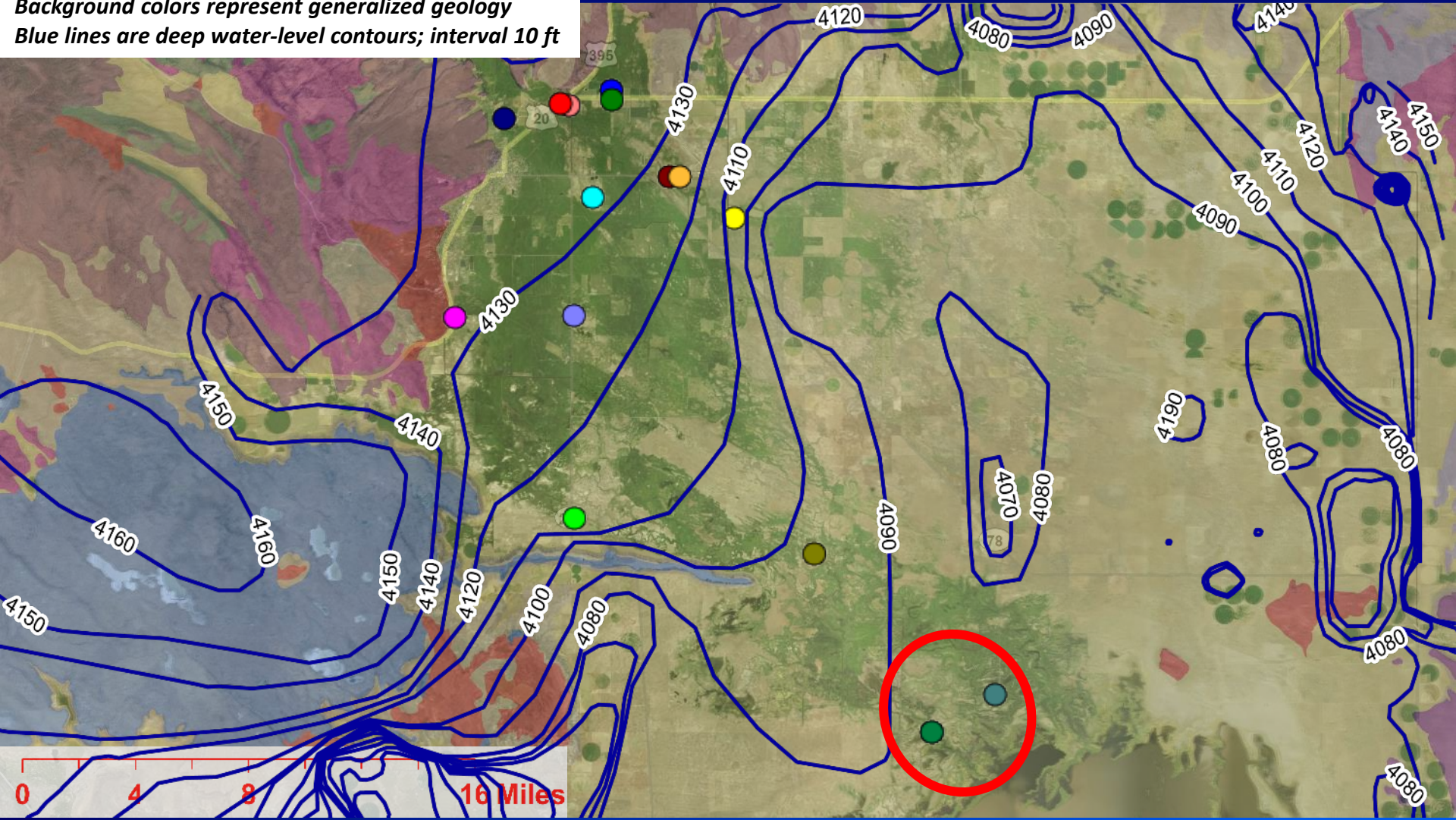
Silvies River floodplain

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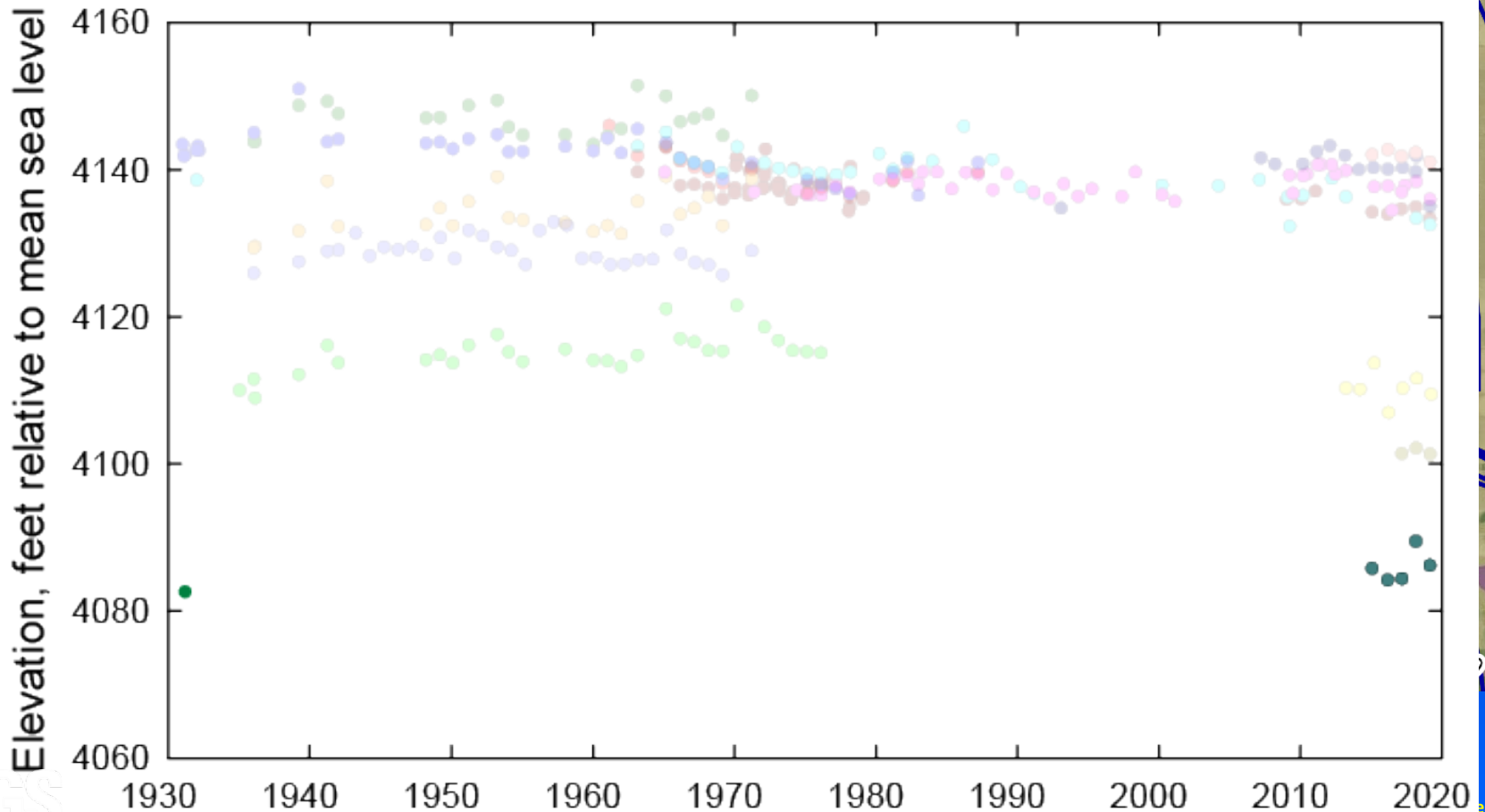
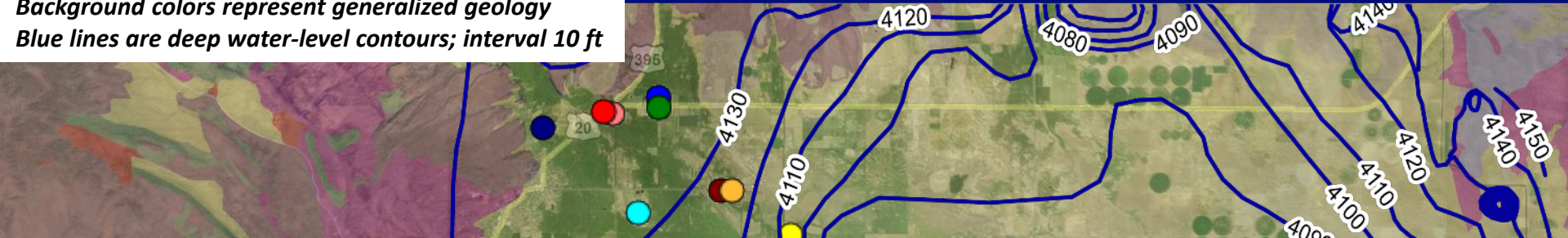
Silvies River floodplain

Background colors represent generalized geology
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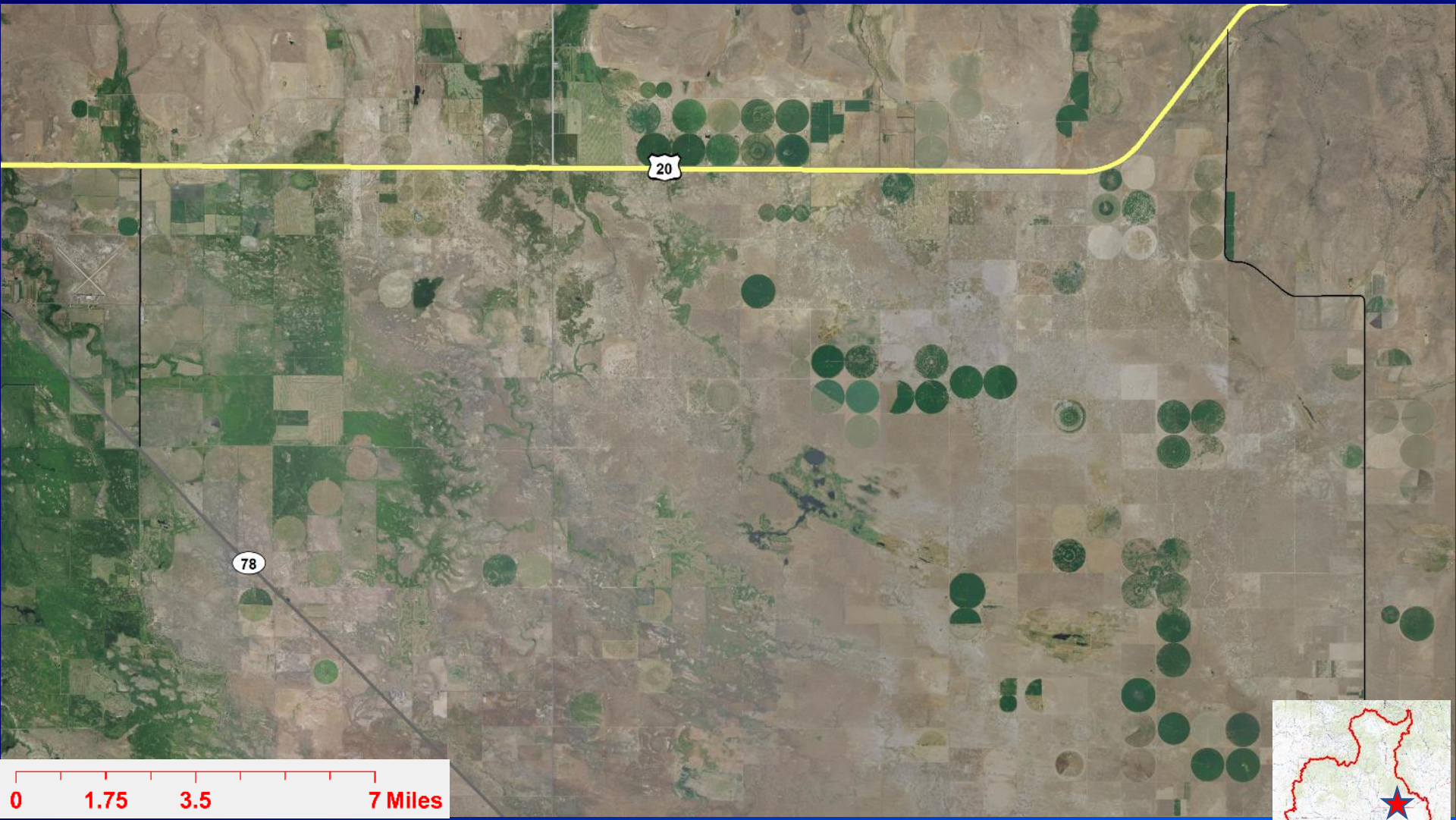


Silvies River floodplain

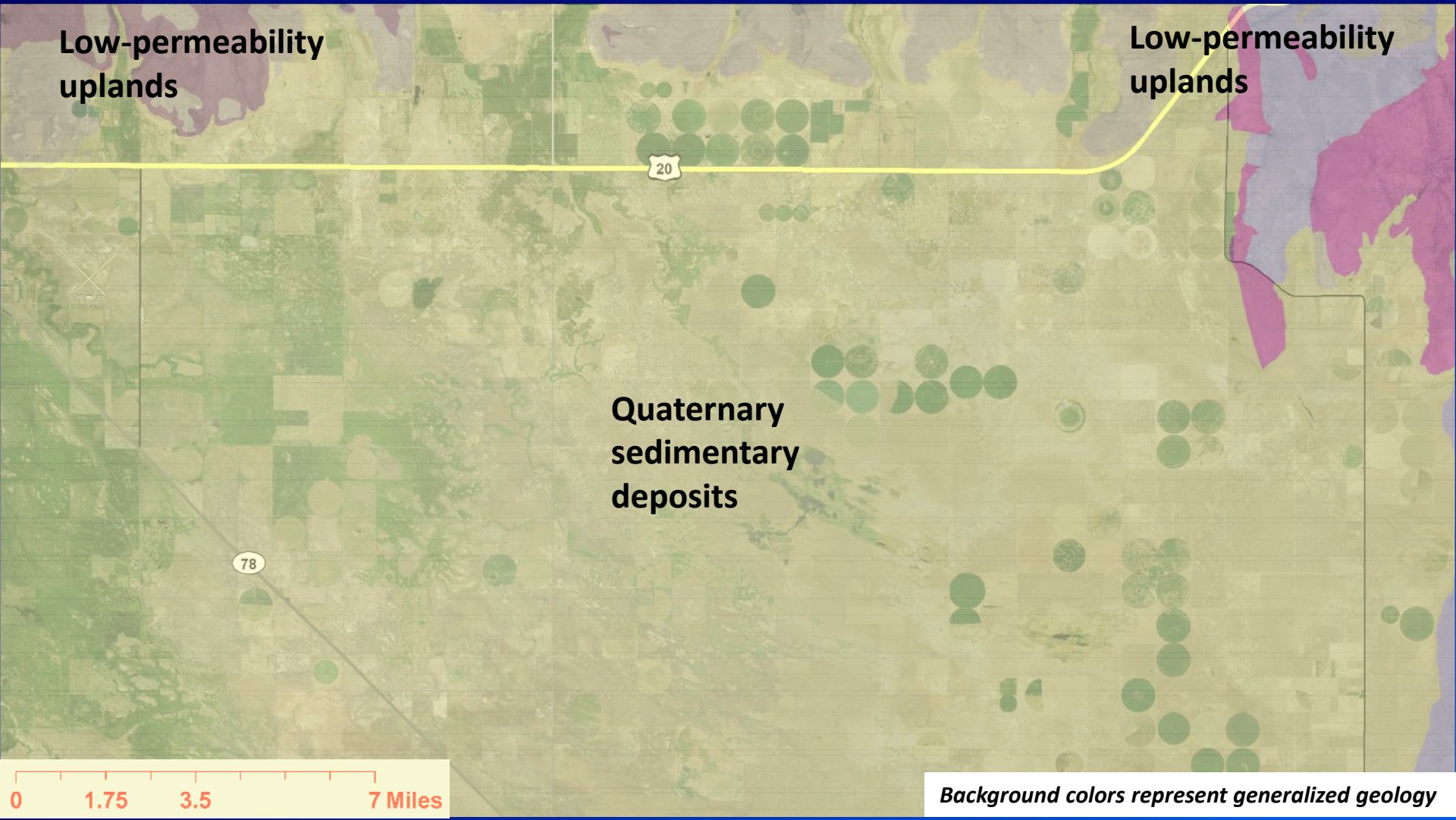
Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



Prater Creek to Curtis Creek floodplains

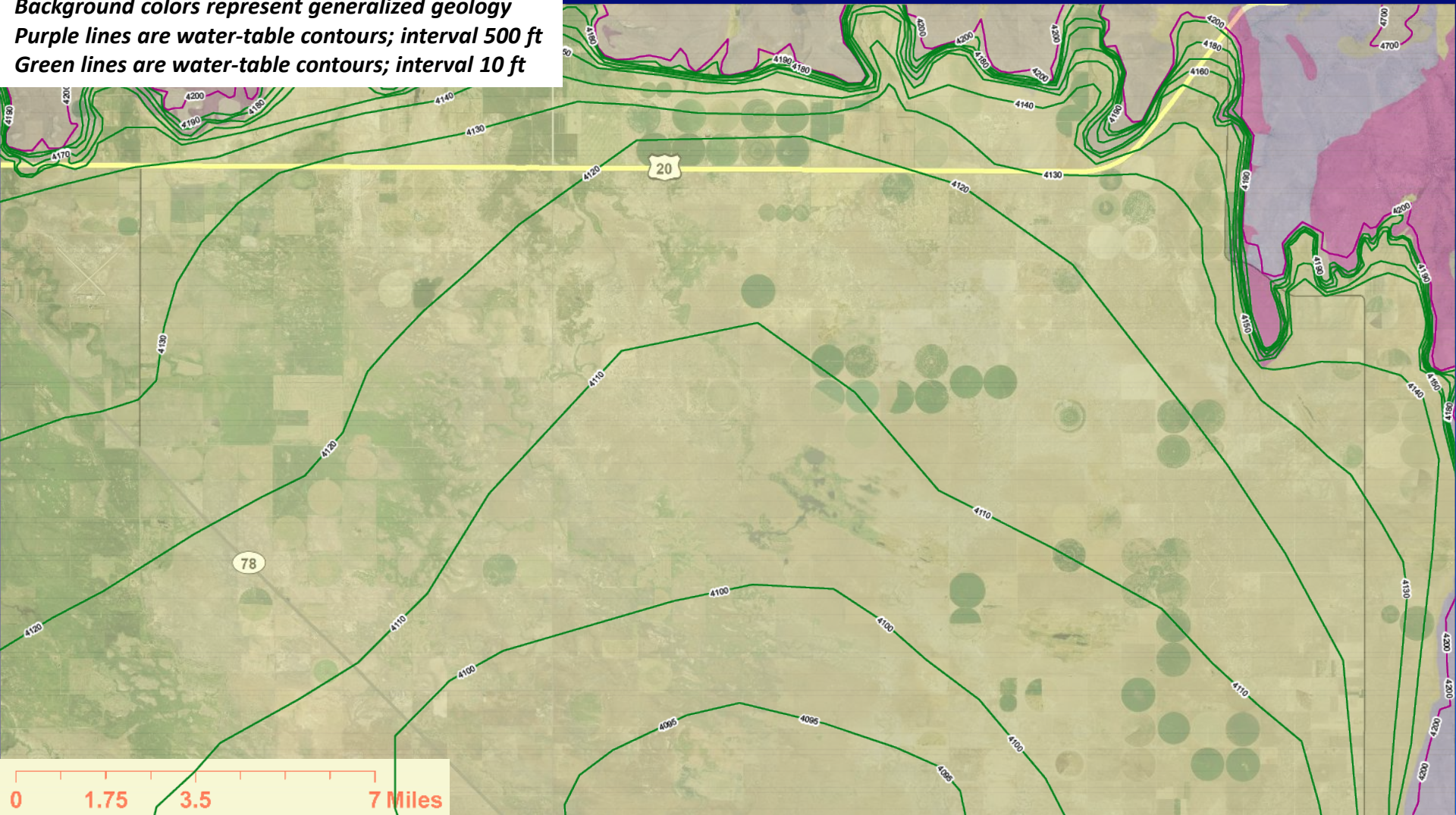


Prater Creek to Curtis Creek floodplains



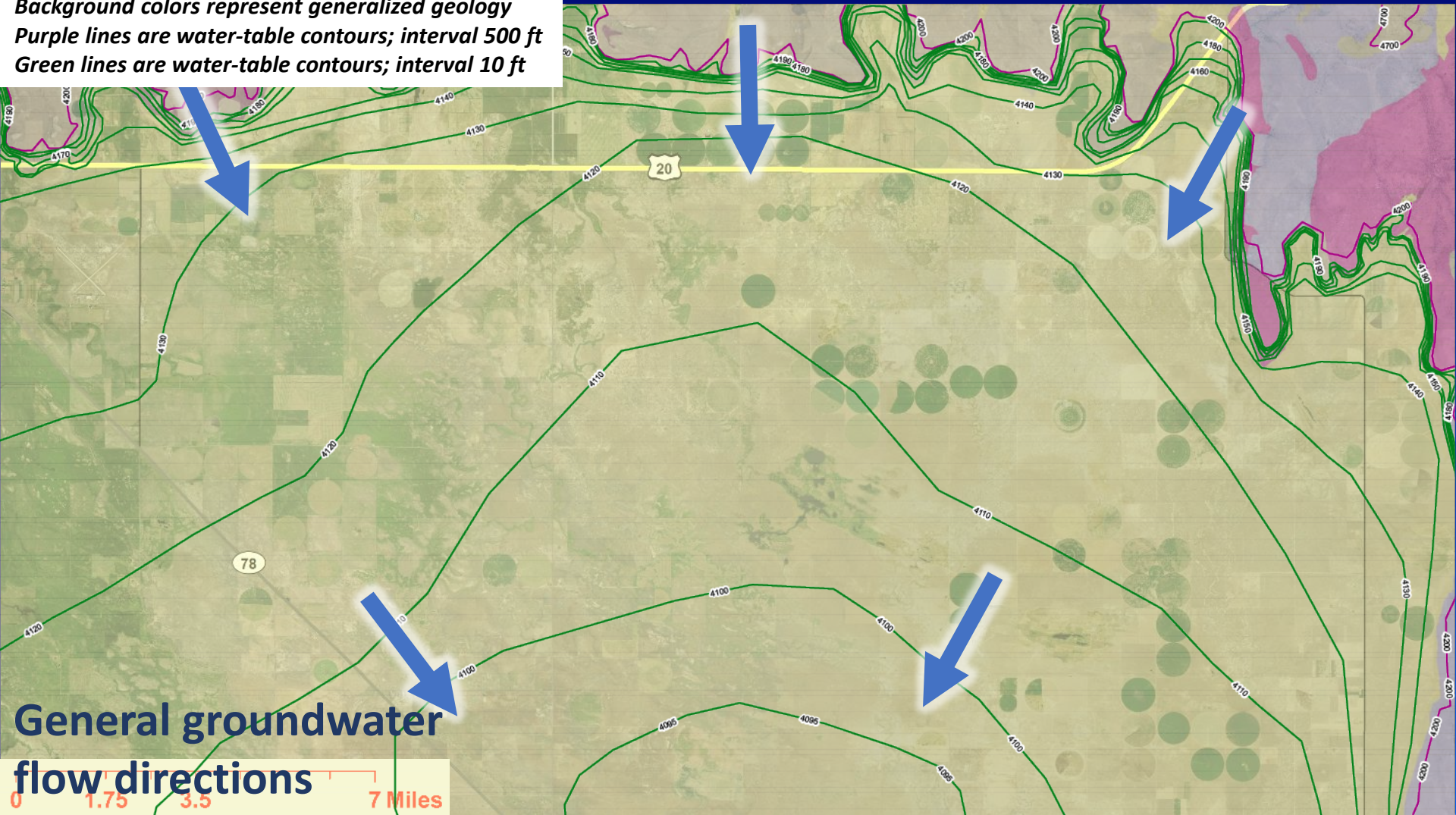
Prater Creek to Curtis Creek floodplains

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



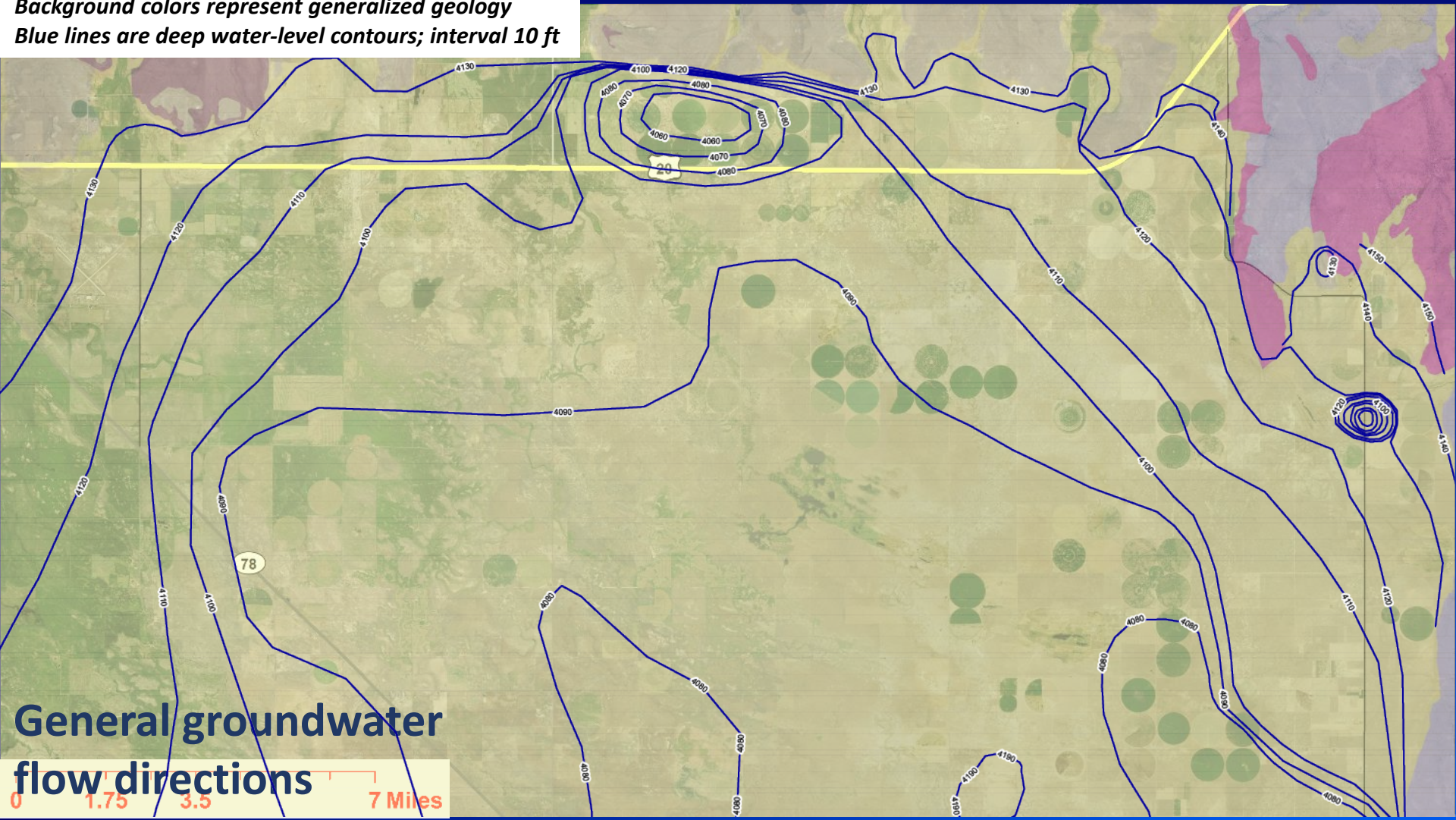
Prater Creek to Curtis Creek floodplains

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Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Prater Creek to Curtis Creek floodplains

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



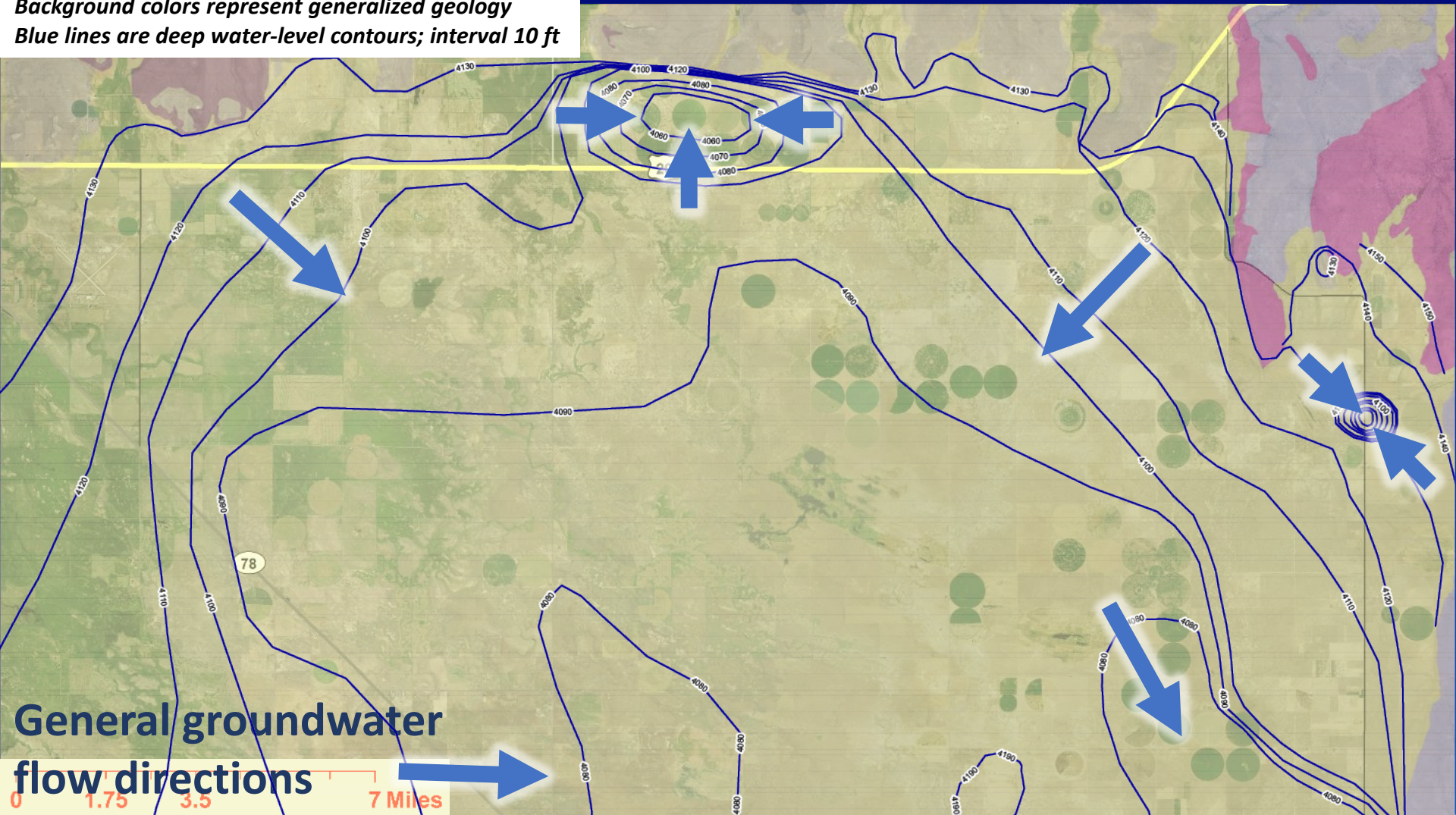
General groundwater
flow directions

0 1.75 3.5 7 Miles



Prater Creek to Curtis Creek floodplains

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



General groundwater
flow directions

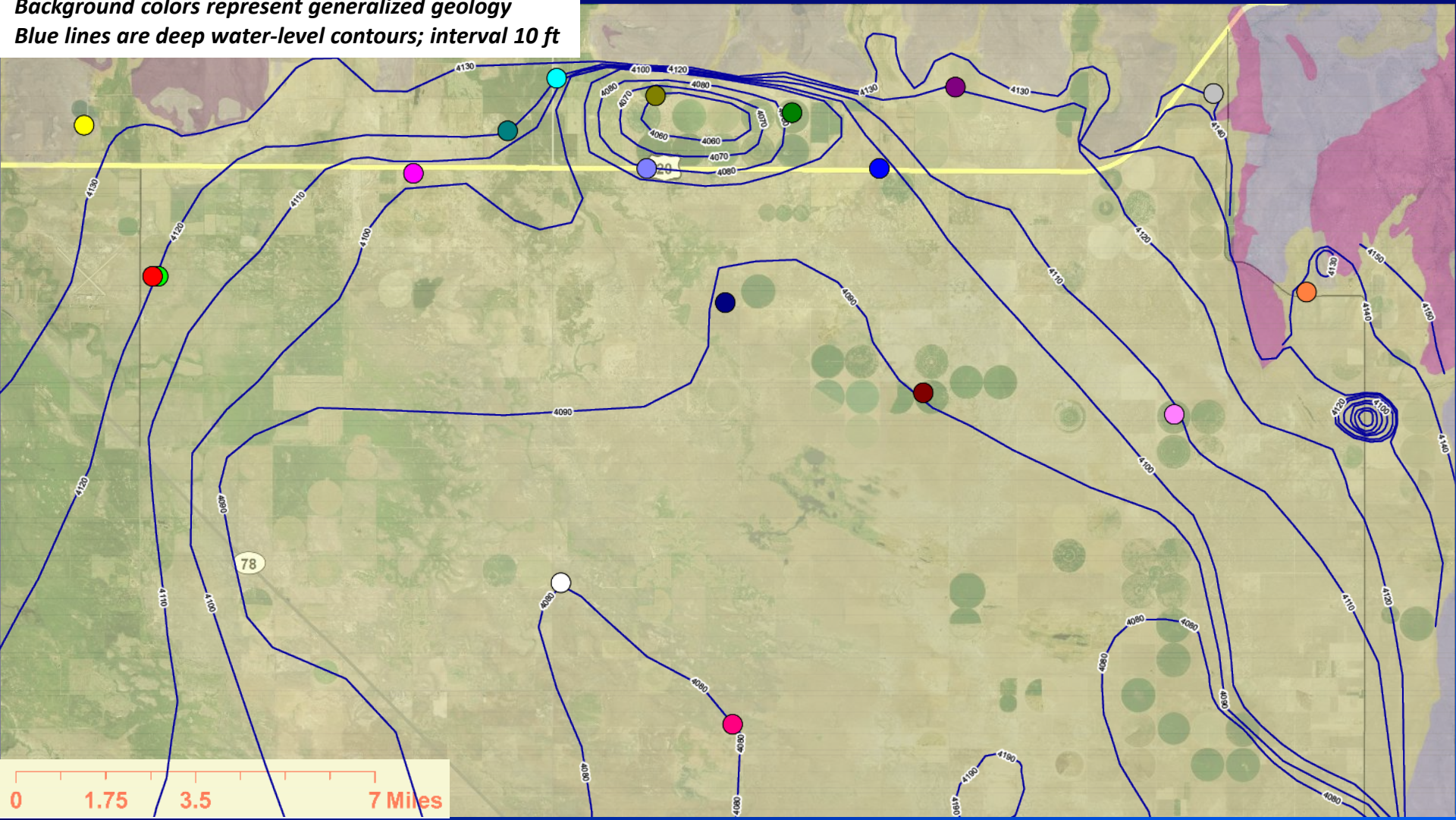


Preliminary Information—Subject to Revision. Not for Citation or Distribution.

Generalized Geologic Map of the Harney Basin, Oregon
(Boschmann, in prep.)

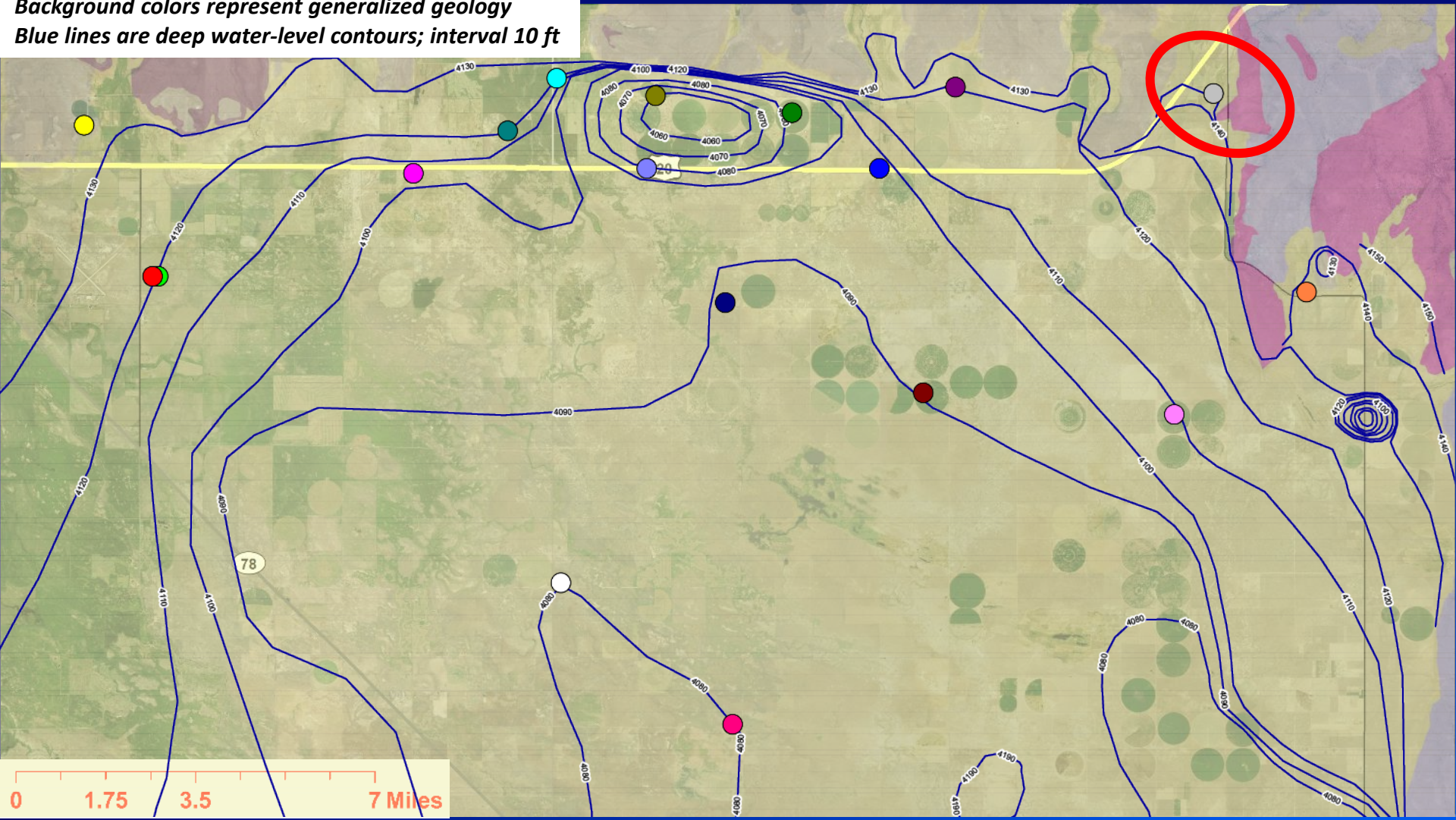
Prater Creek to Curtis Creek floodplains

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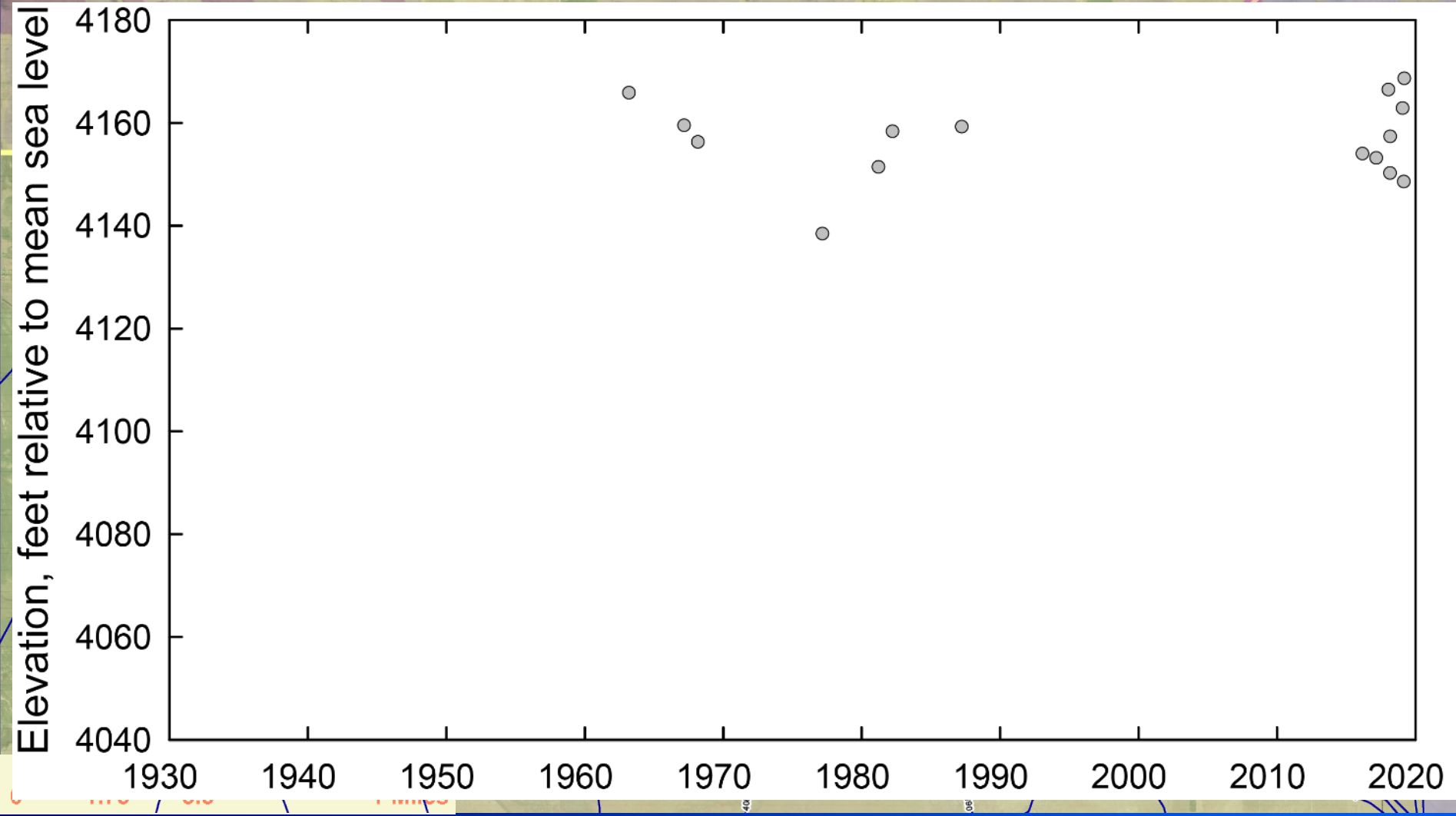


Prater Creek to Curtis Creek floodplains

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

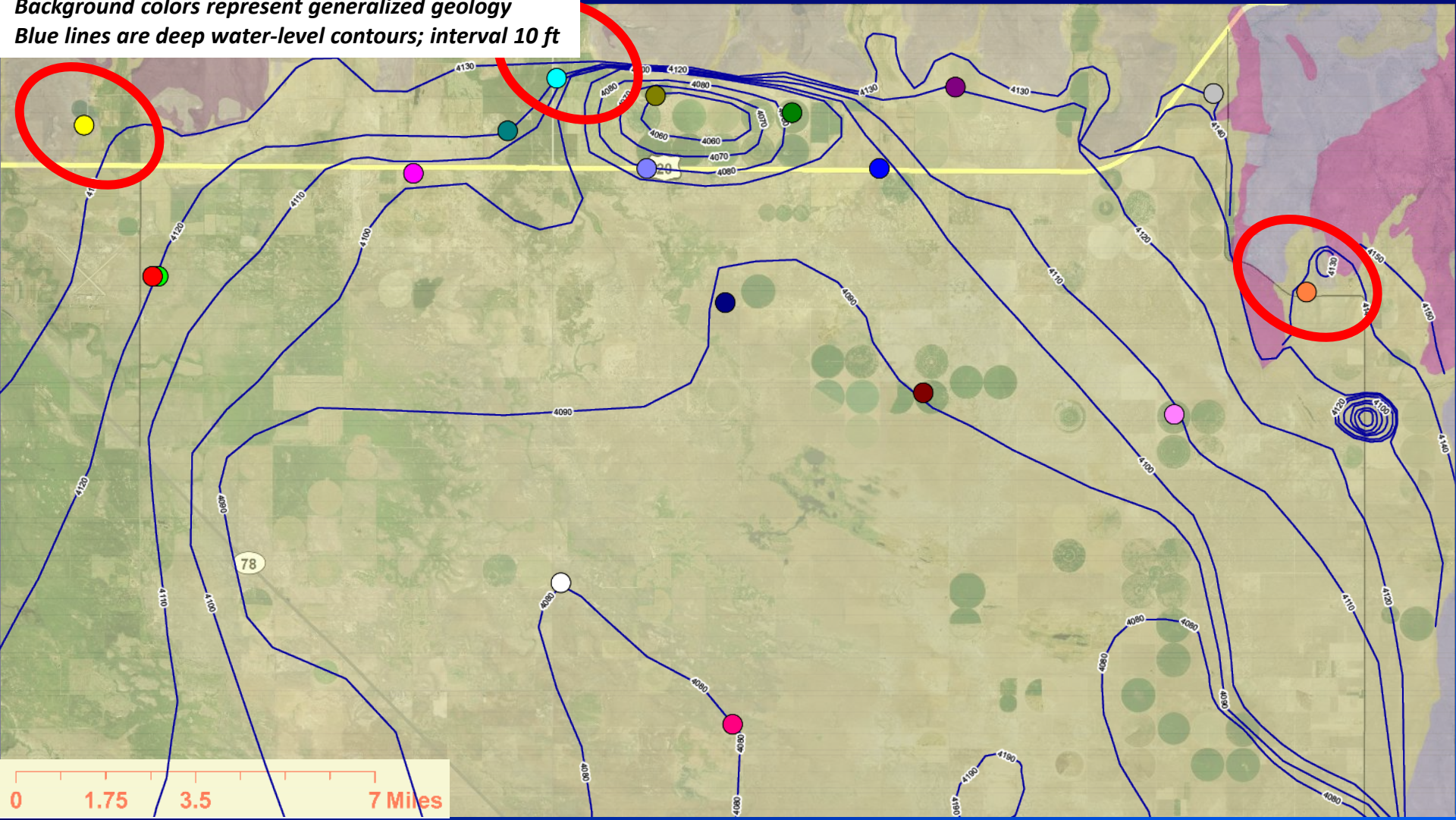


Prater Creek to Curtis Creek floodplains

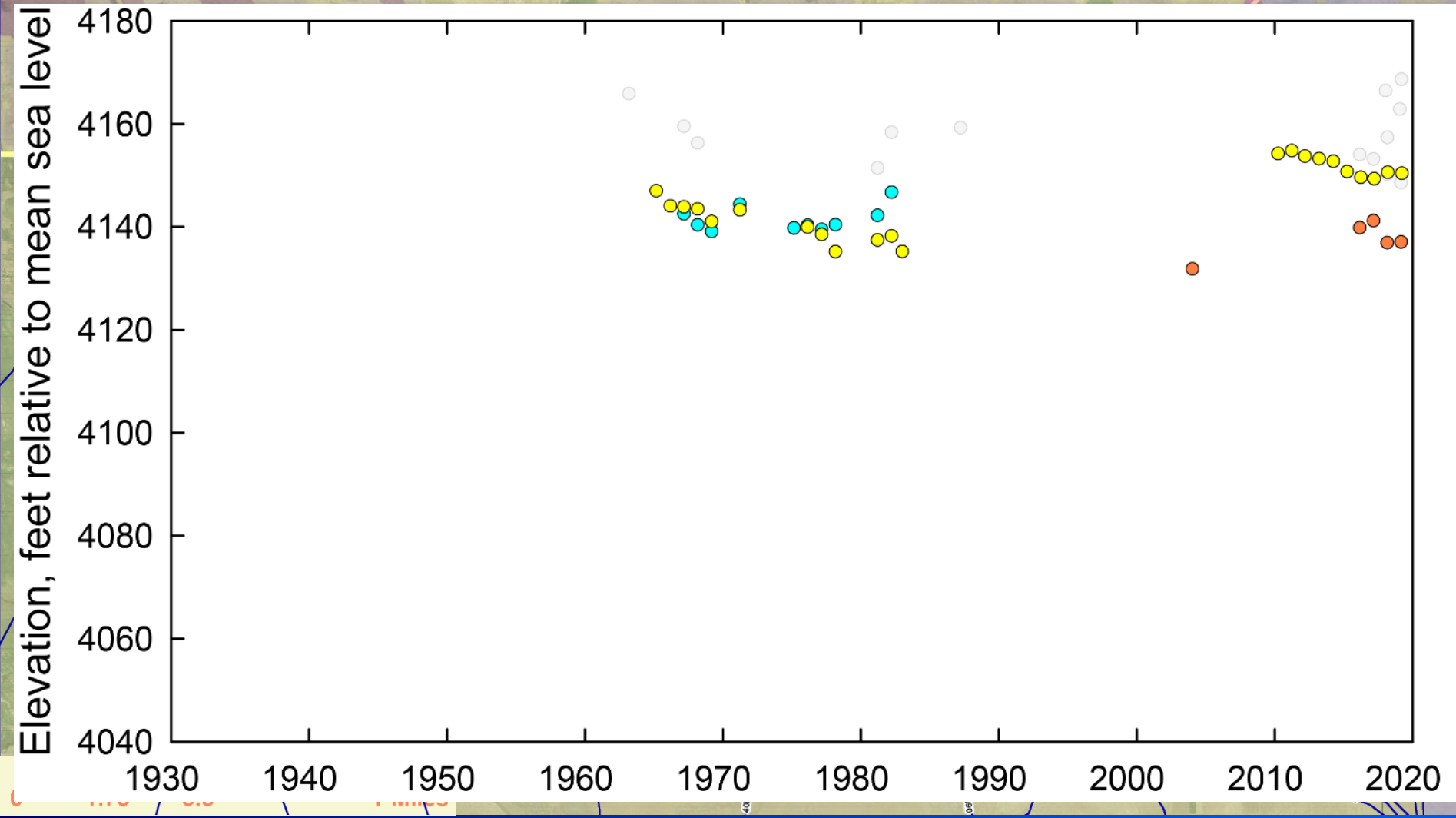


Prater Creek to Curtis Creek floodplains

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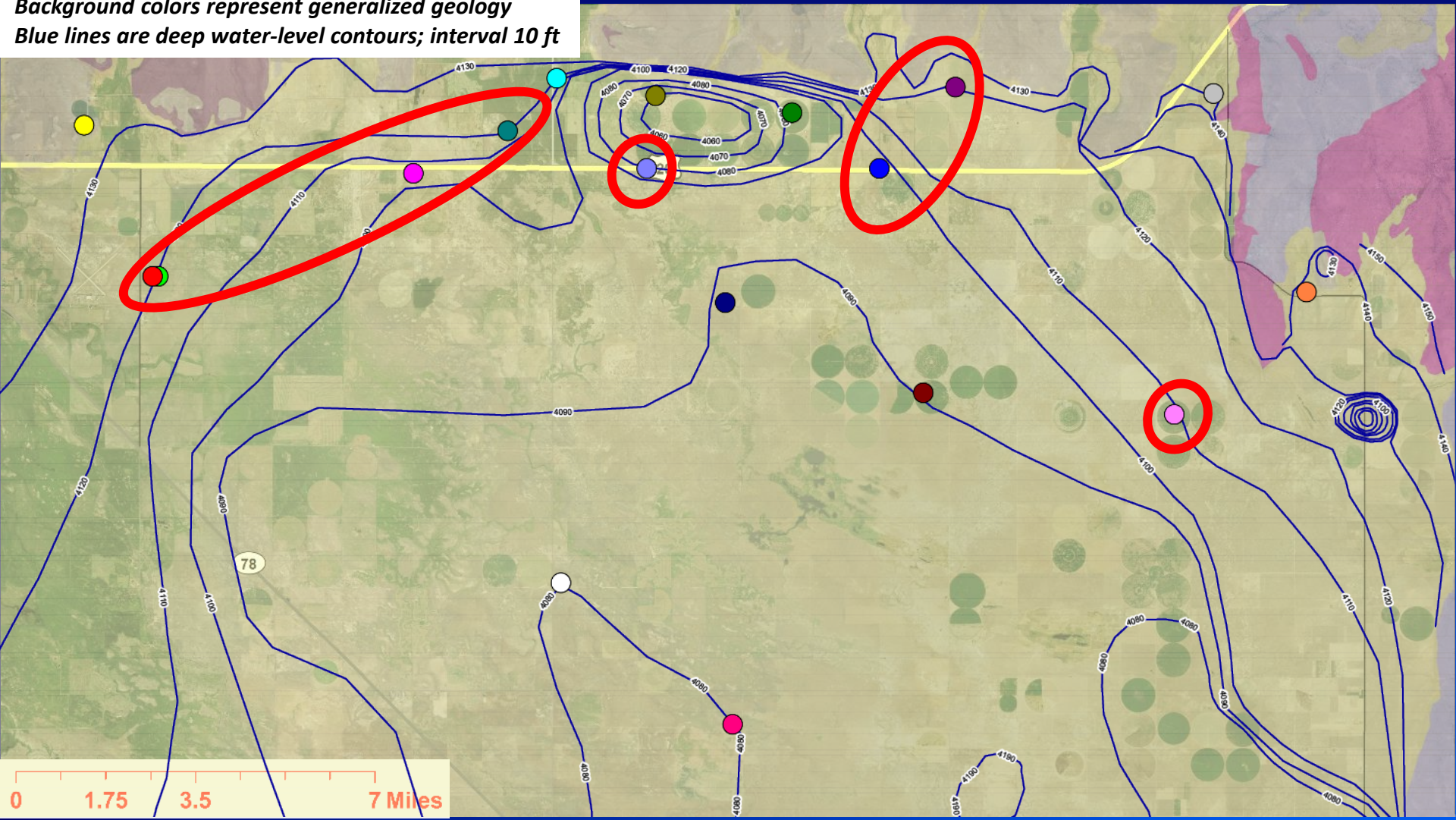


Prater Creek to Curtis Creek floodplains

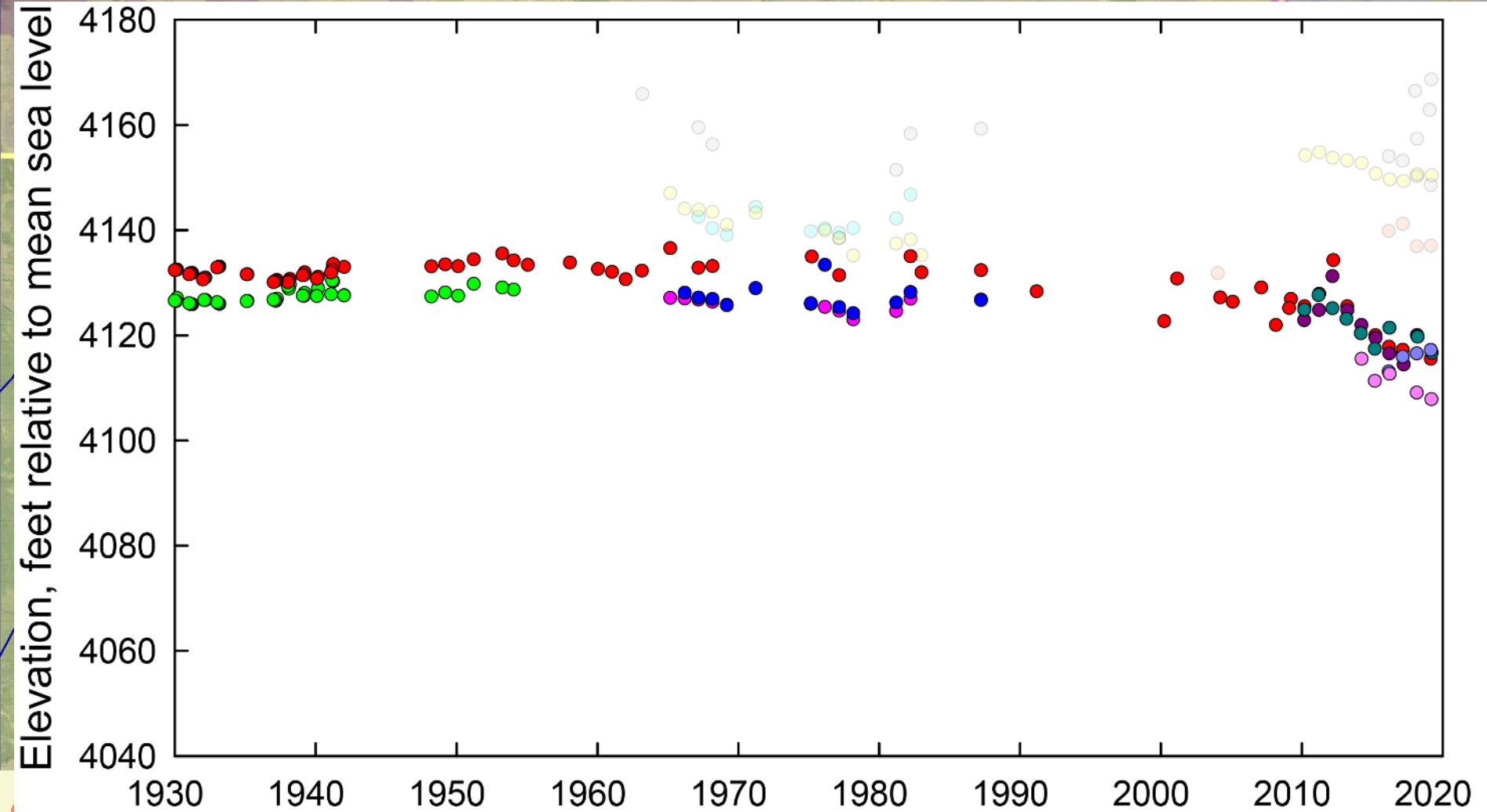


Prater Creek to Curtis Creek floodplains

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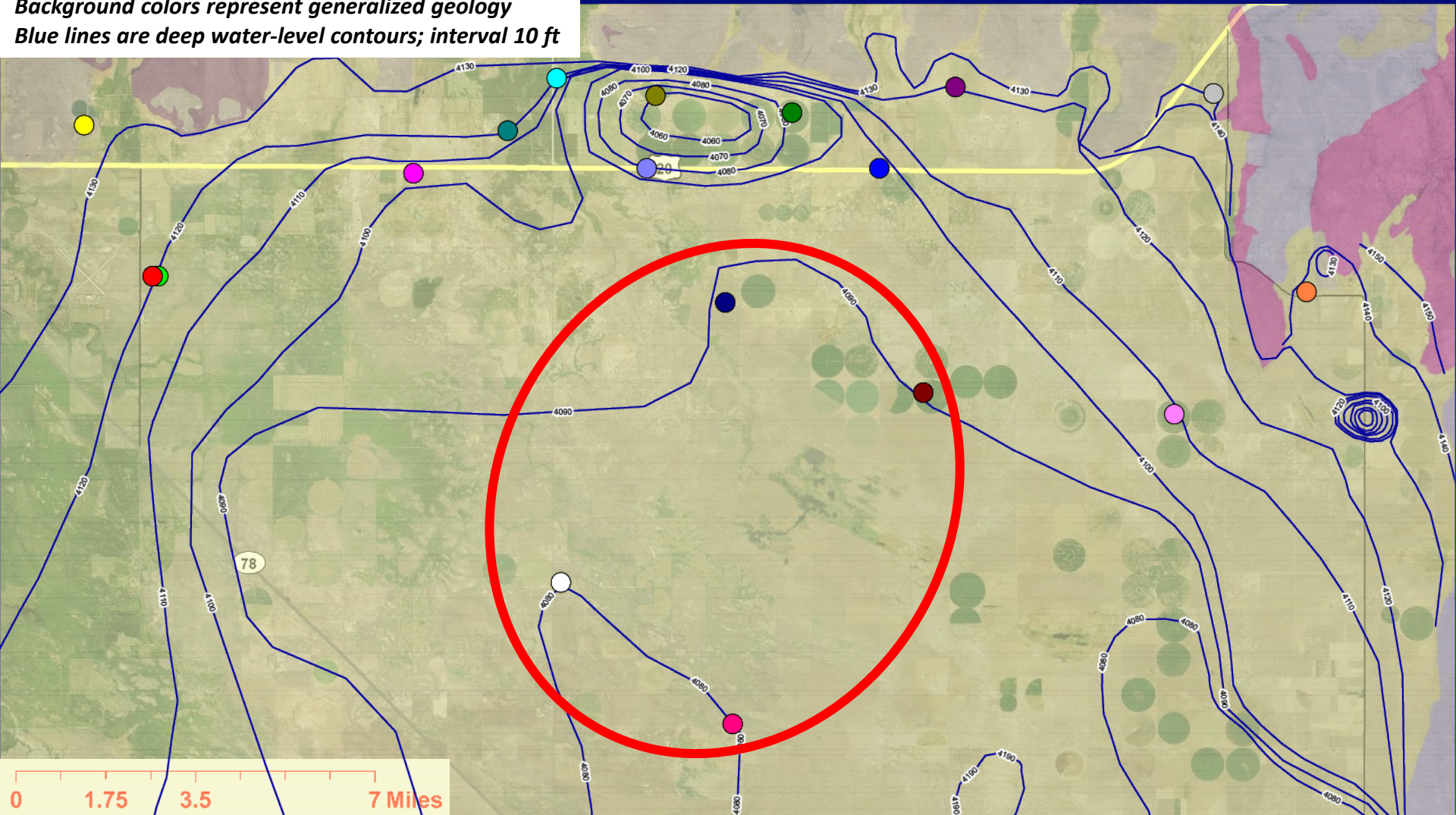


Prater Creek to Curtis Creek floodplains

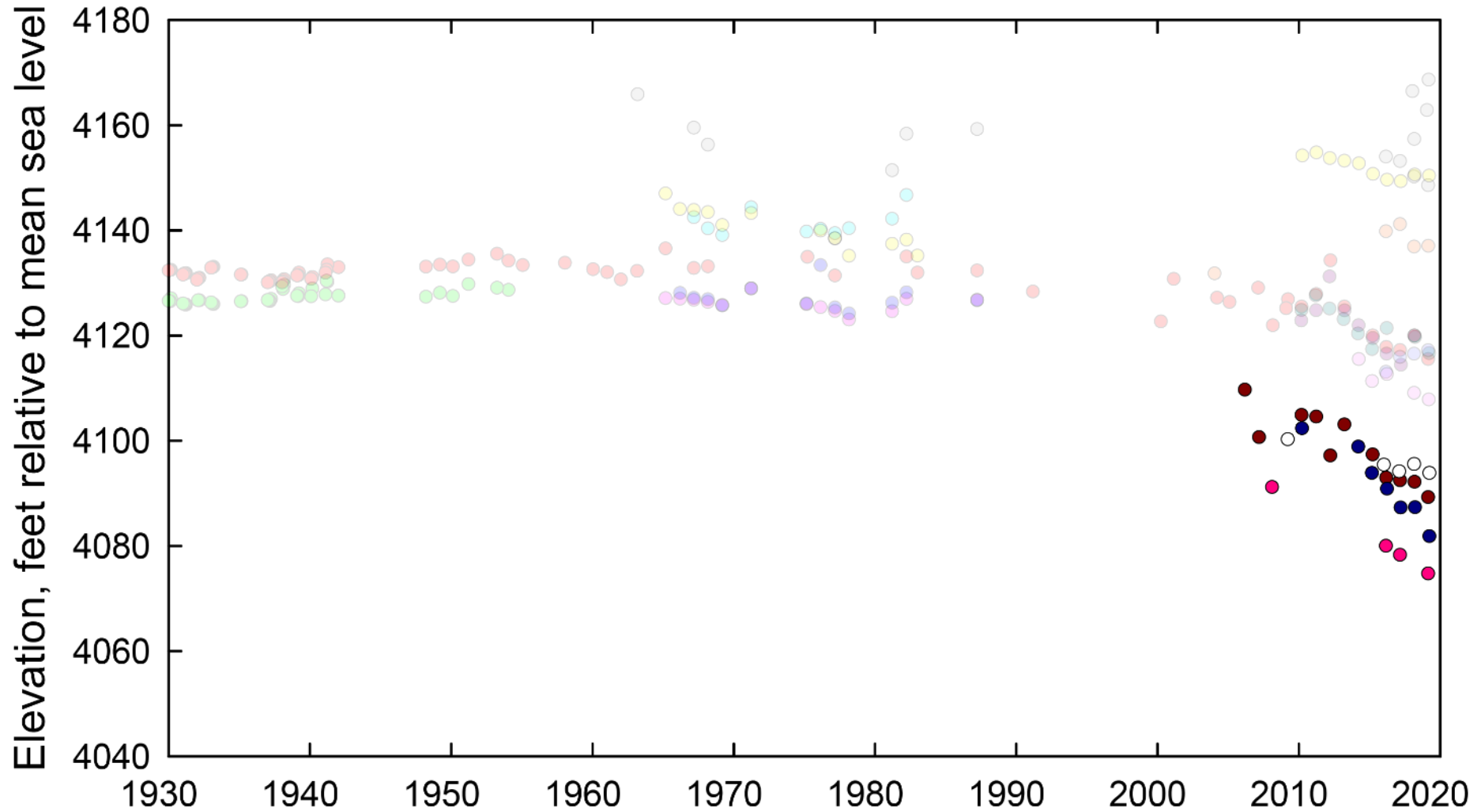


Prater Creek to Curtis Creek floodplains

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

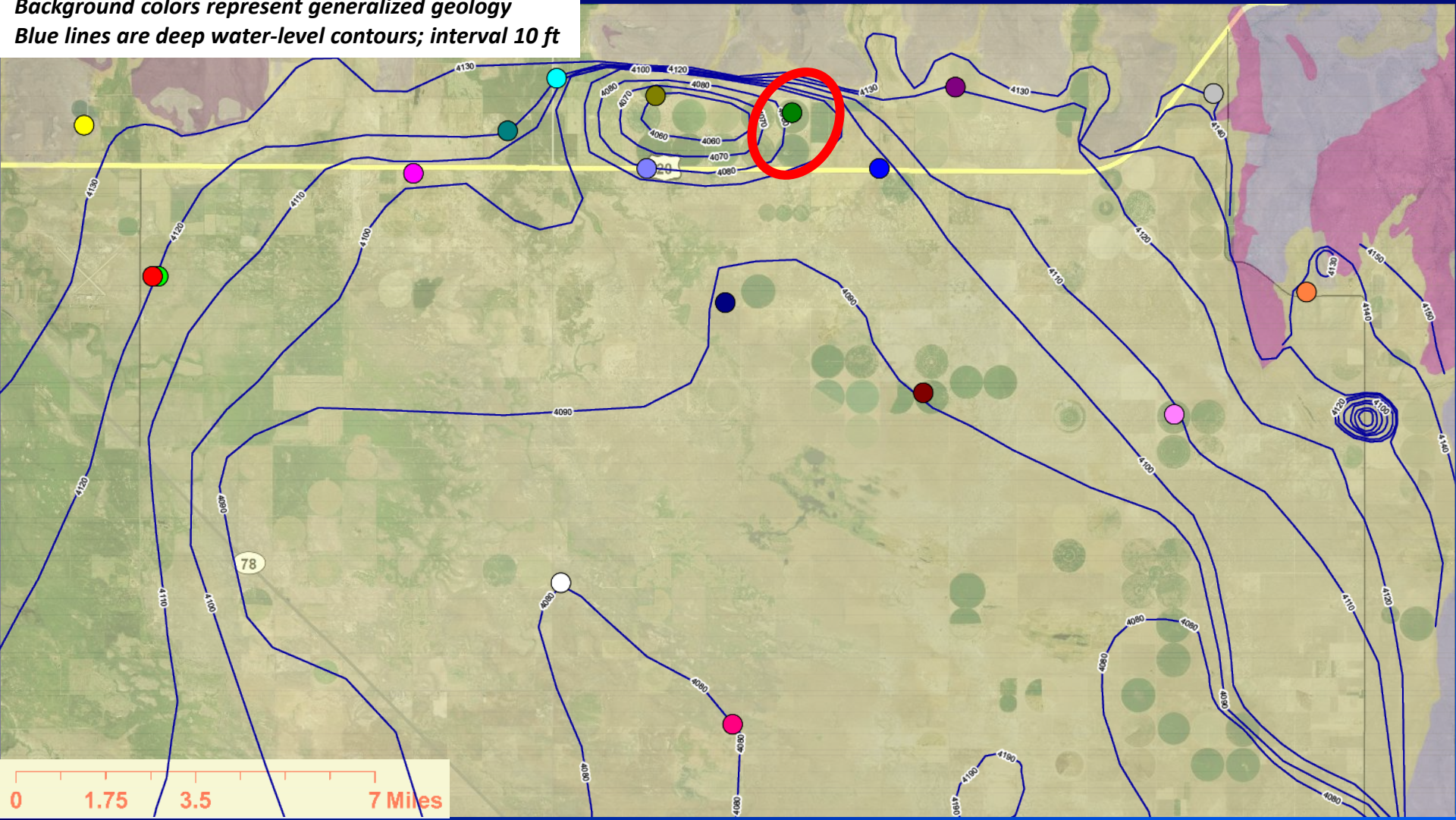


Prater Creek to Curtis Creek floodplains

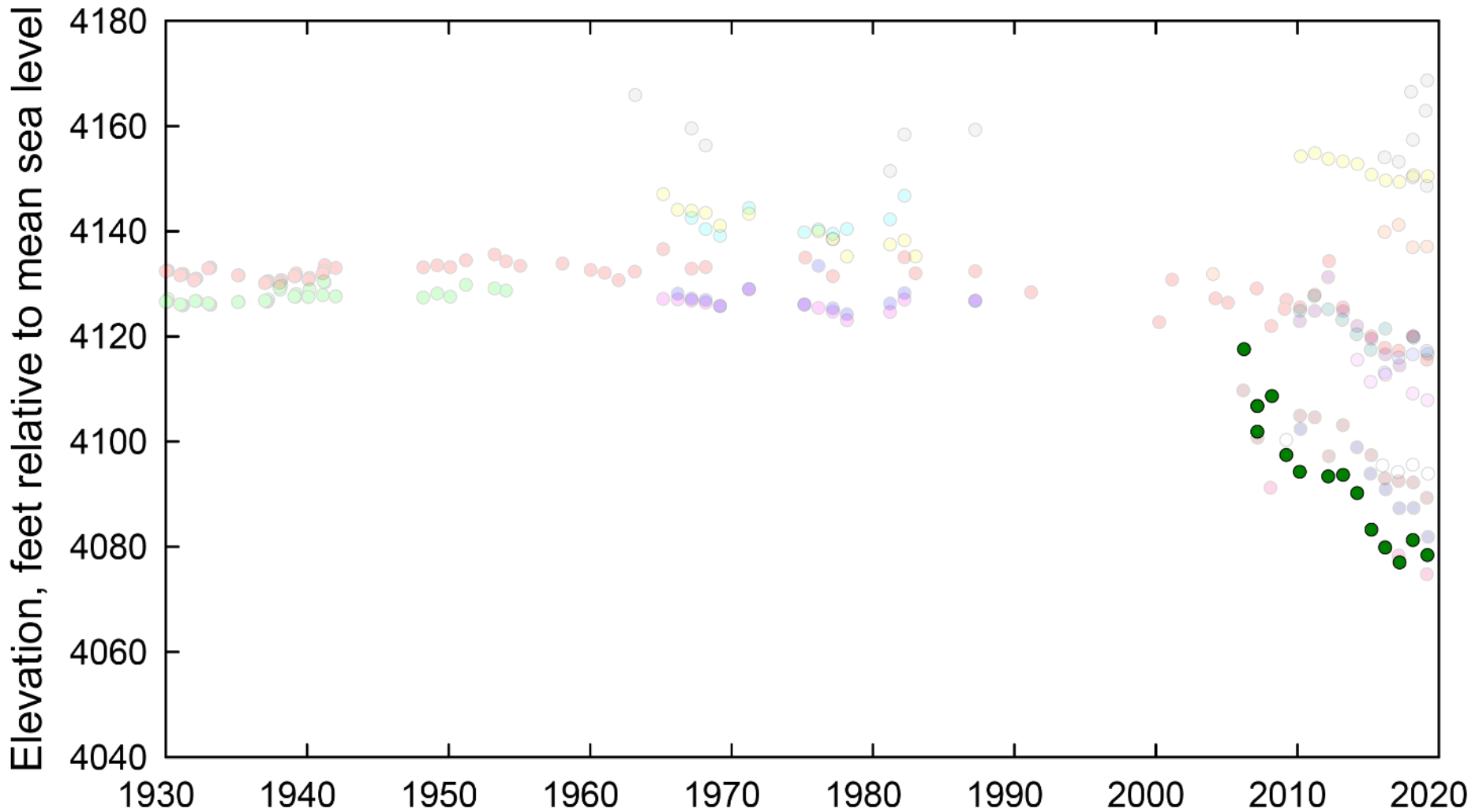


Prater Creek to Curtis Creek floodplains

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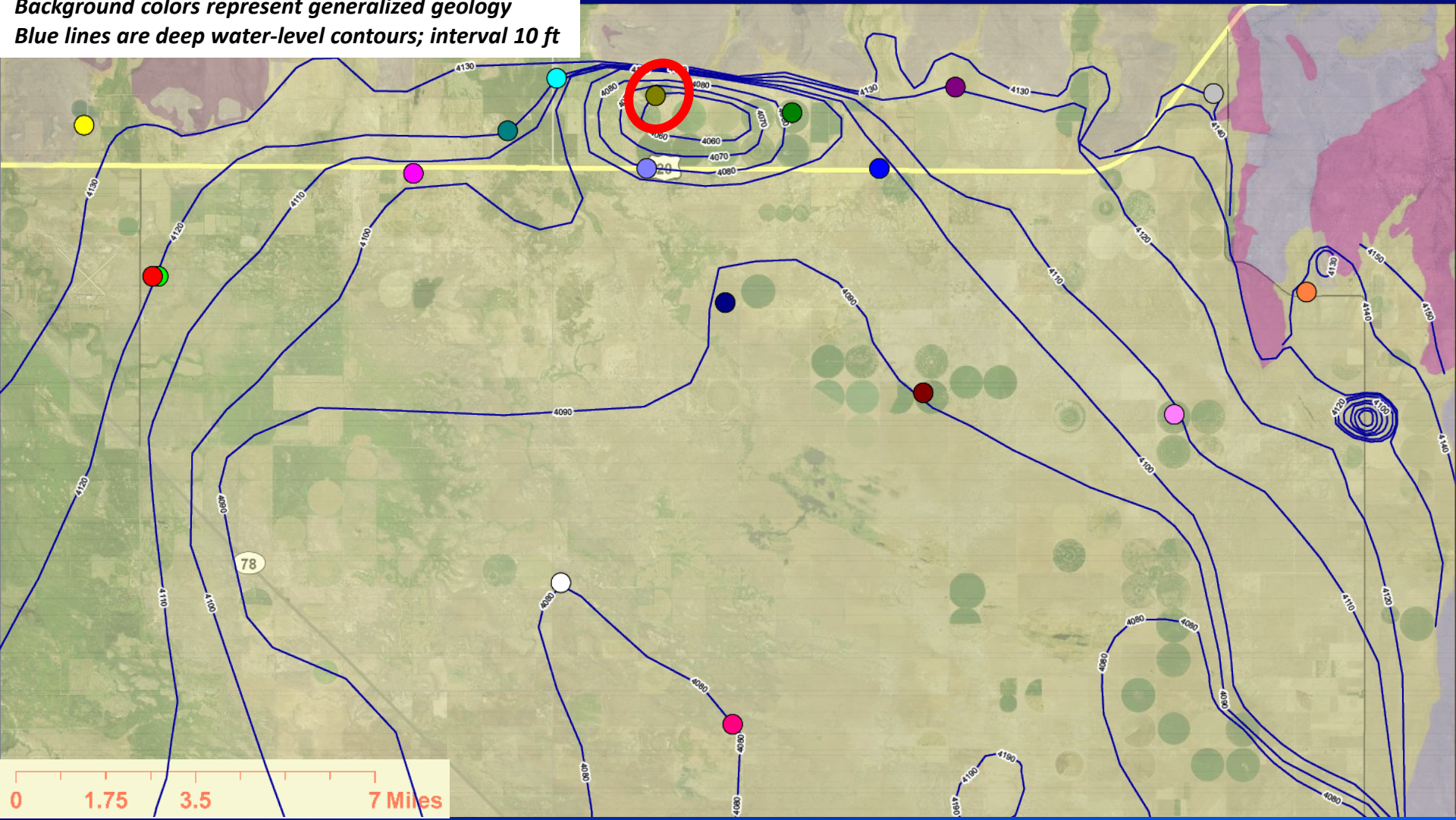


Prater Creek to Curtis Creek floodplains

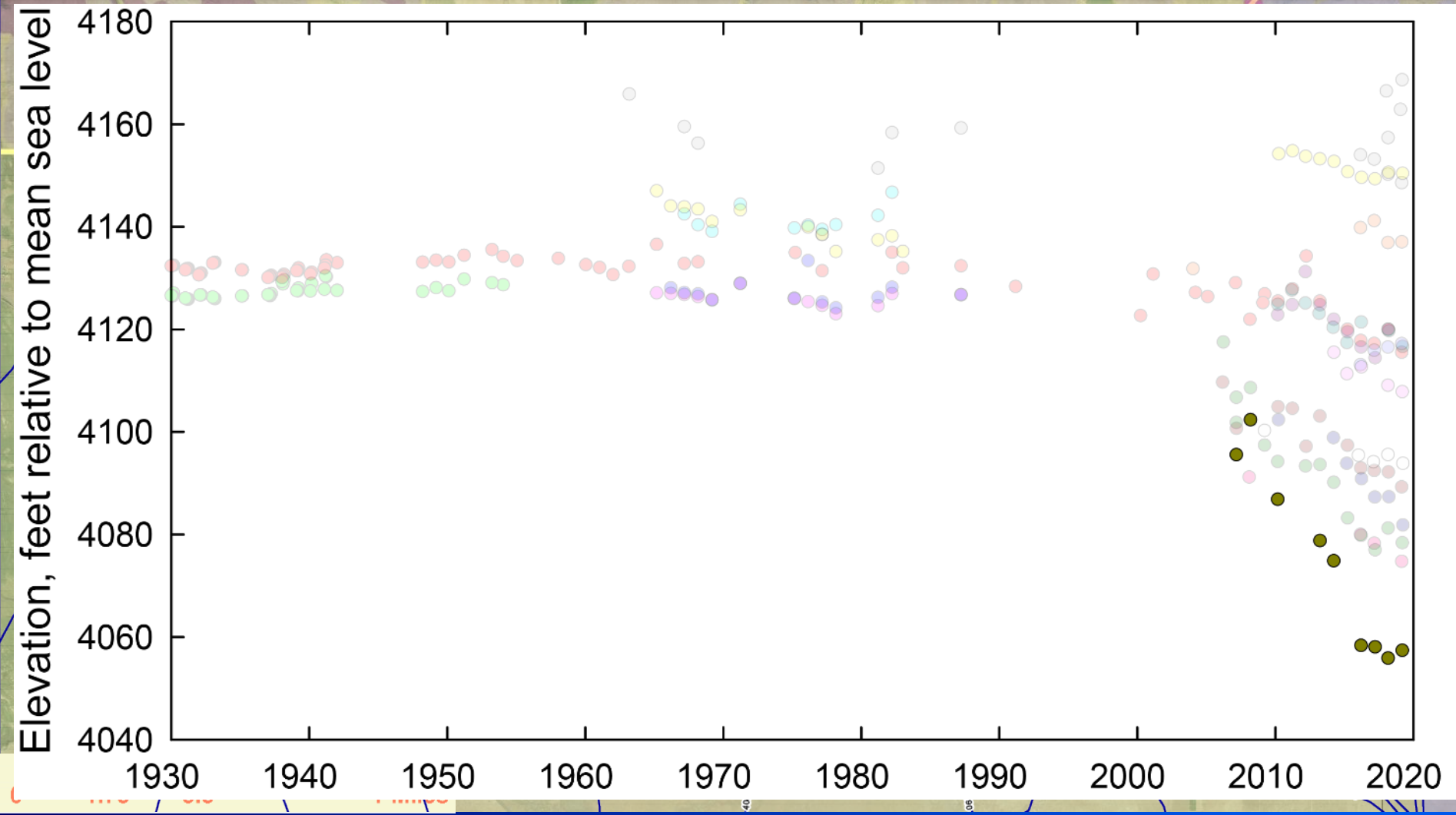


Prater Creek to Curtis Creek floodplains

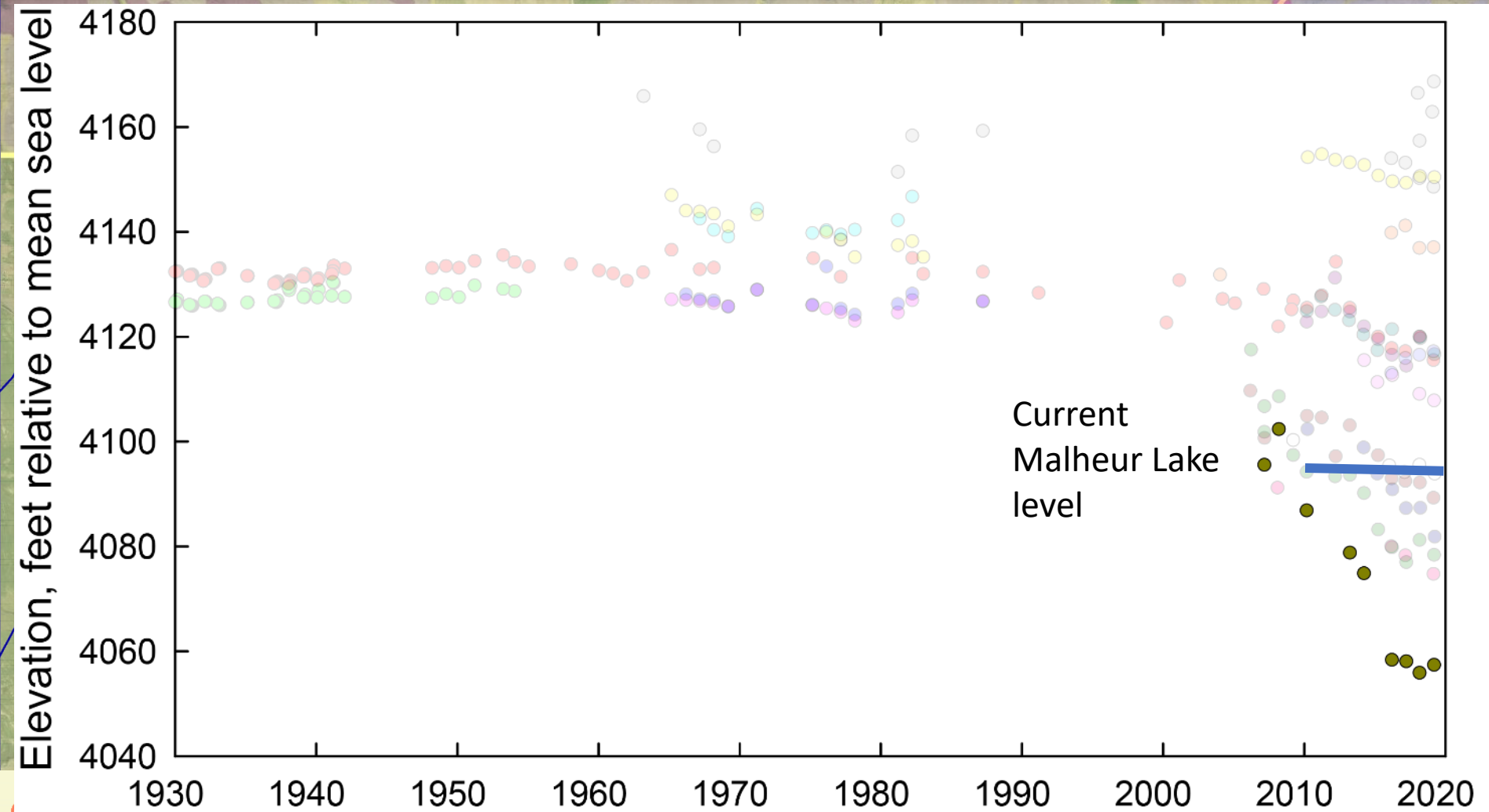
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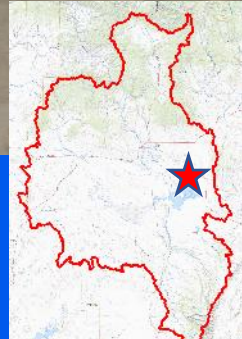
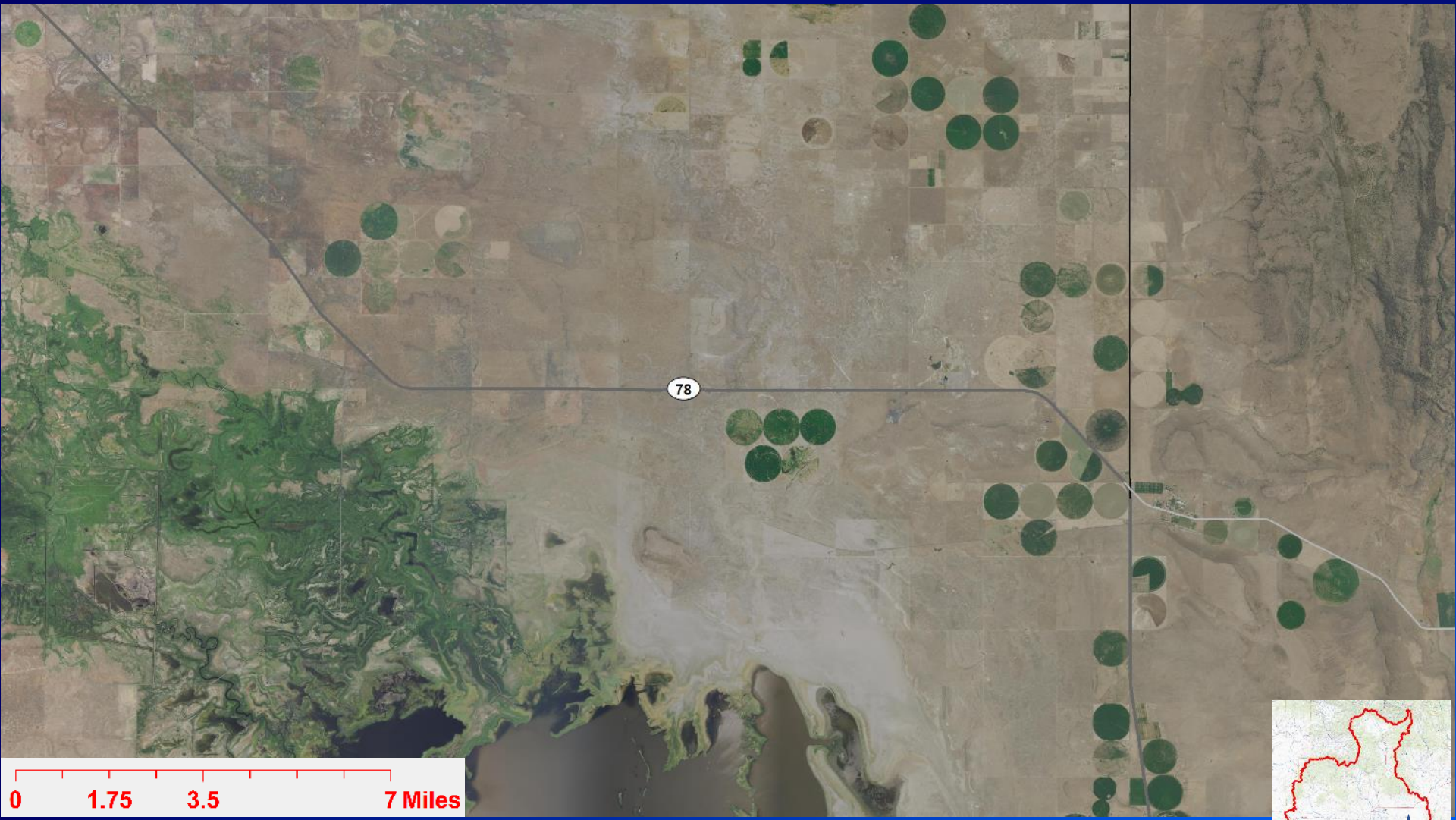
Prater Creek to Curtis Creek floodplains



Prater Creek to Curtis Creek floodplains

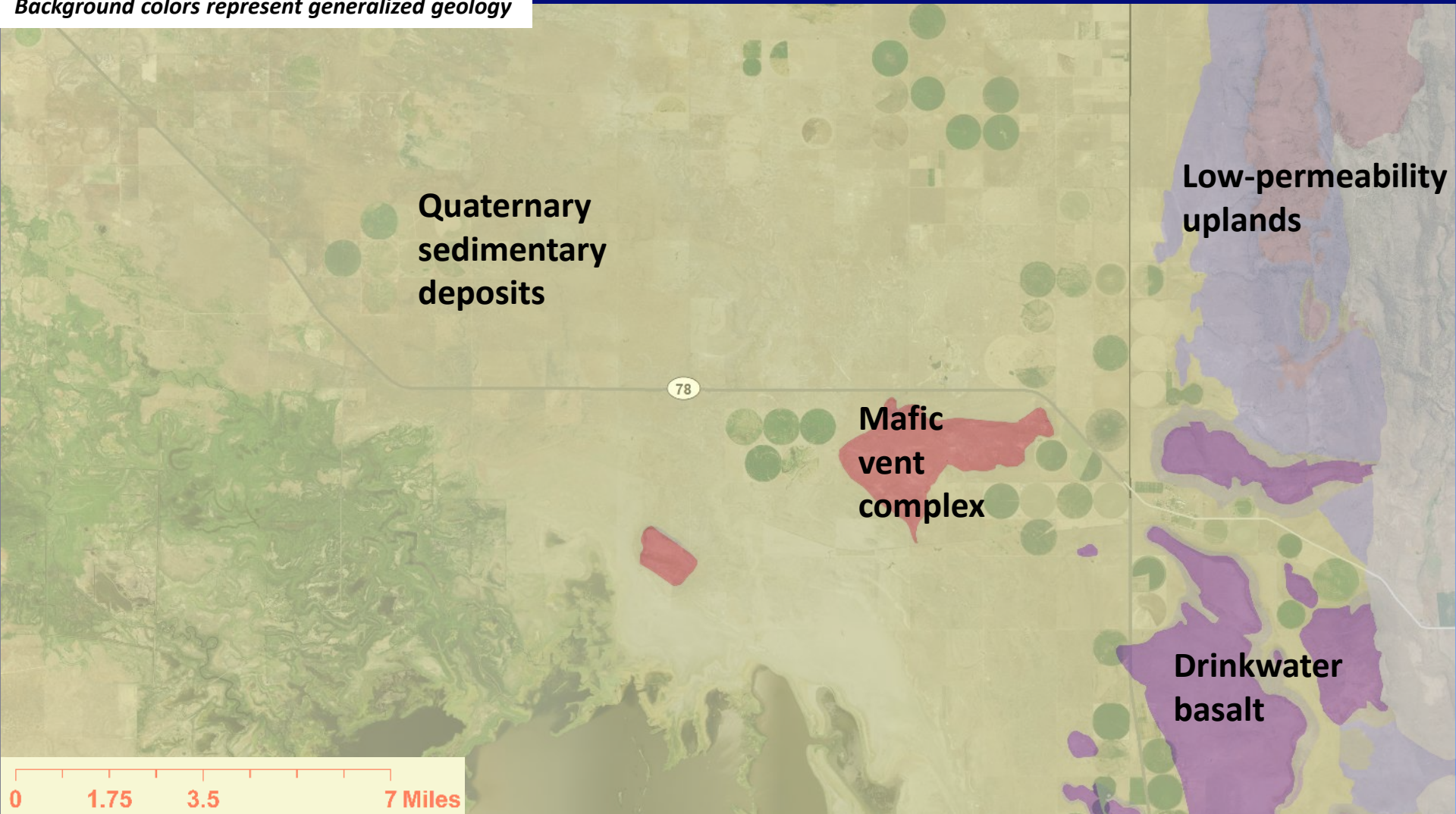


Crane



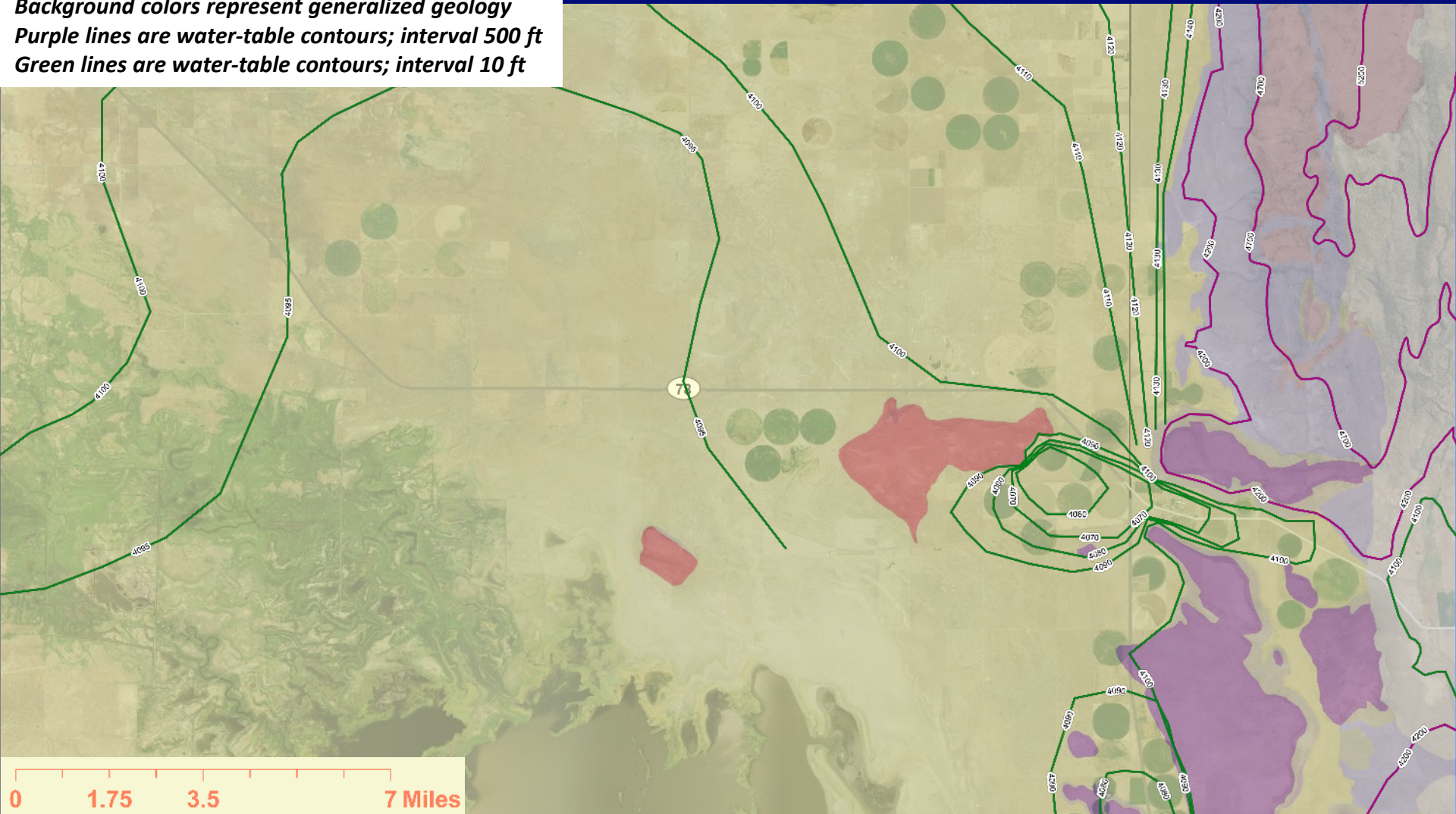
Crane

Background colors represent generalized geology



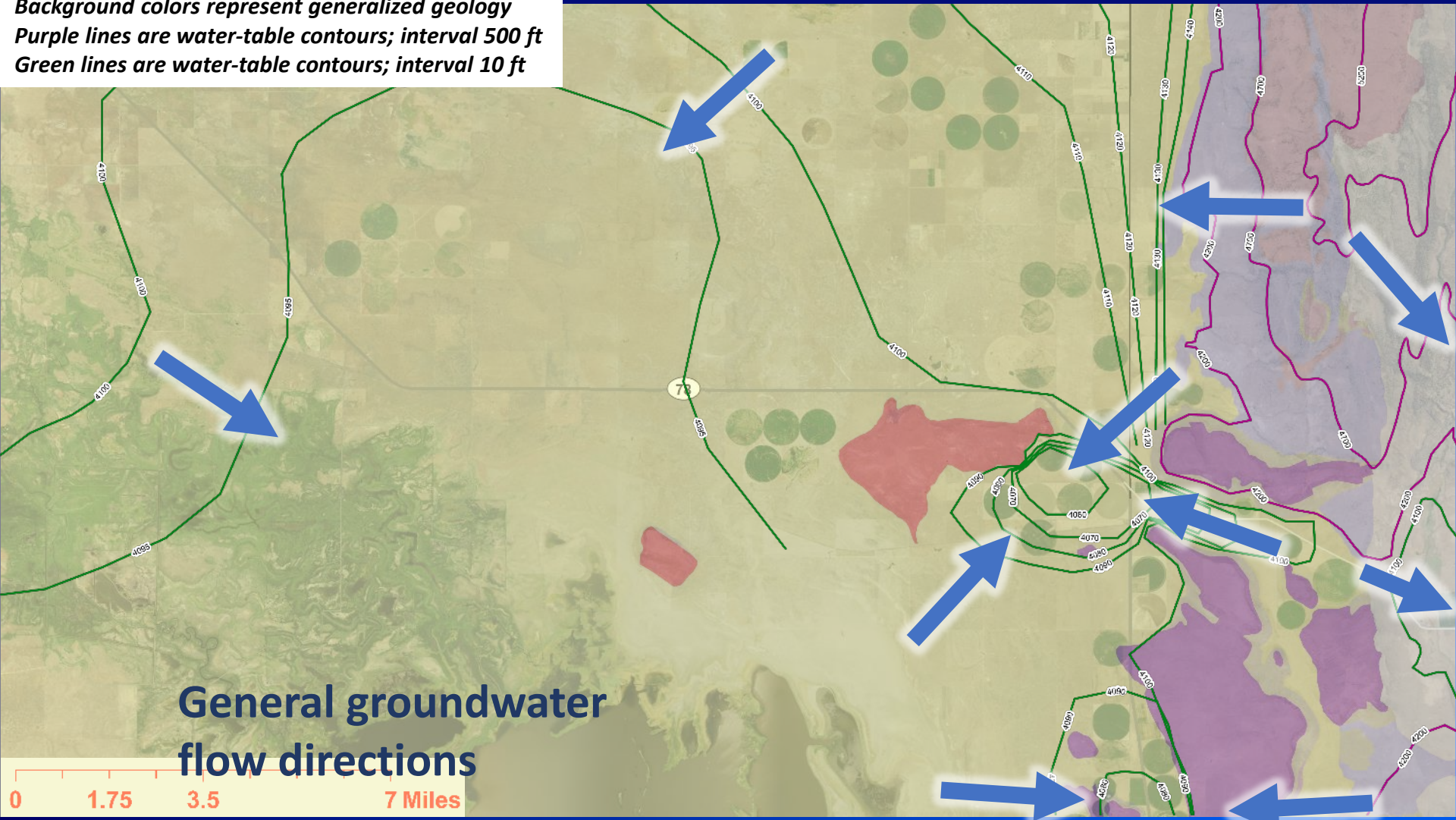
Crane

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Crane

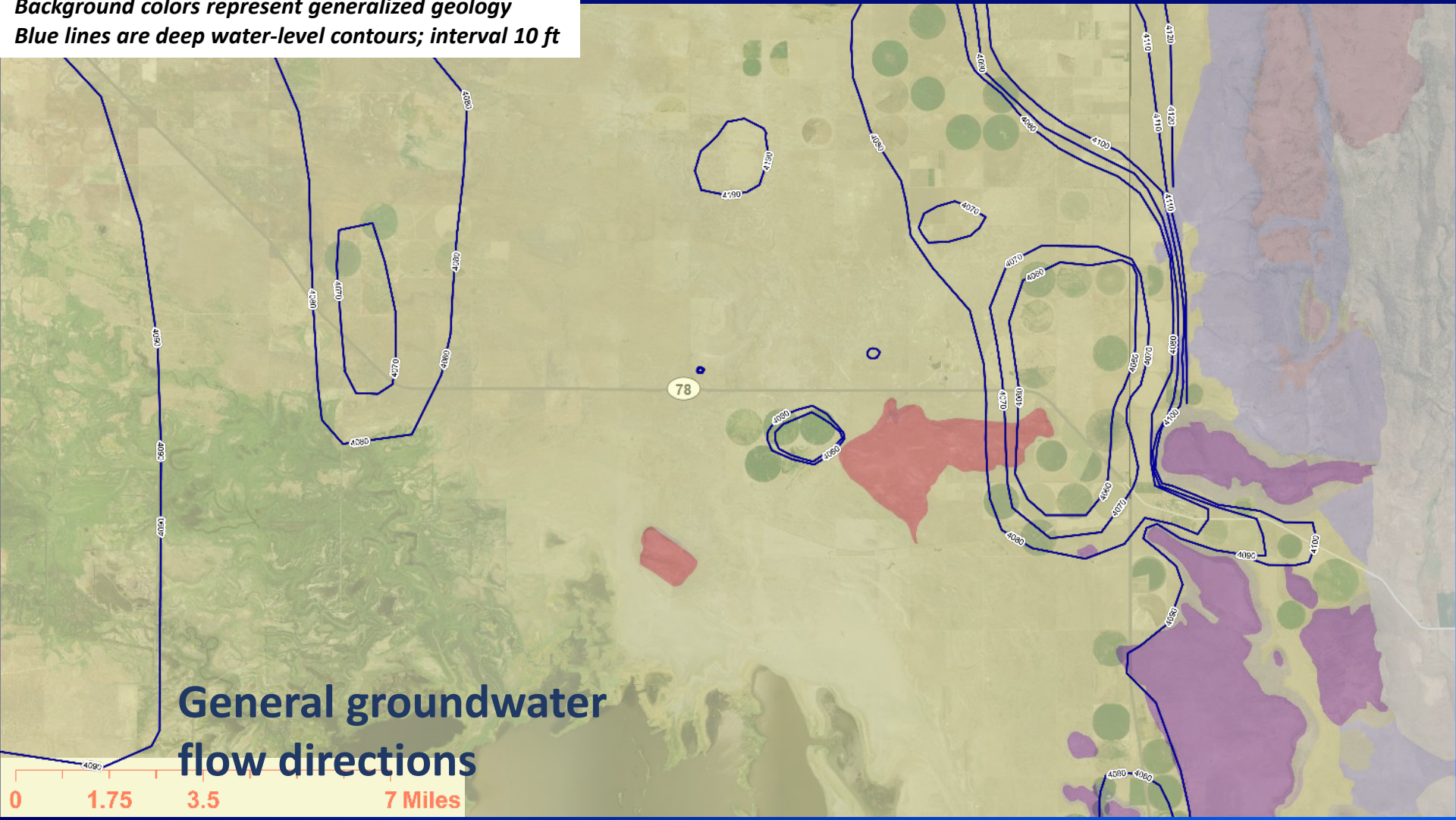
Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



General groundwater
flow directions

Crane

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

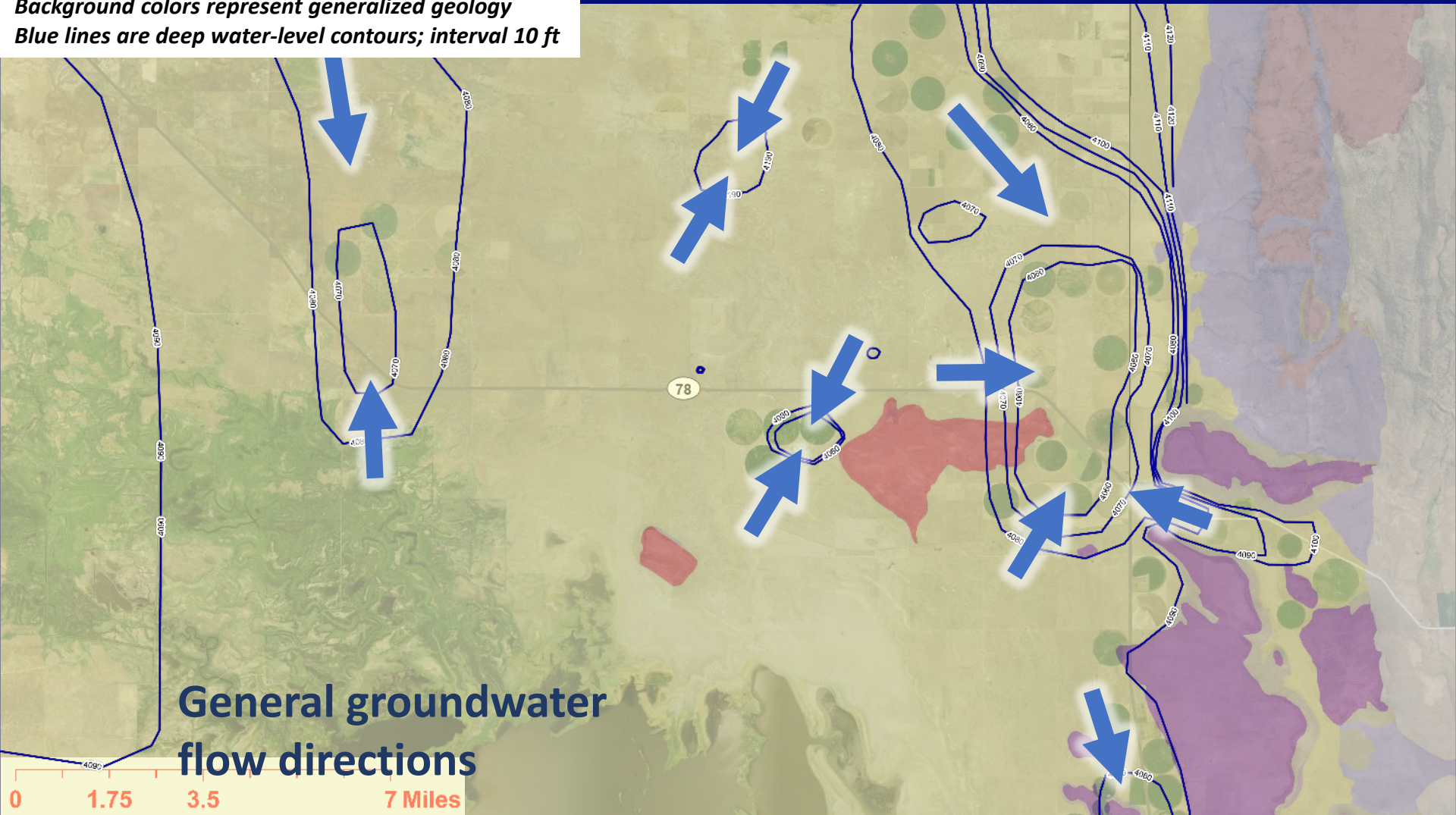


General groundwater
flow directions



Crane

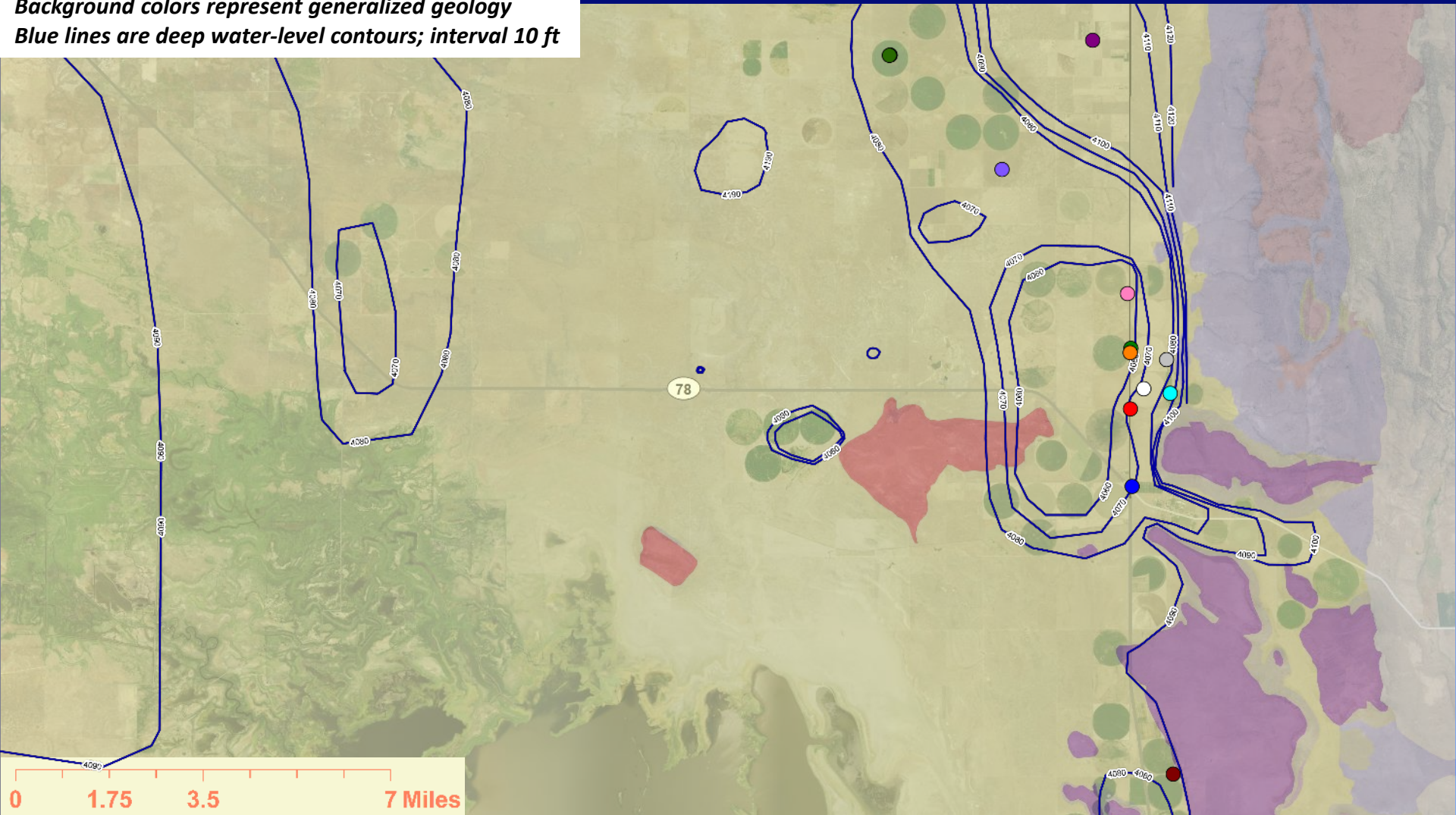
Background colors represent generalized geology
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General groundwater
flow directions

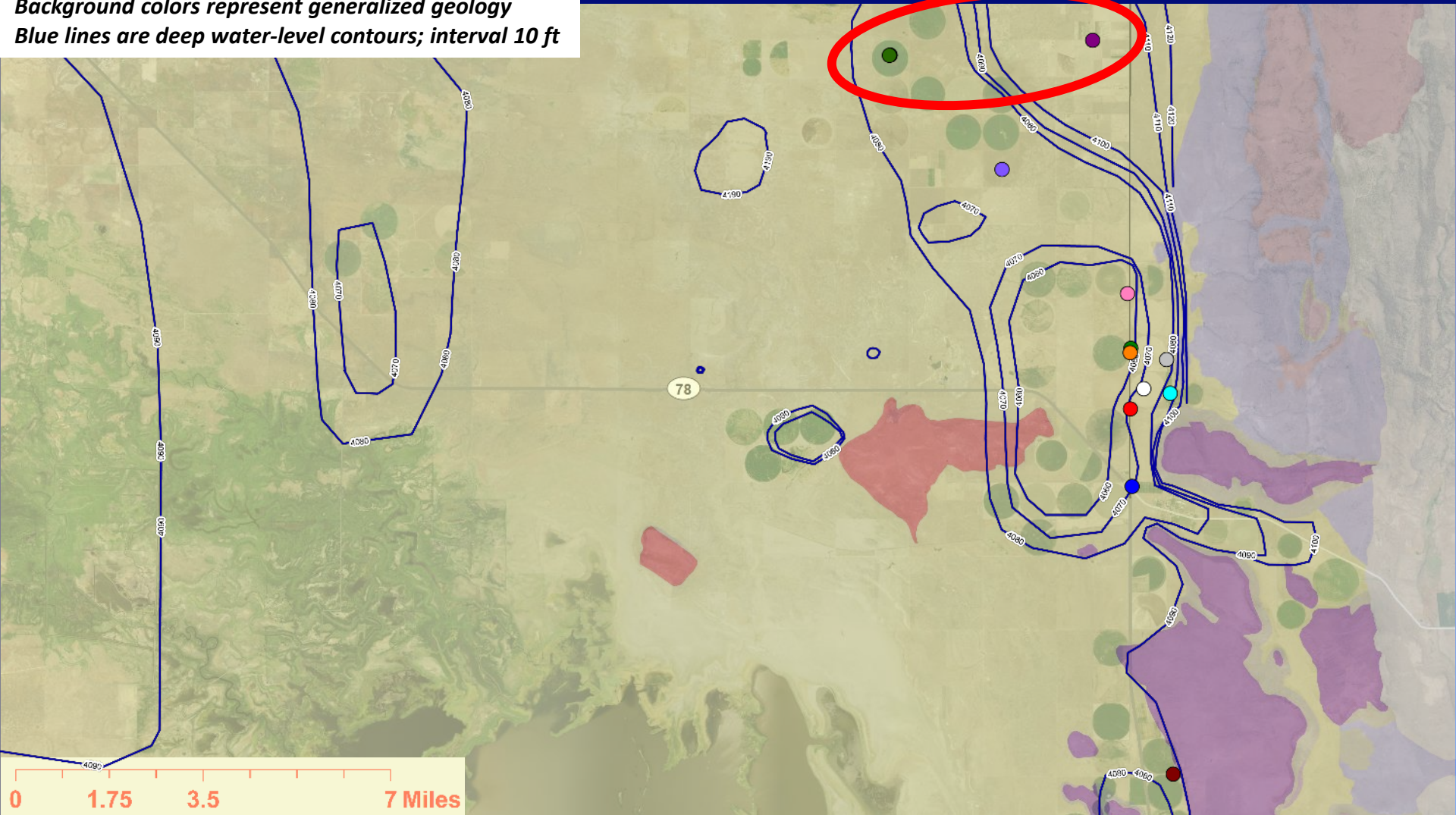
Crane

Background colors represent generalized geology
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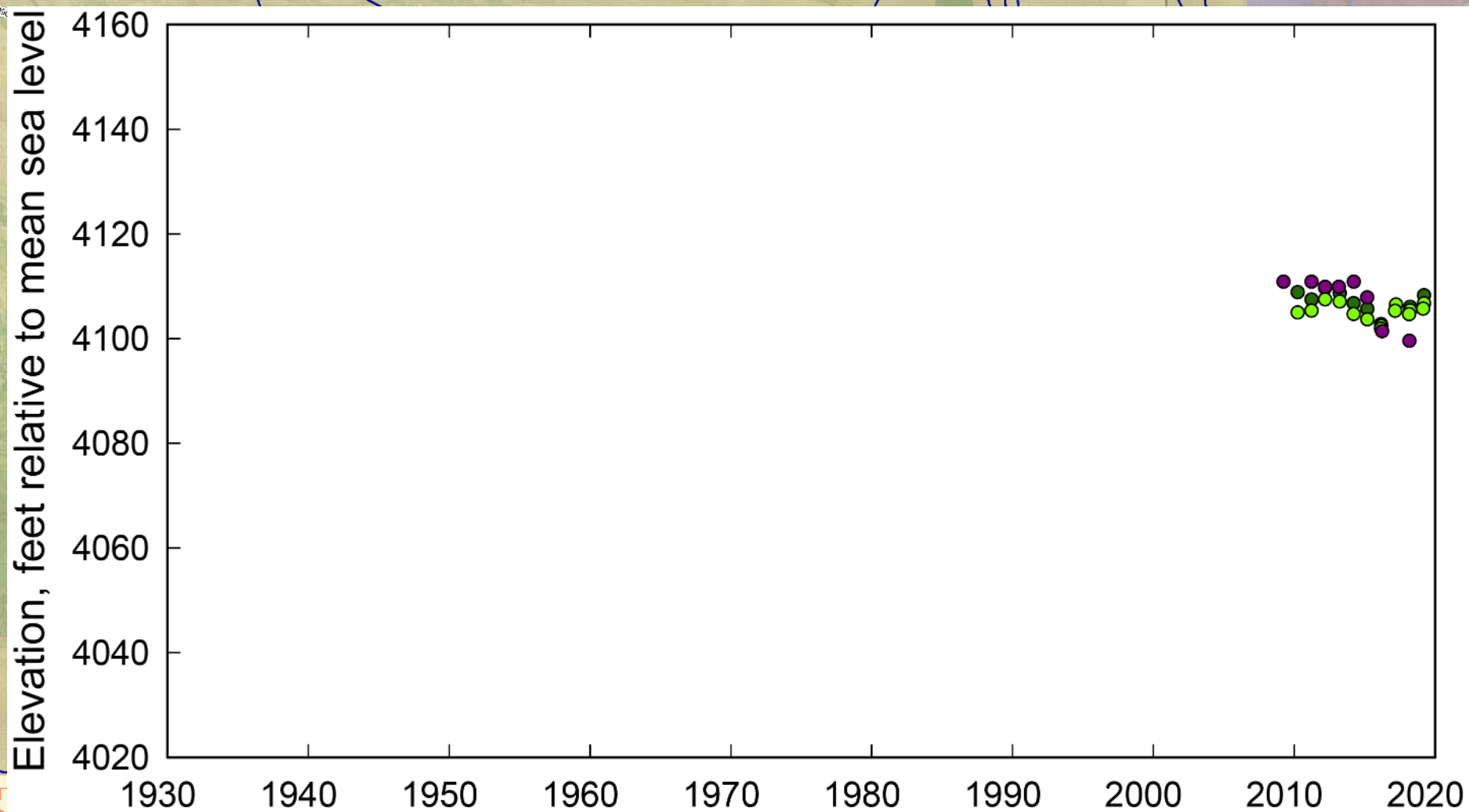


Crane

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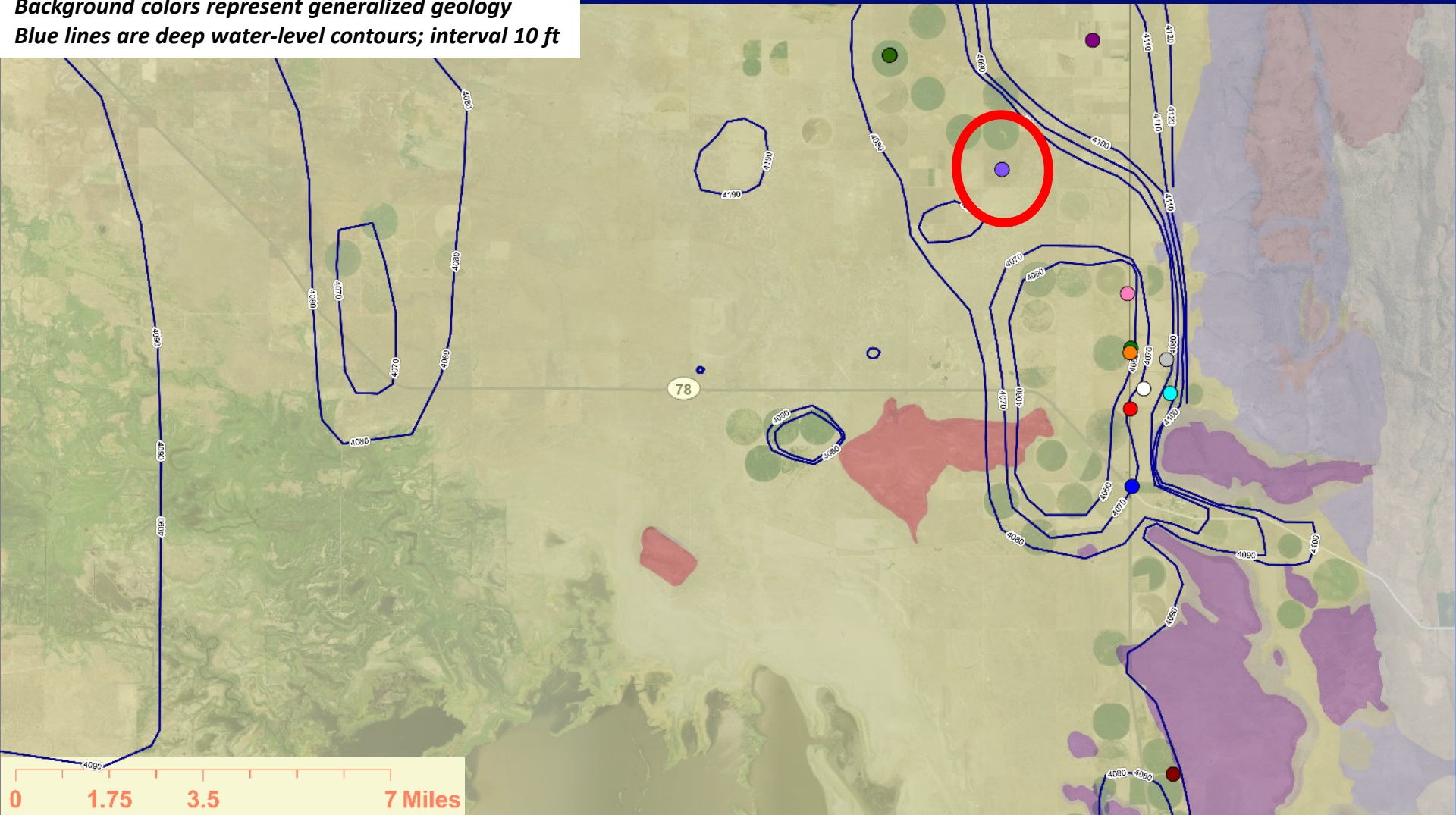


Crane

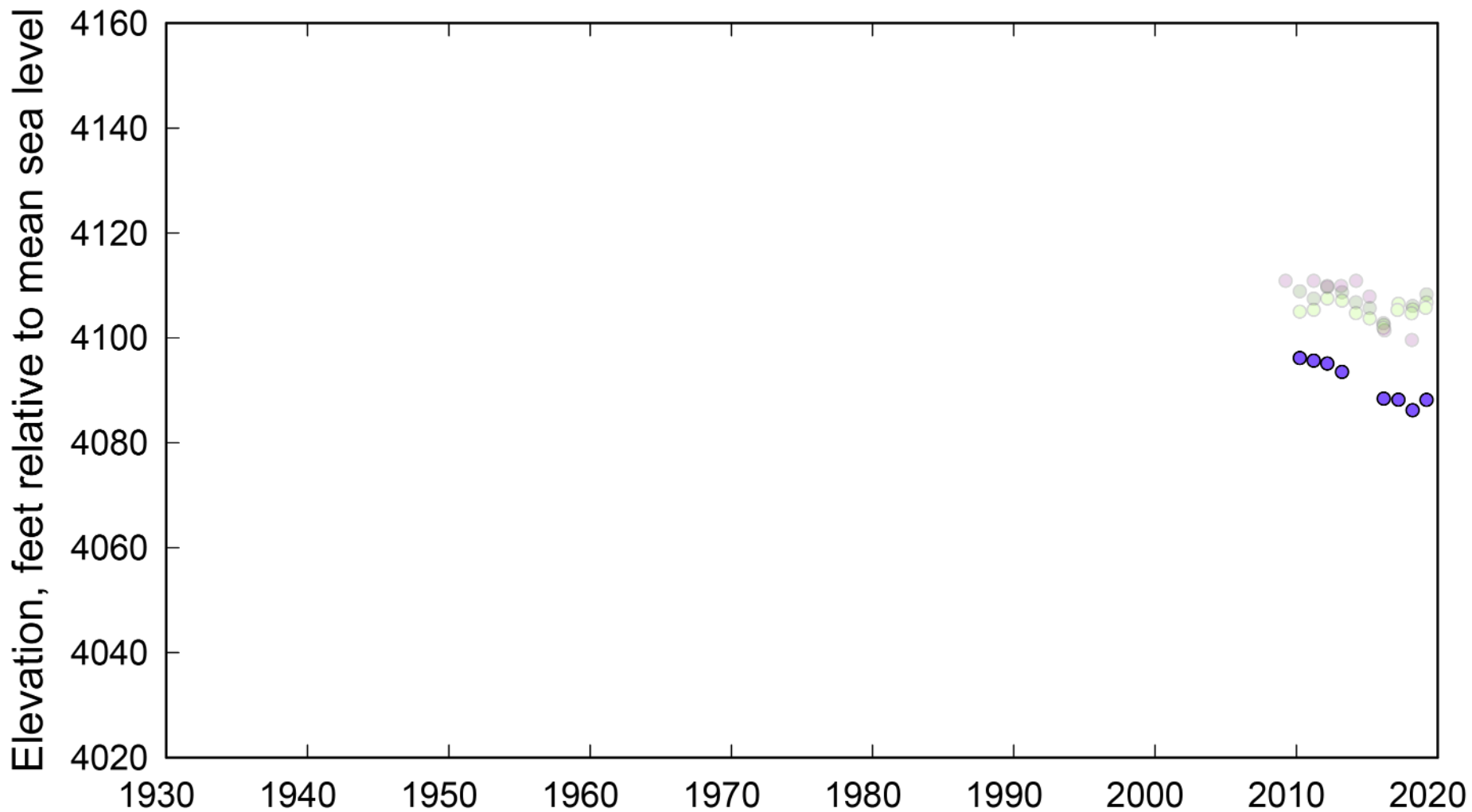


Crane

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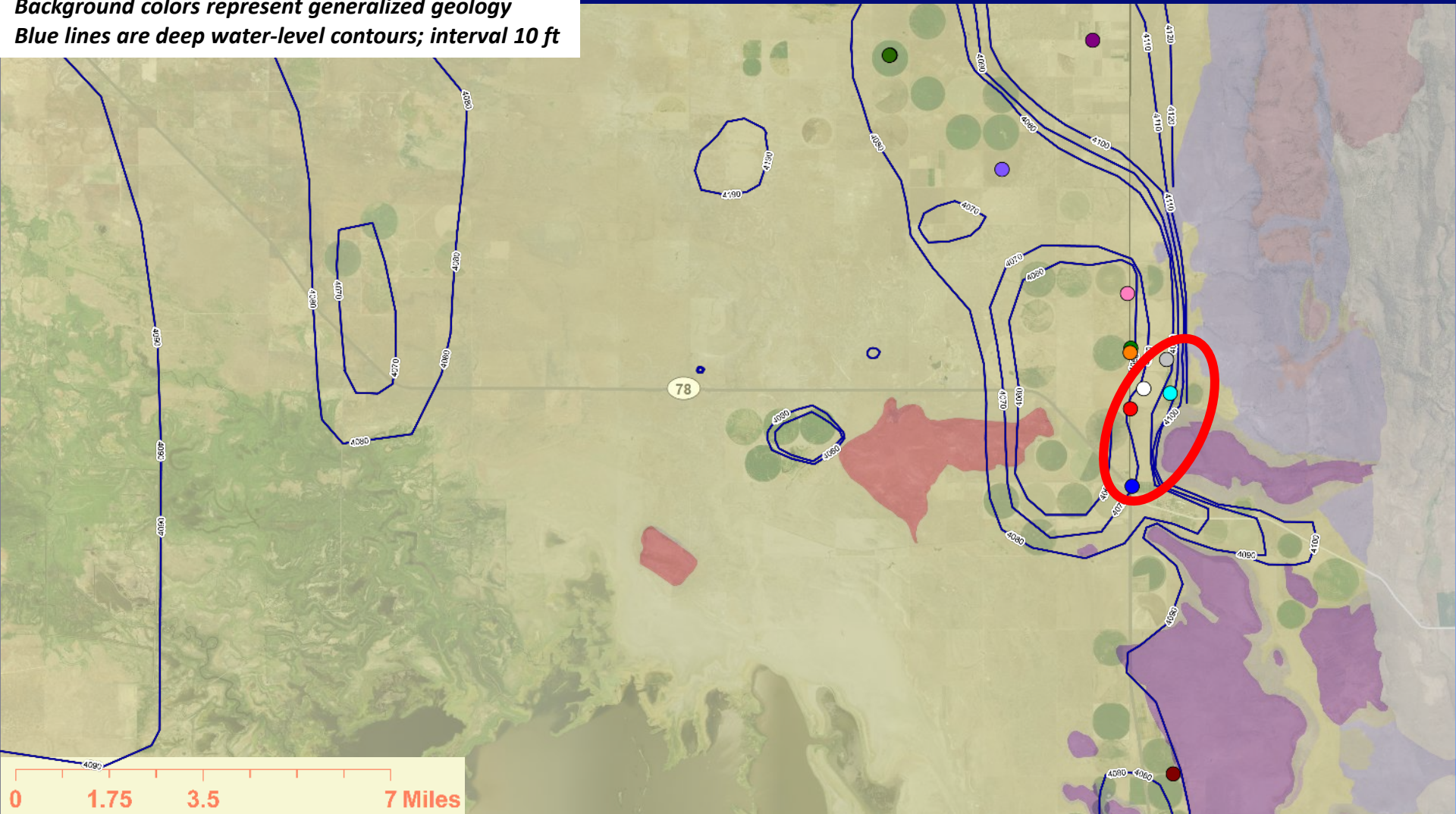


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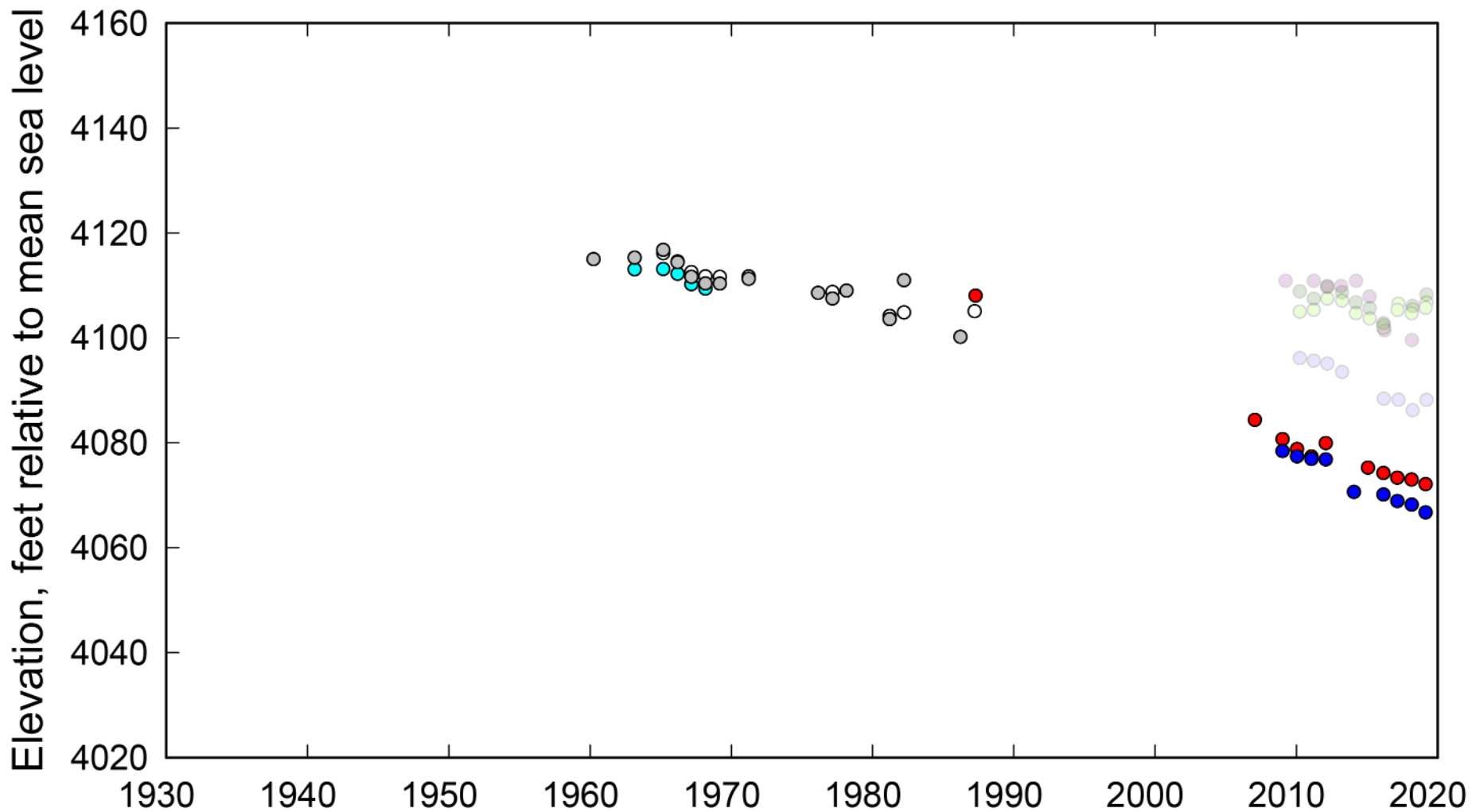


Crane

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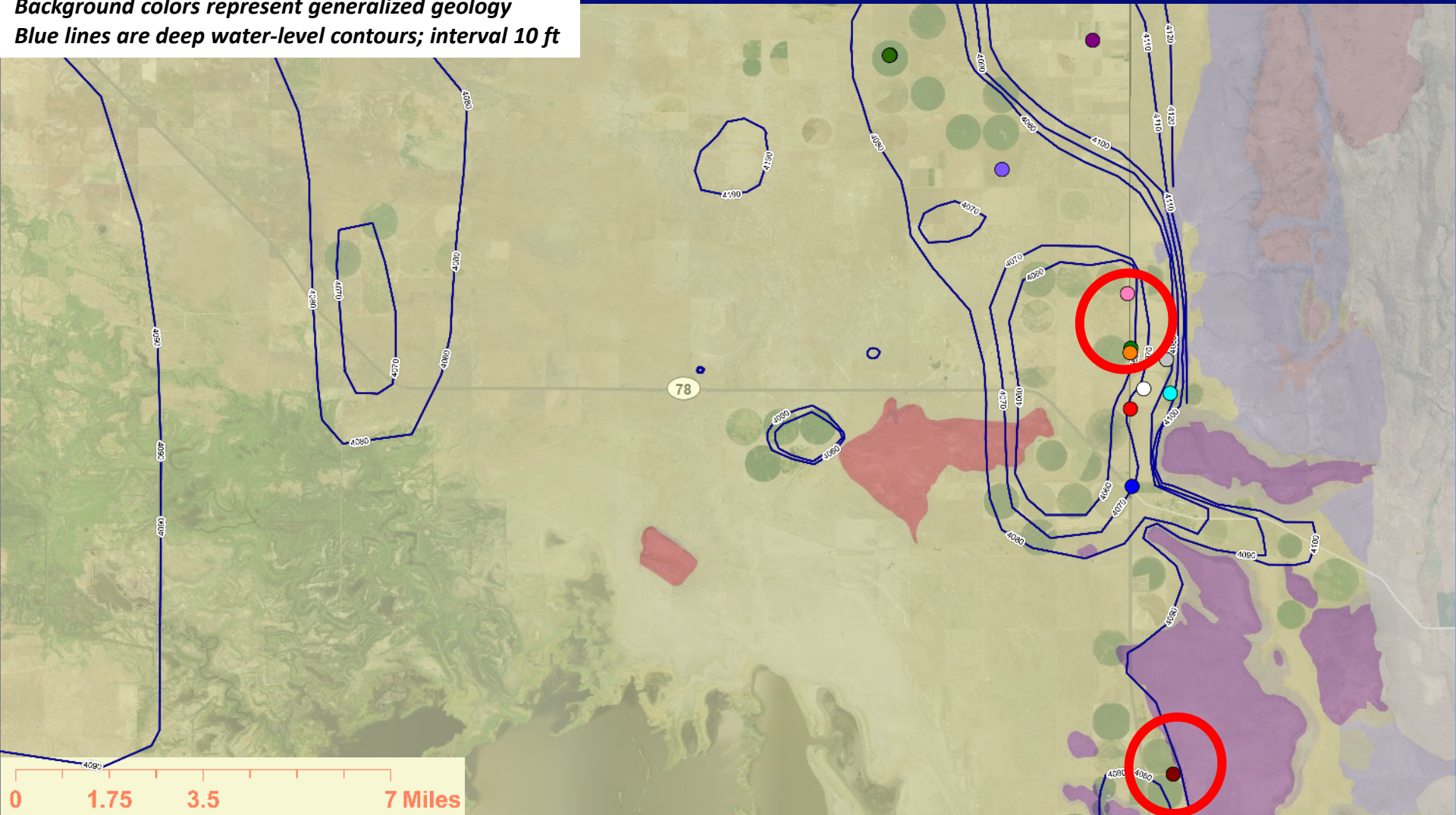


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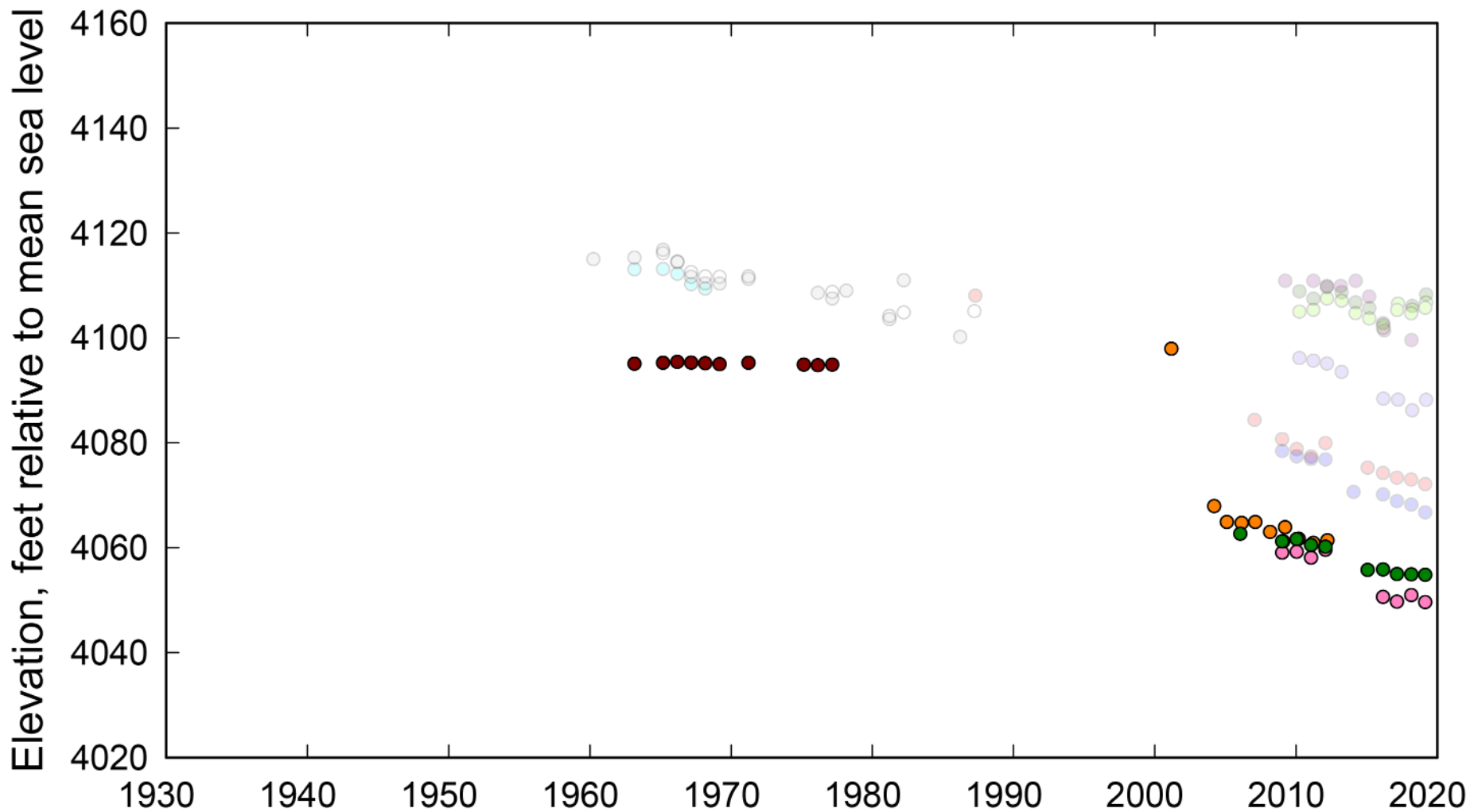


Crane

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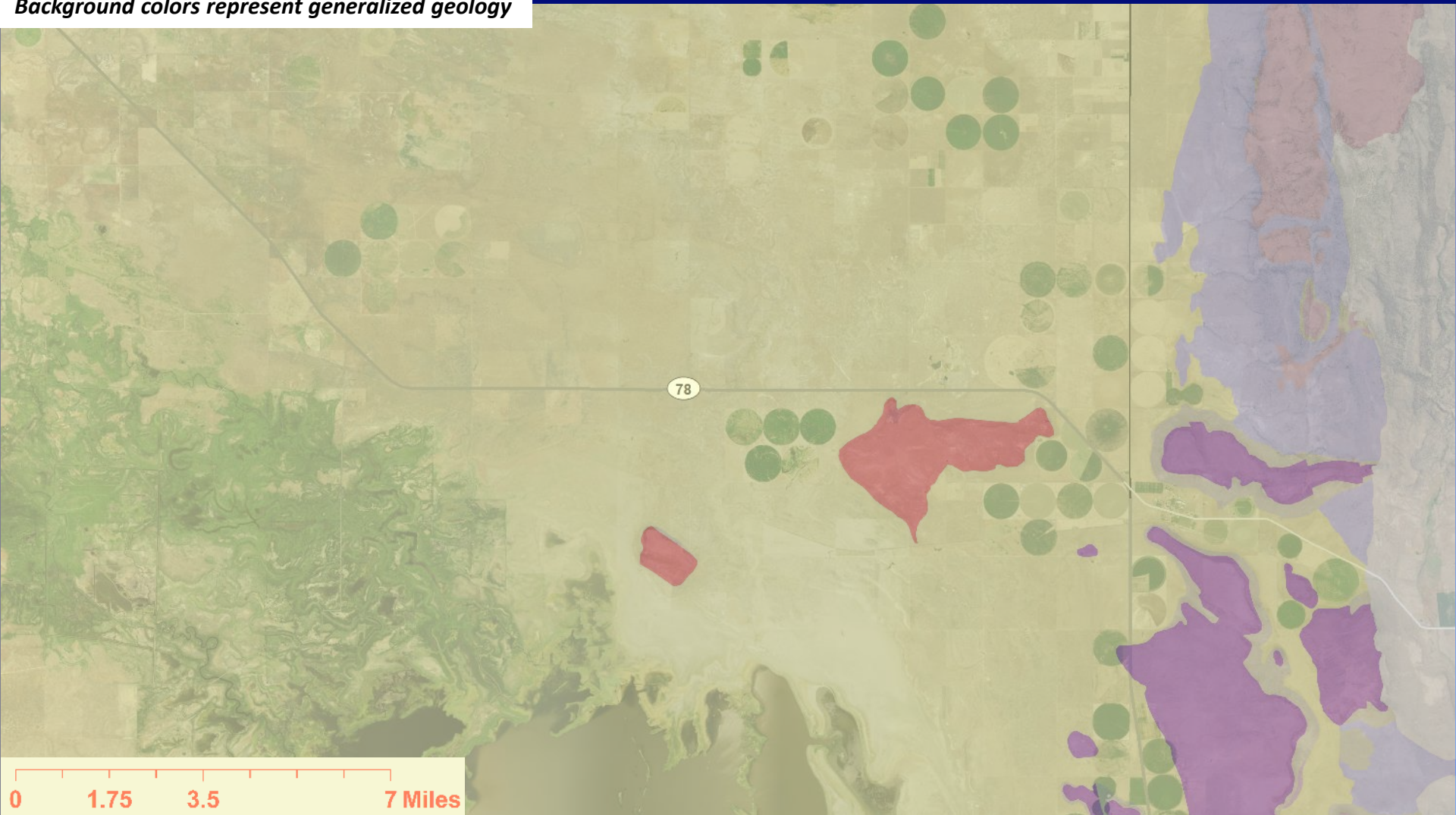


Crane



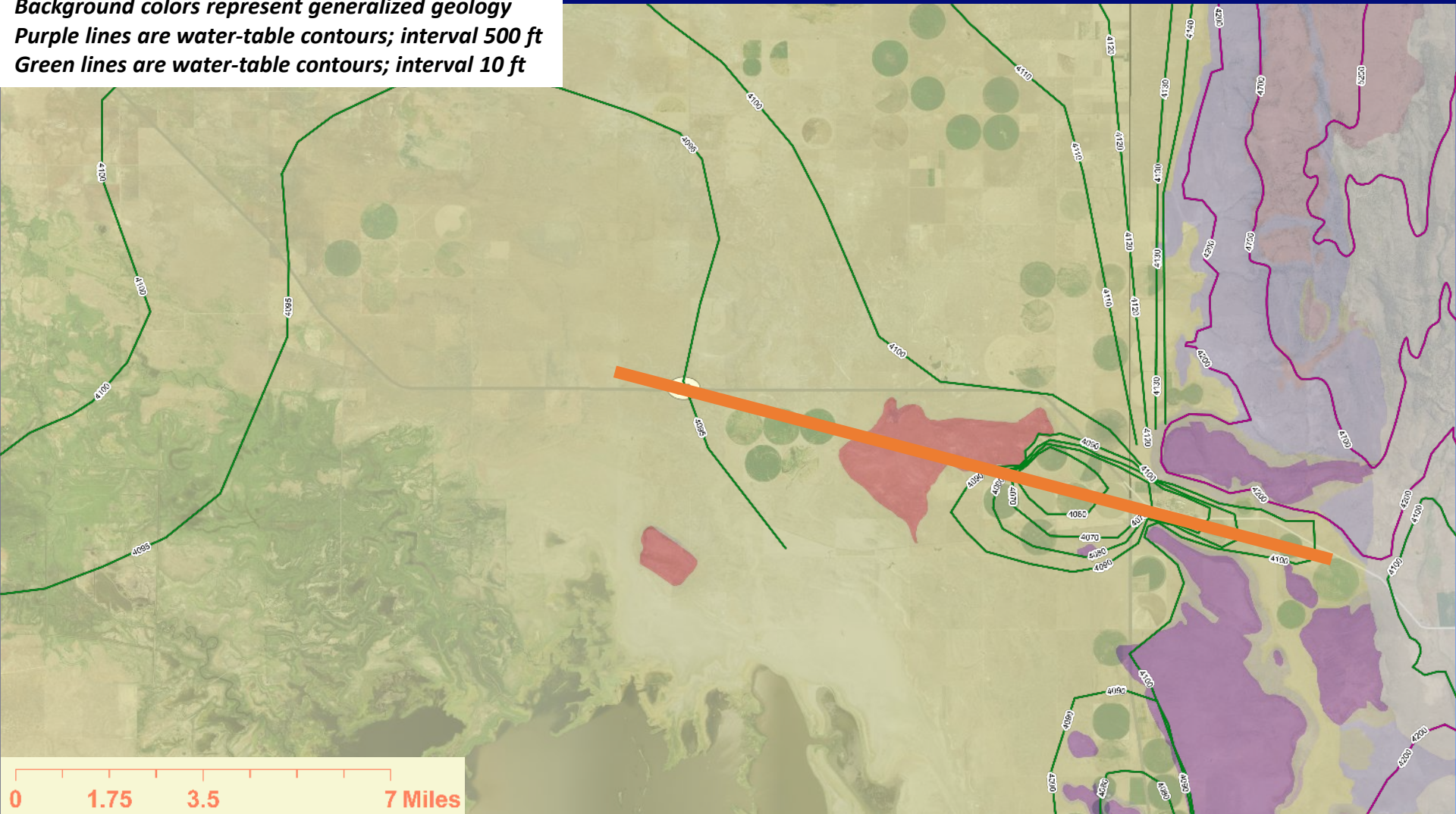
Crane

Background colors represent generalized geology

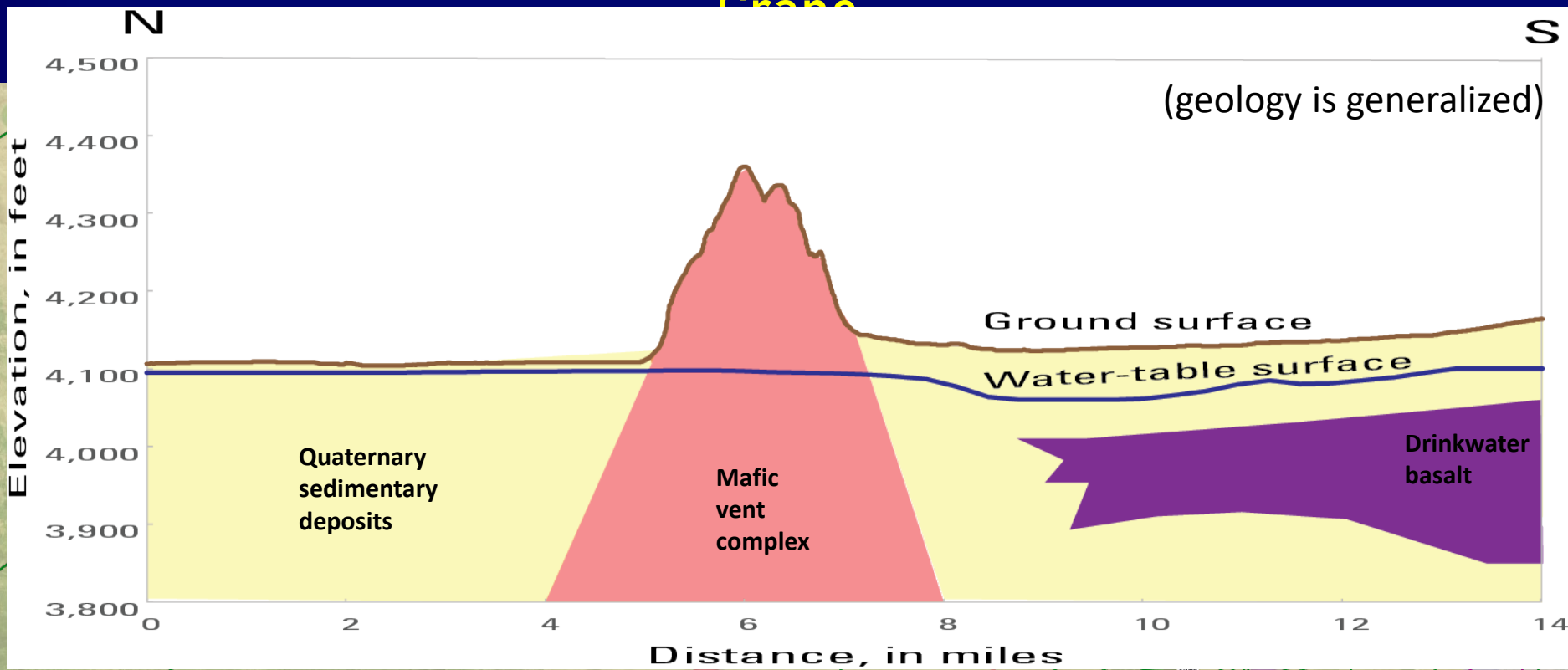


Crane

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Crane

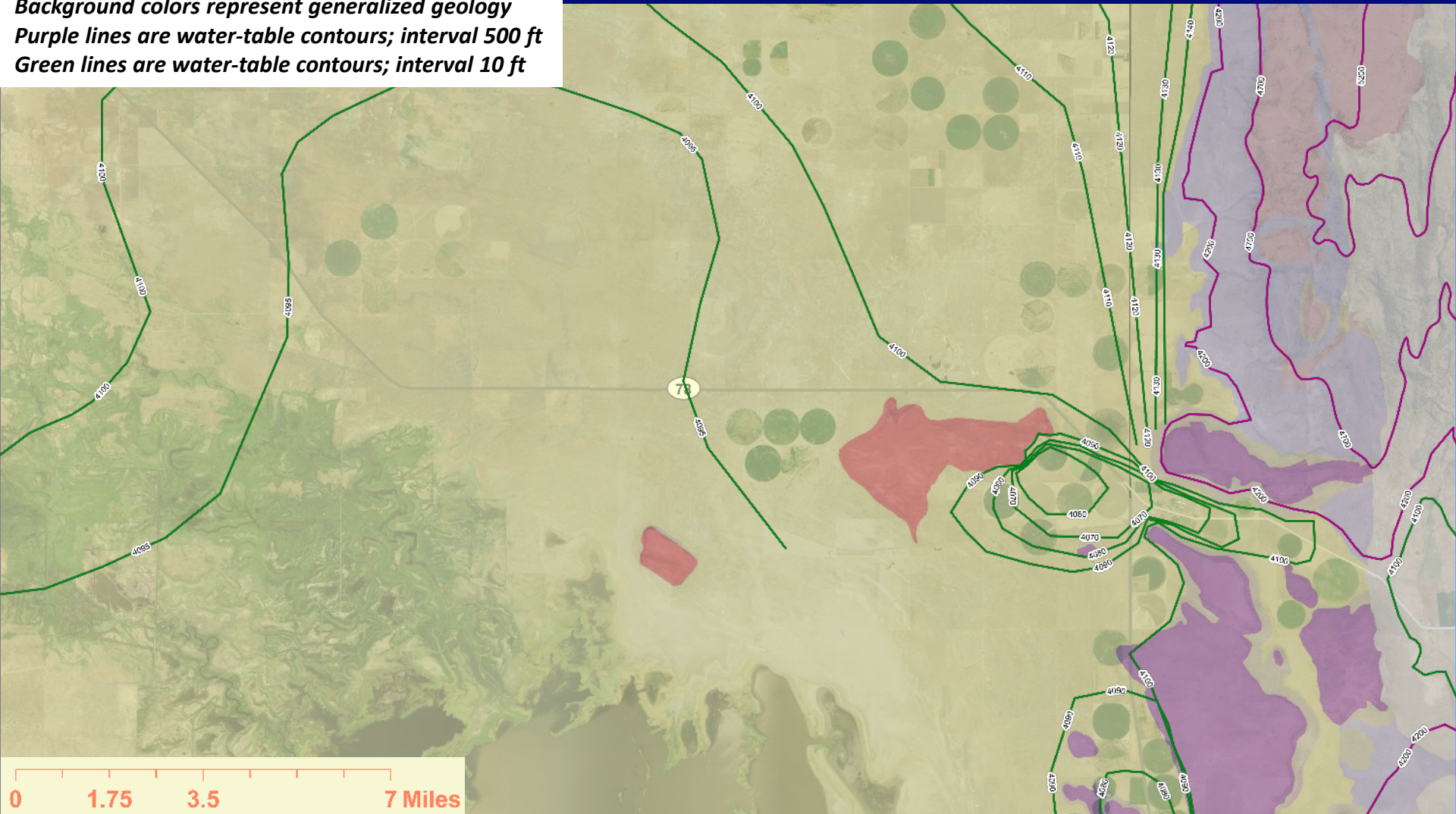


Preliminary Information—Subject to Revision. Not for Citation or Distribution.

Generalized Geologic Map of the Harney Basin, Oregon (Boschmann, in prep.)

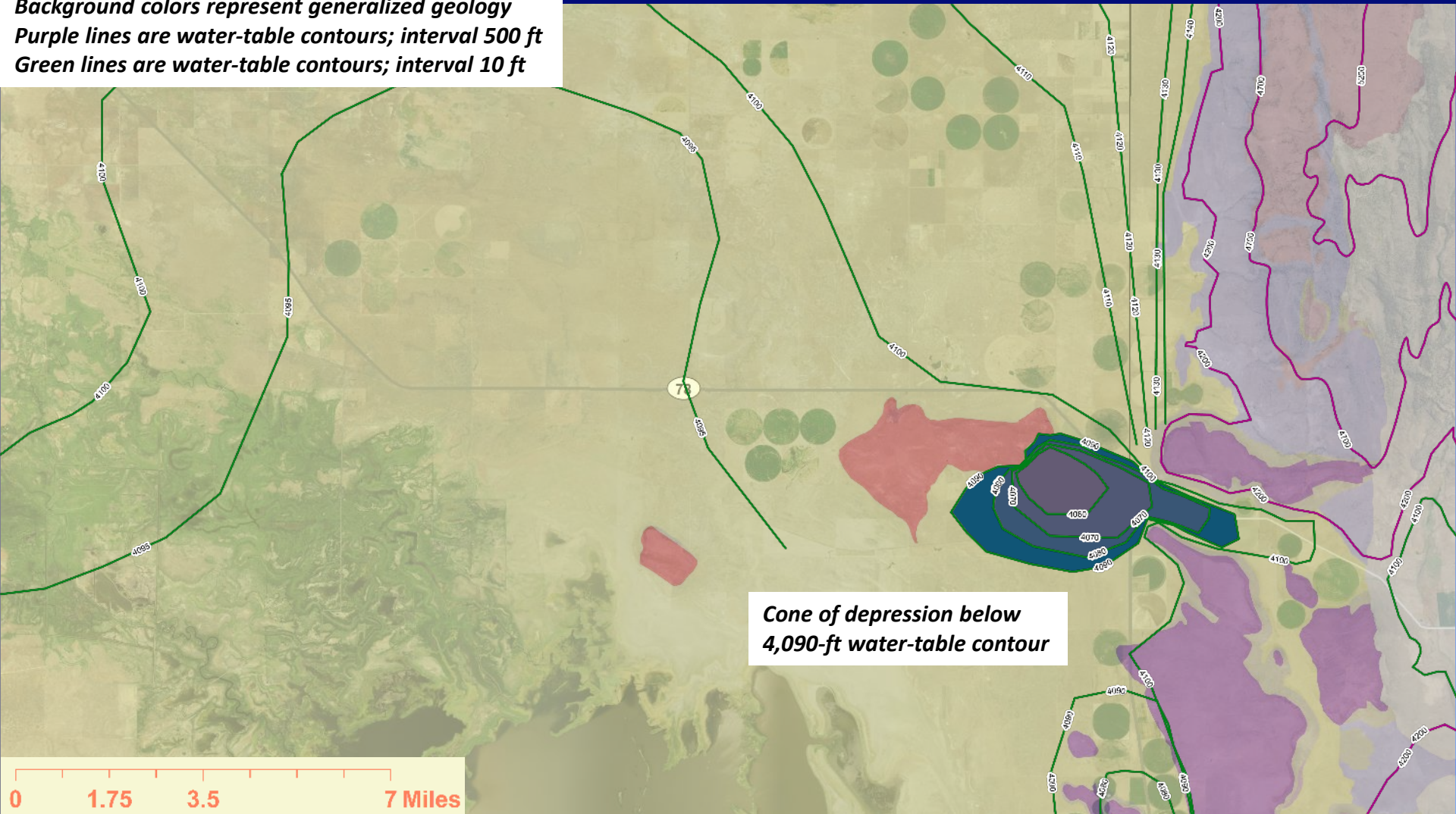
Crane

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Crane

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft

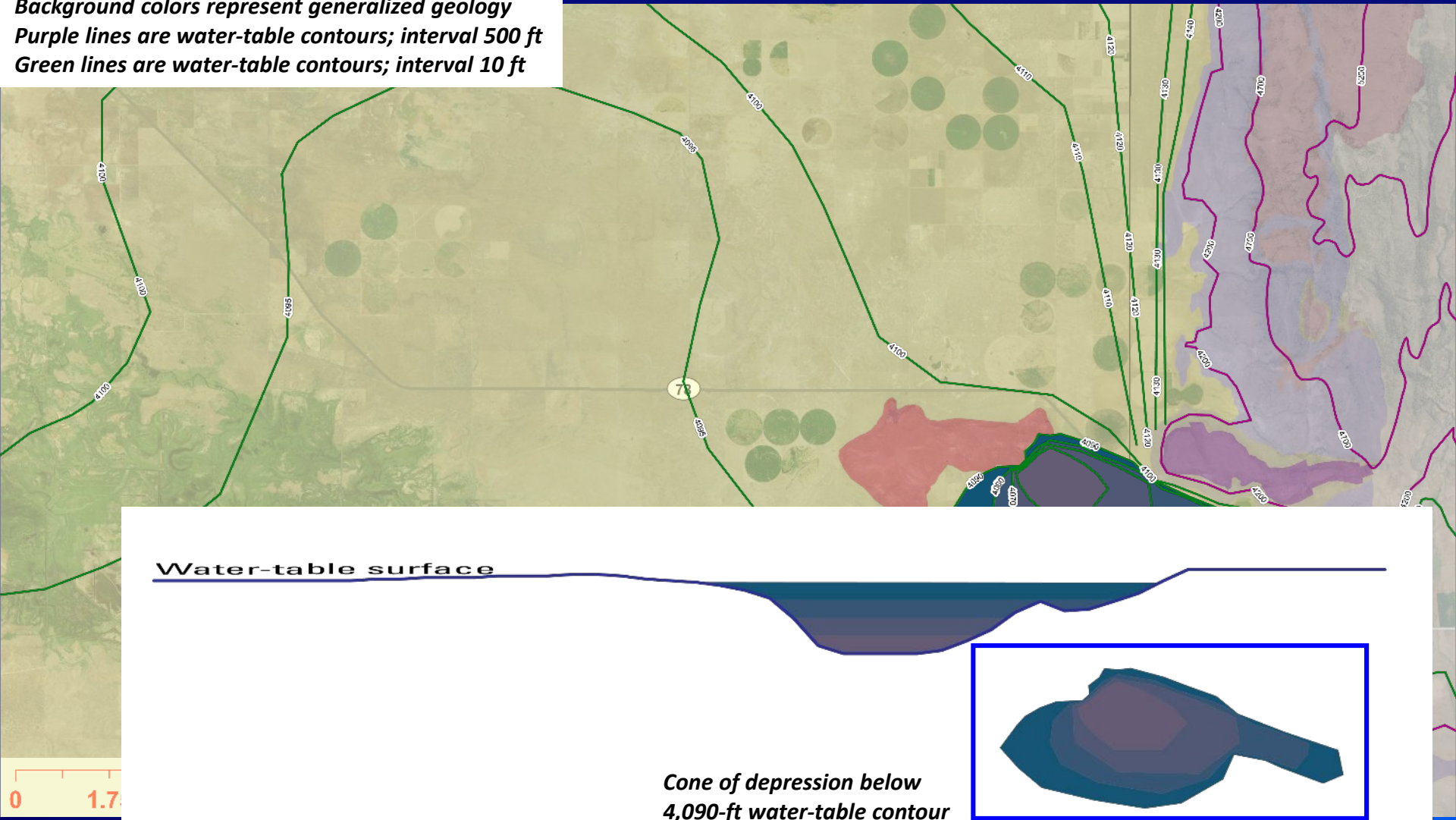


**Cone of depression below
4,090-ft water-table contour**



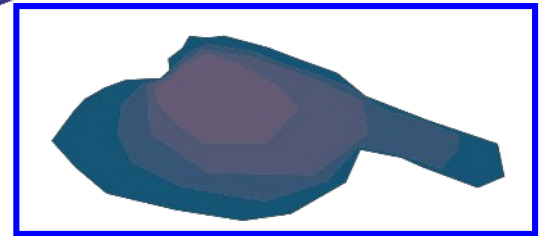
Crane

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Water-table surface

*Cone of depression below
4,090-ft water-table contour*



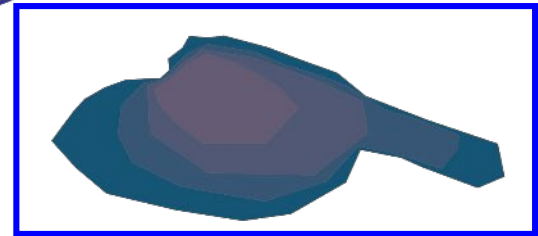
Crane

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft

Rough estimate of removed water
Total "hole" volume x Porosity = **23,000–34,000 Ac-Ft**
(assume 20-30% porosity) = **7.5–11 billion gallons**

Water-table surface

Cone of depression below
4,090-ft water-table contour



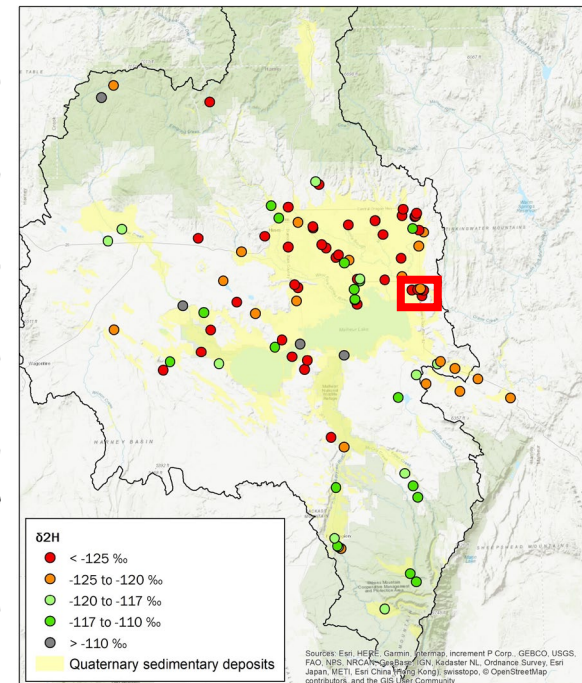
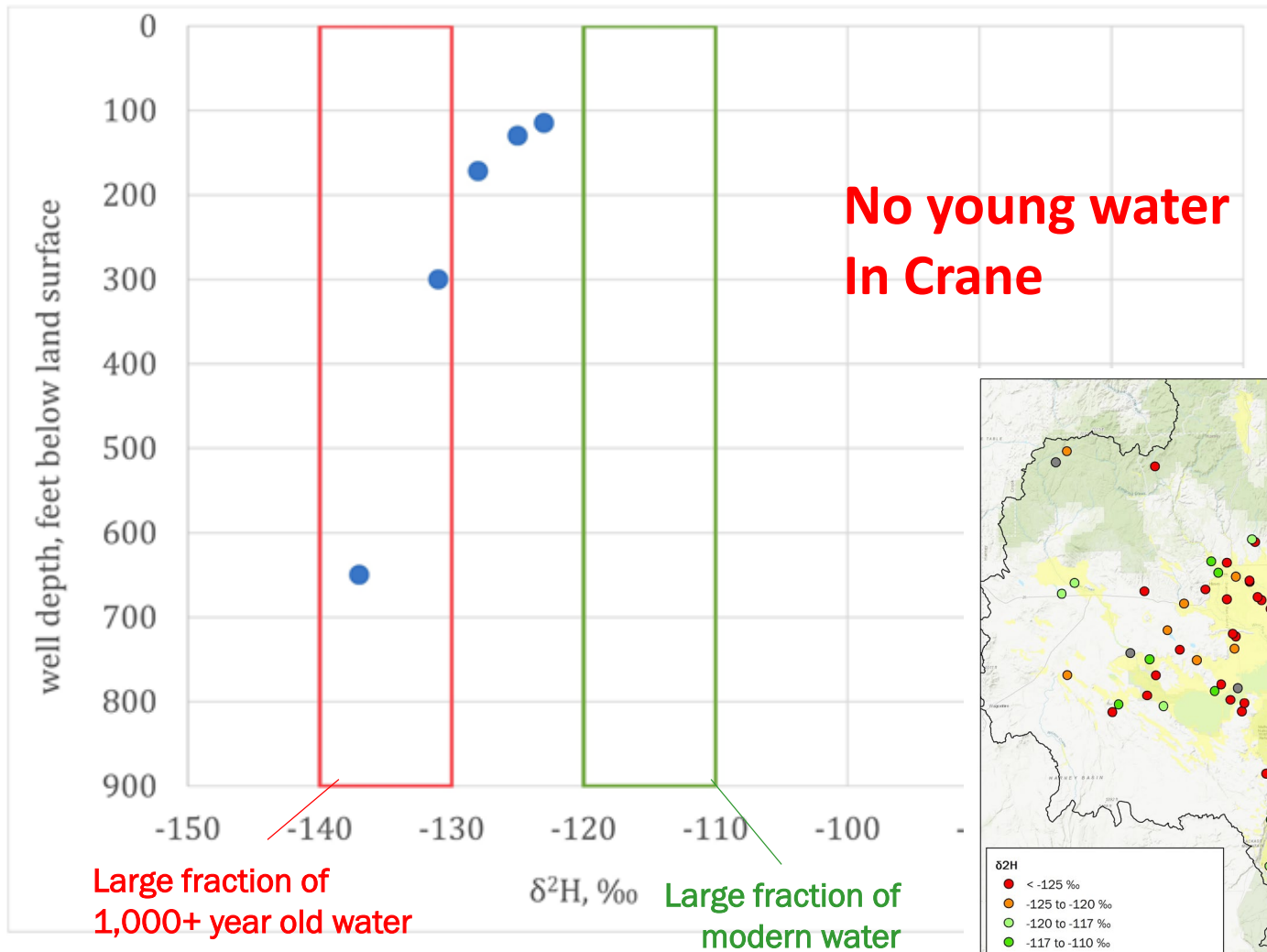
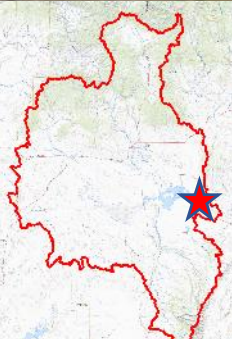
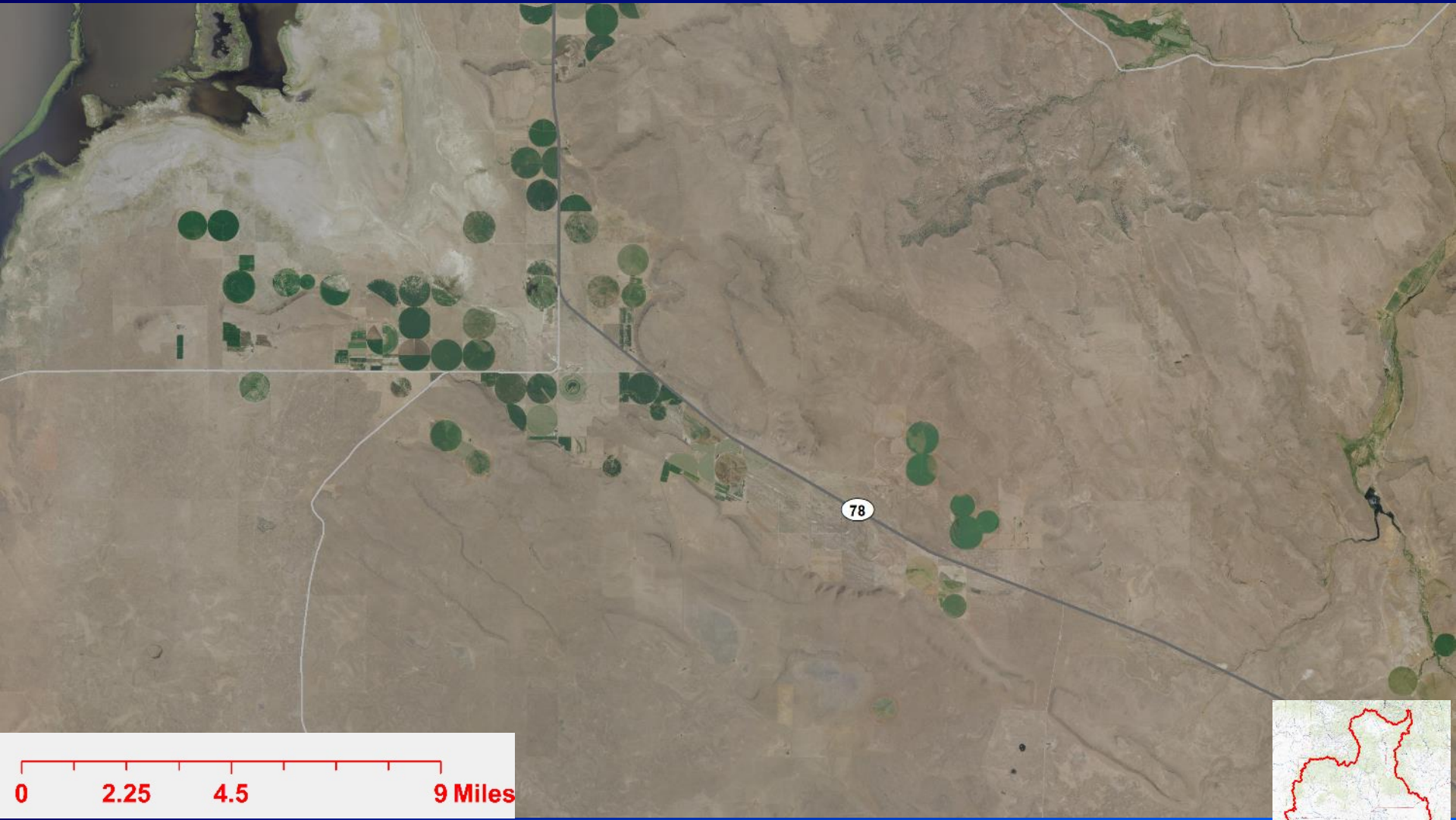


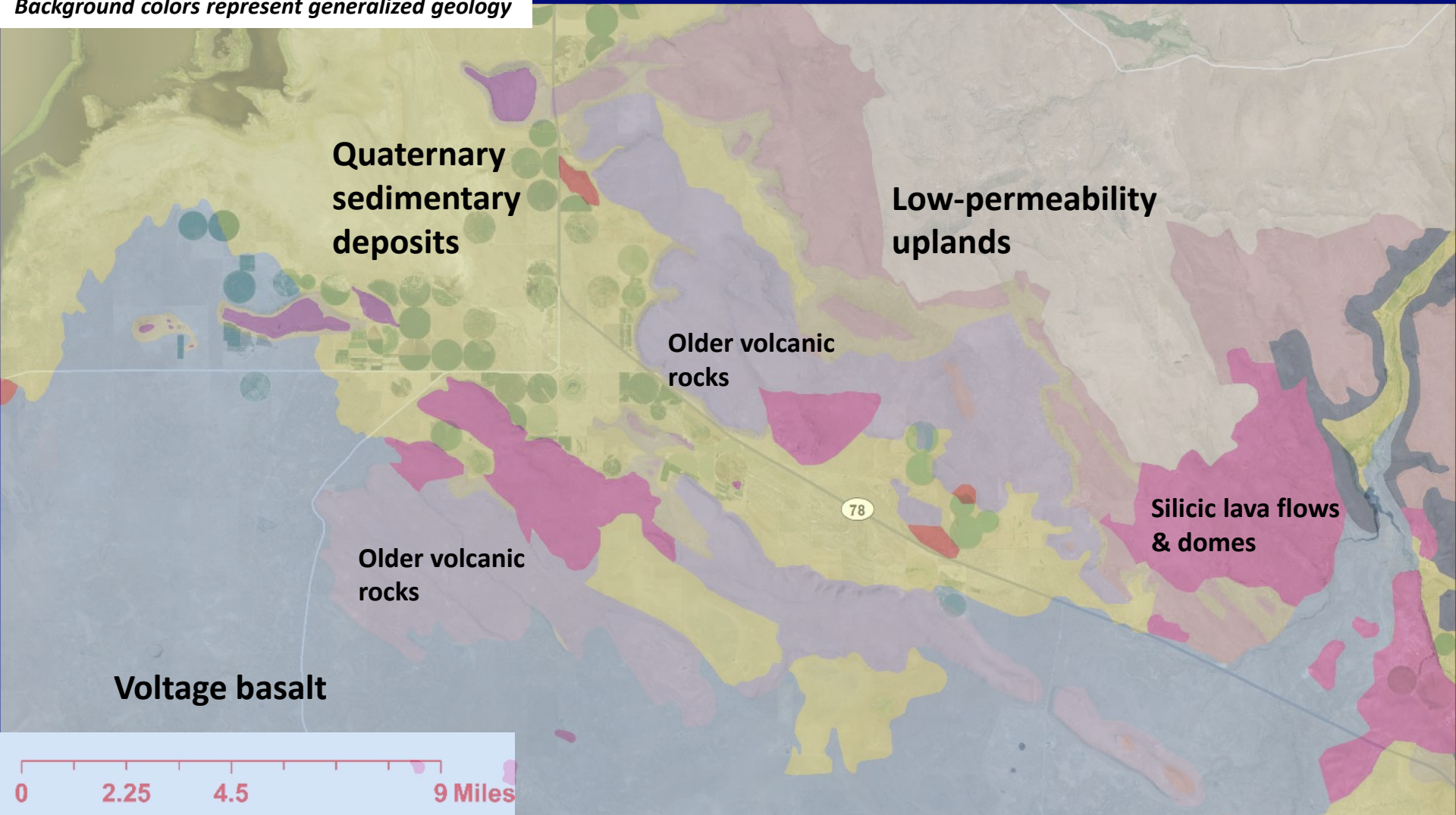
Figure X. $\delta^2\text{H}$ ratio in well samples, Harney Basin, Oregon.

Virginia Valley



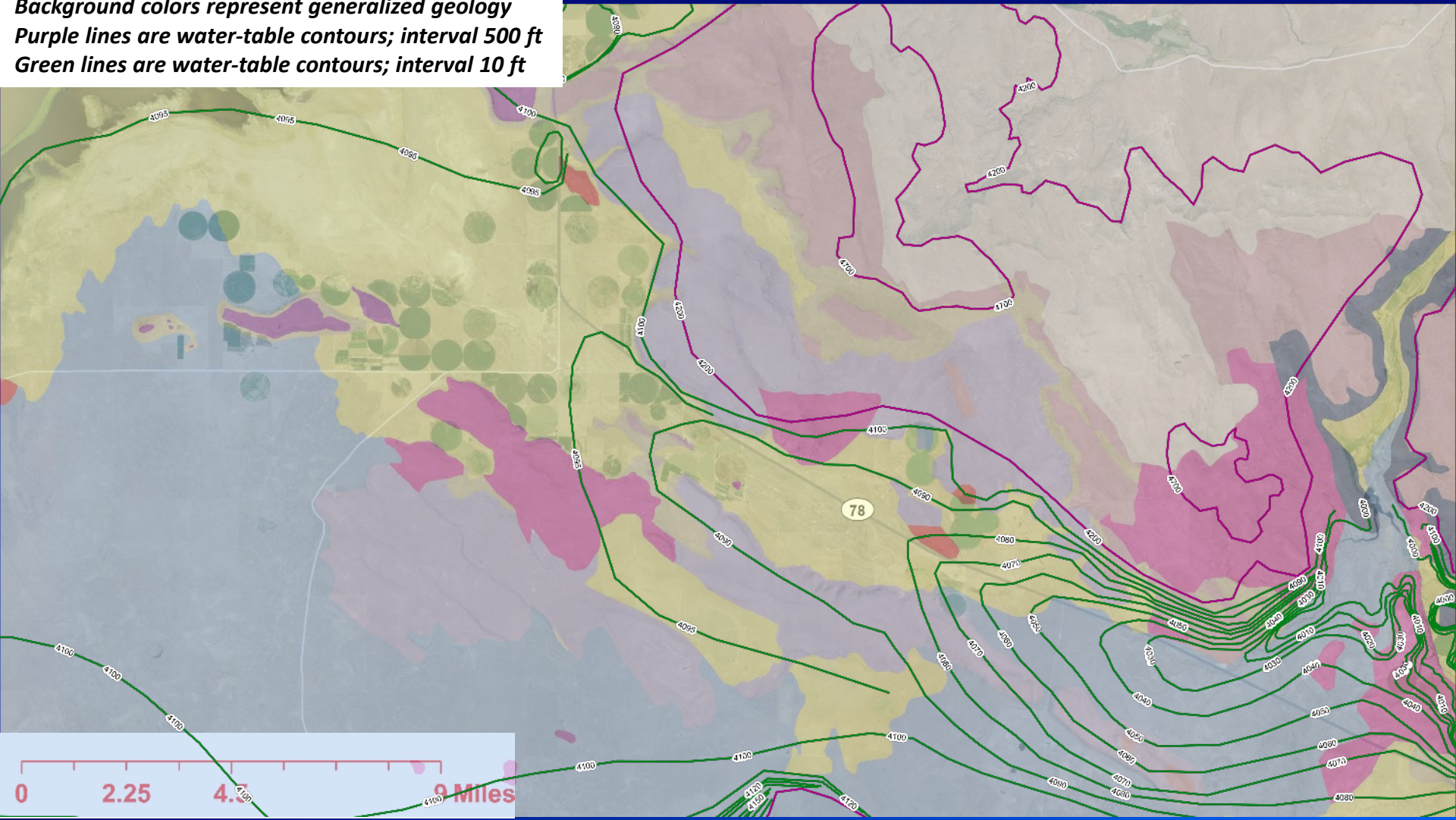
Virginia Valley

Background colors represent generalized geology



Virginia Valley

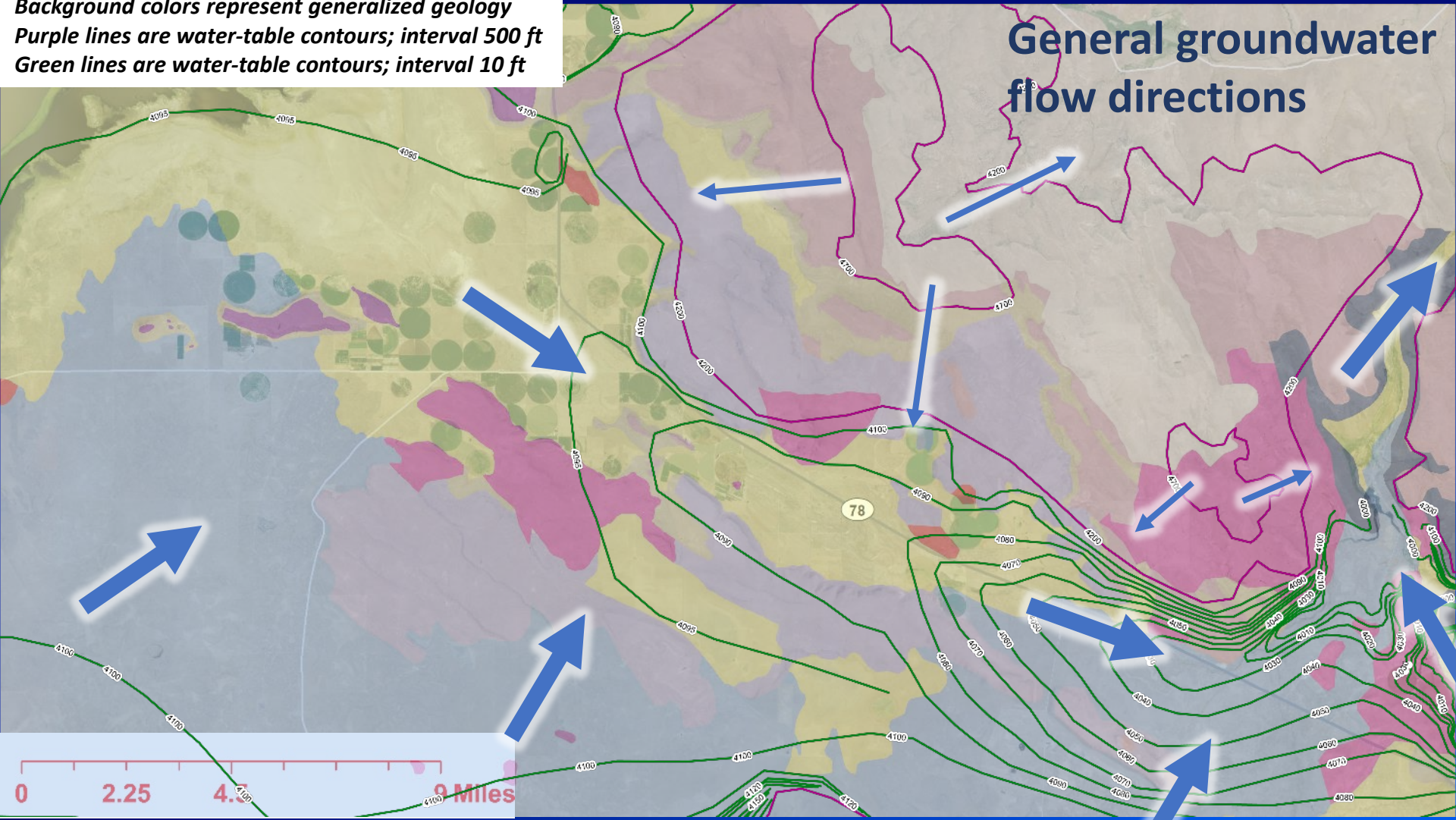
Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Virginia Valley

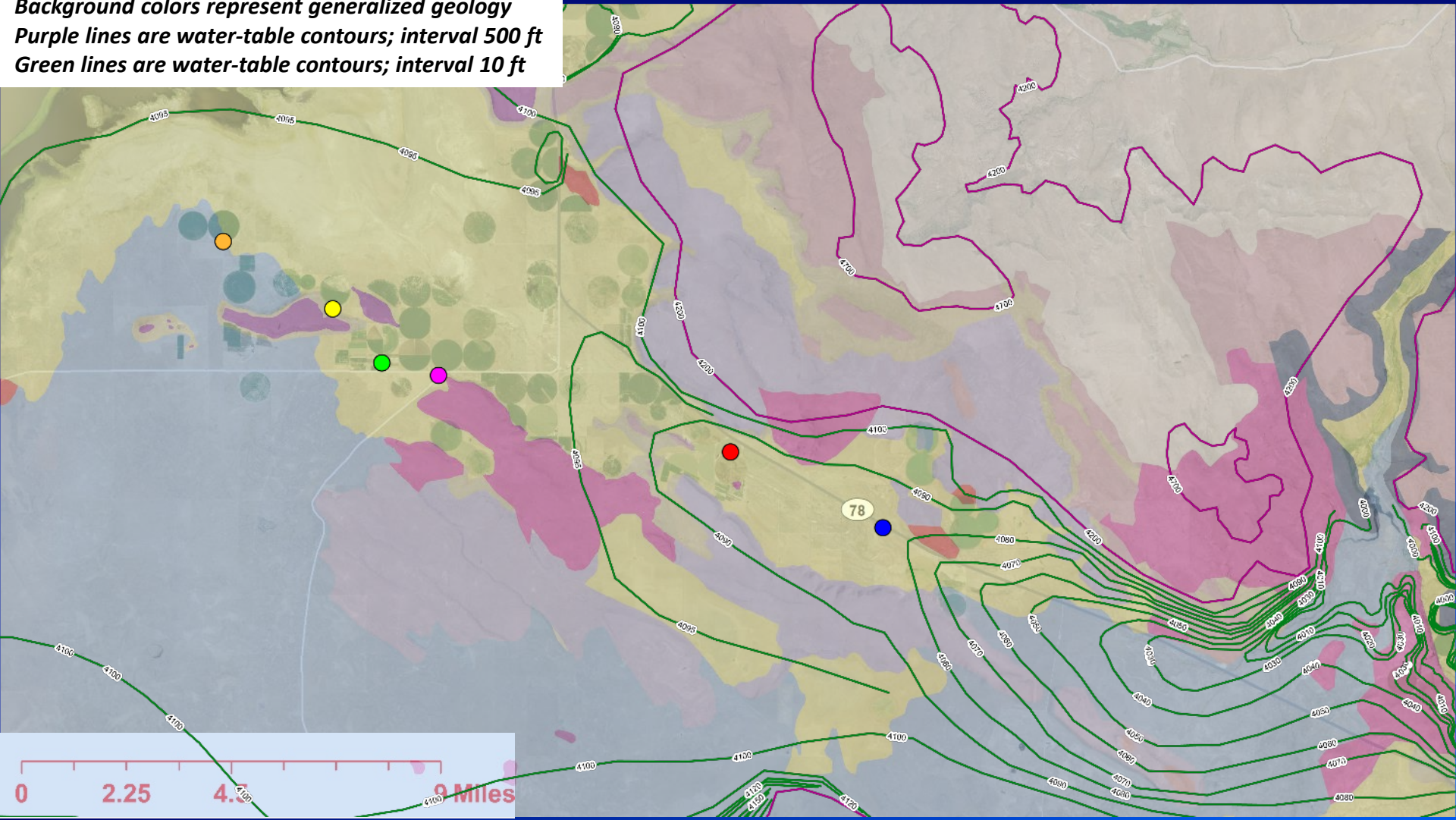
Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft

General groundwater flow directions



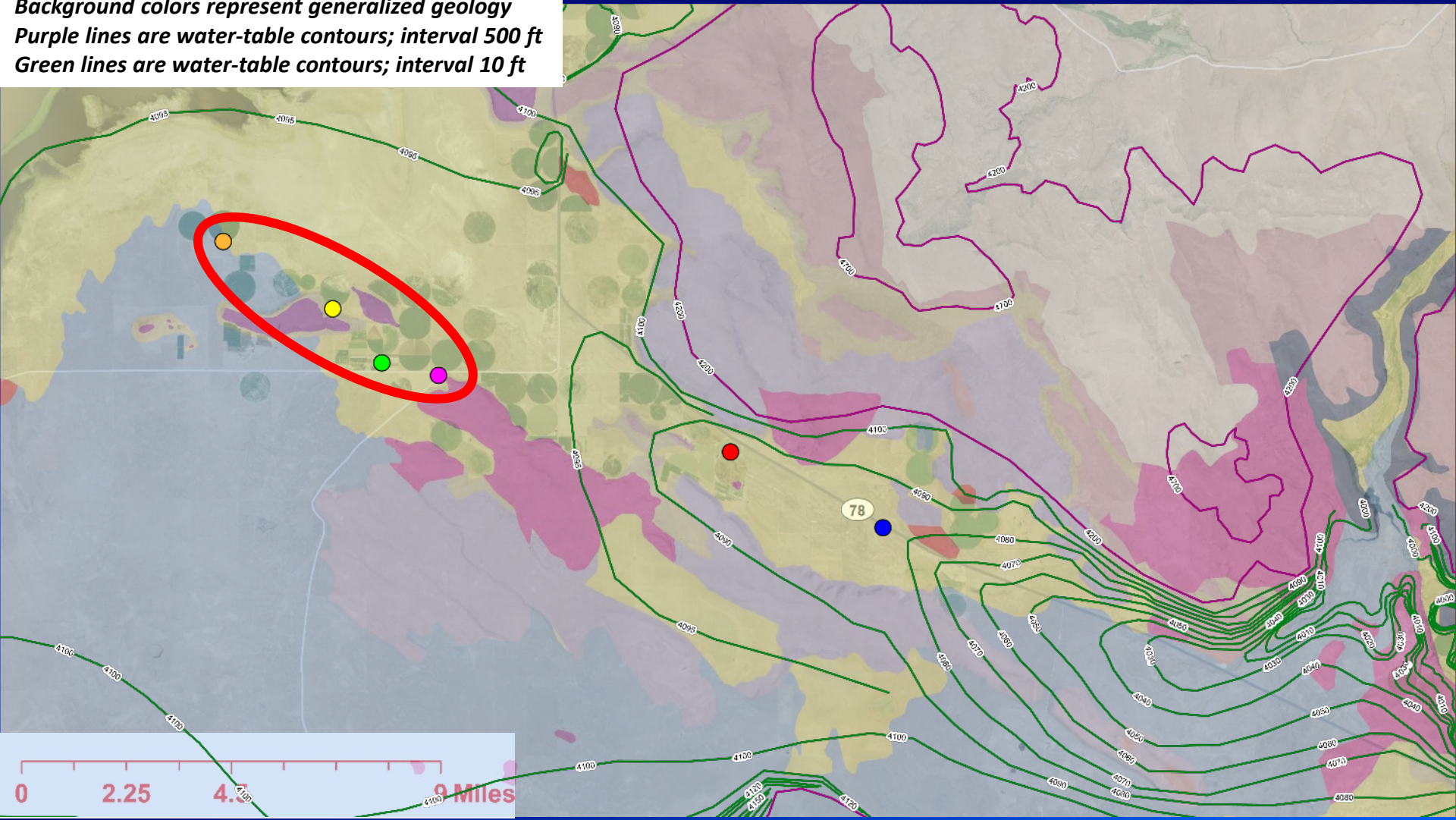
Virginia Valley

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft

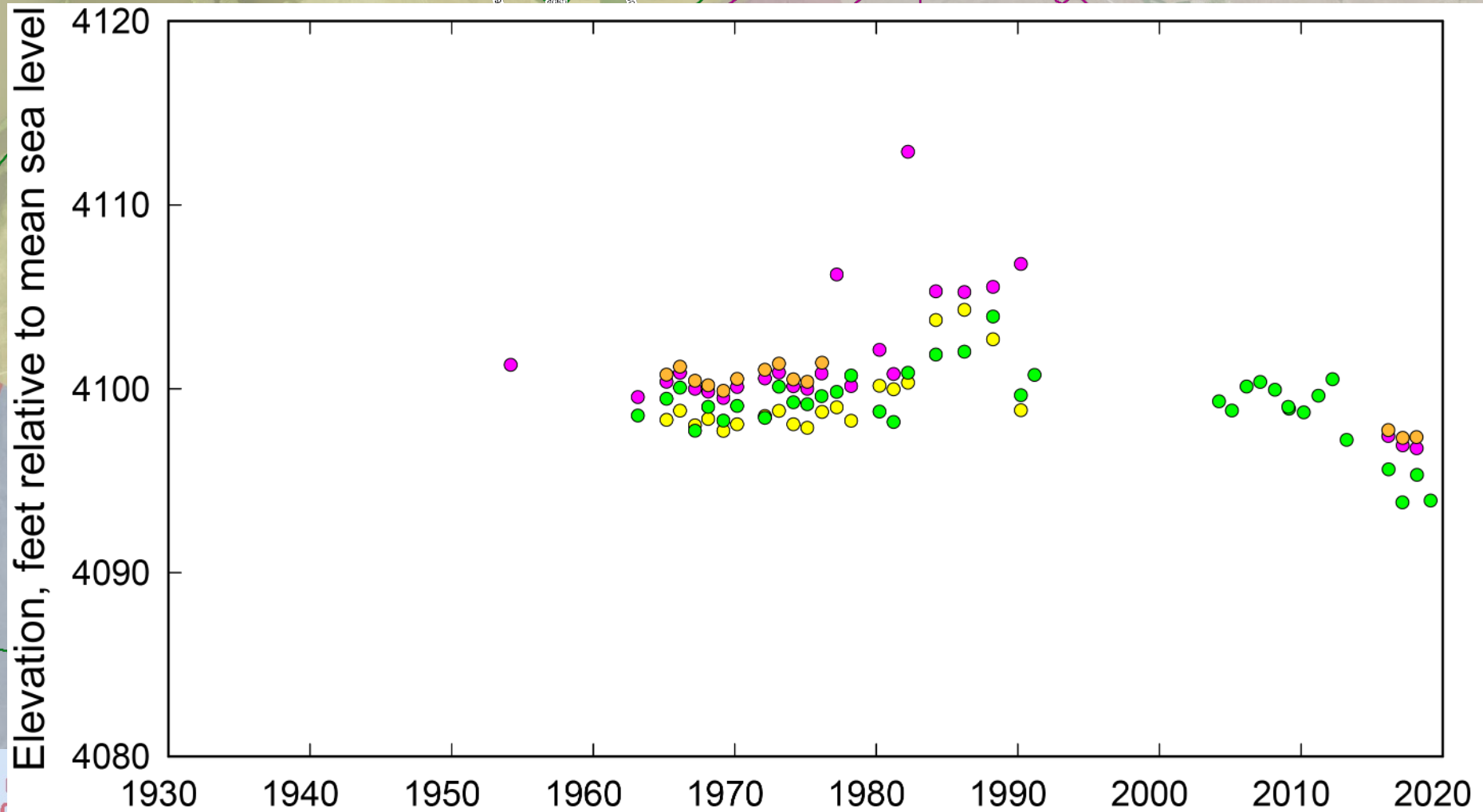


Virginia Valley

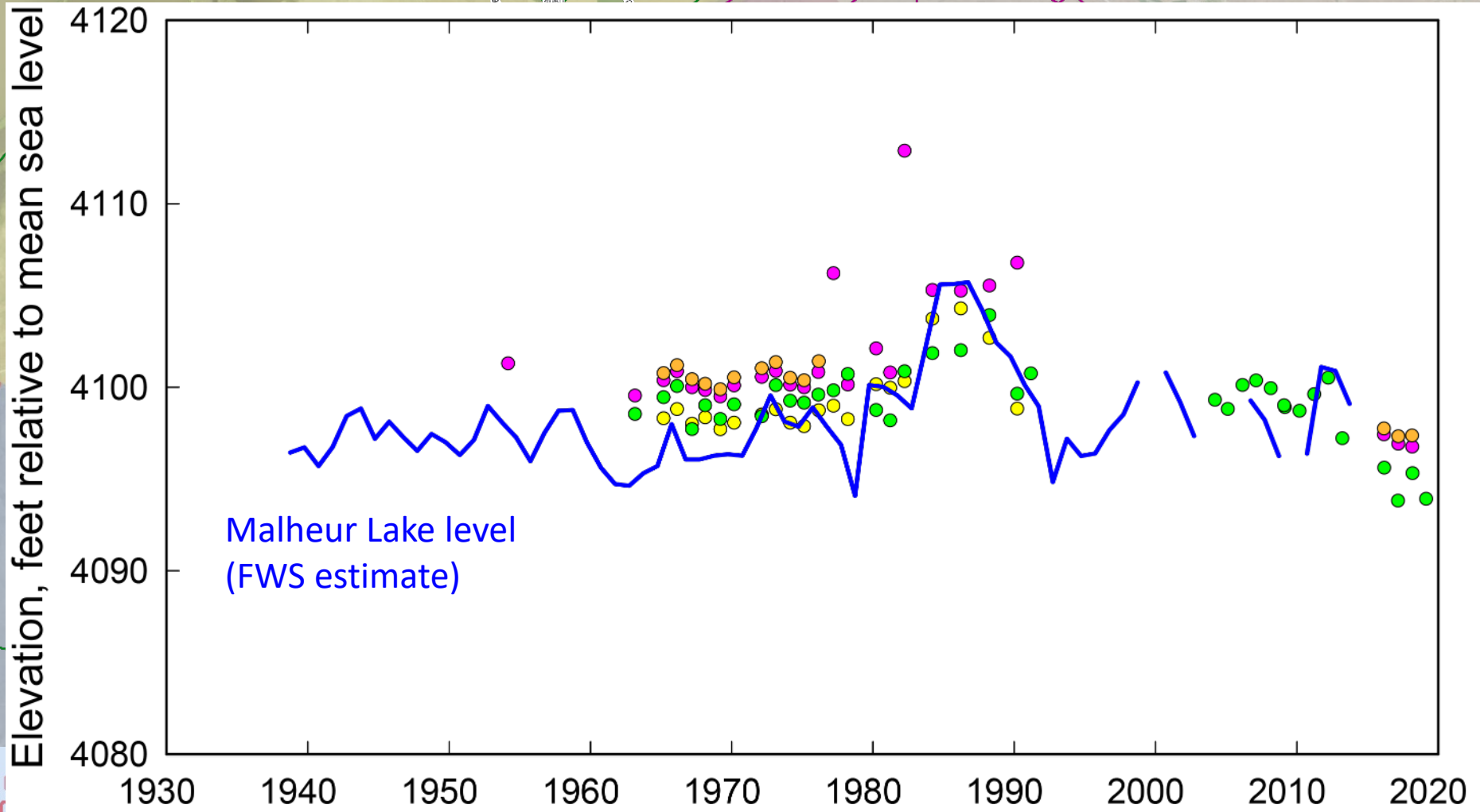
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Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Virginia Valley

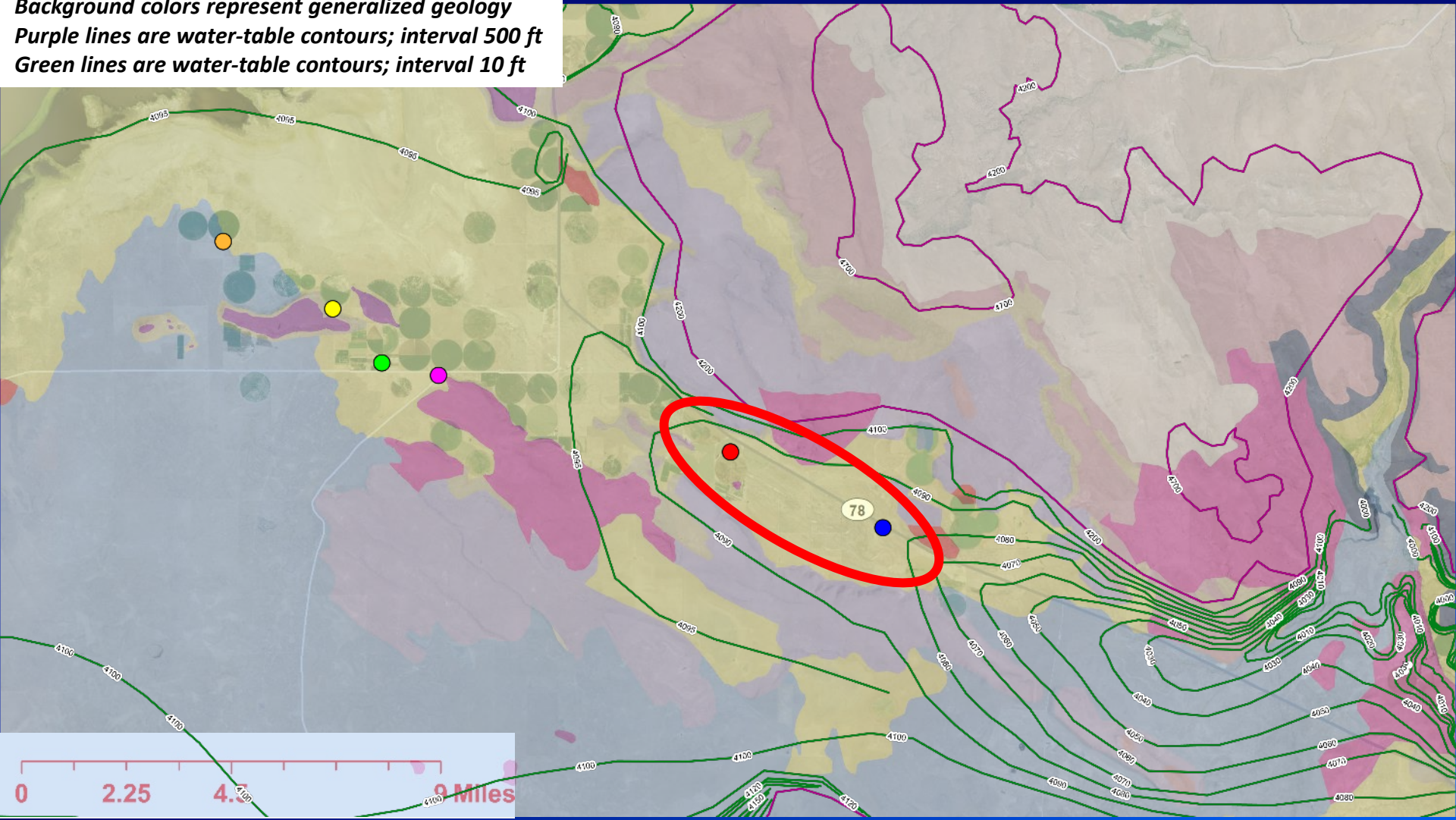


Virginia Valley

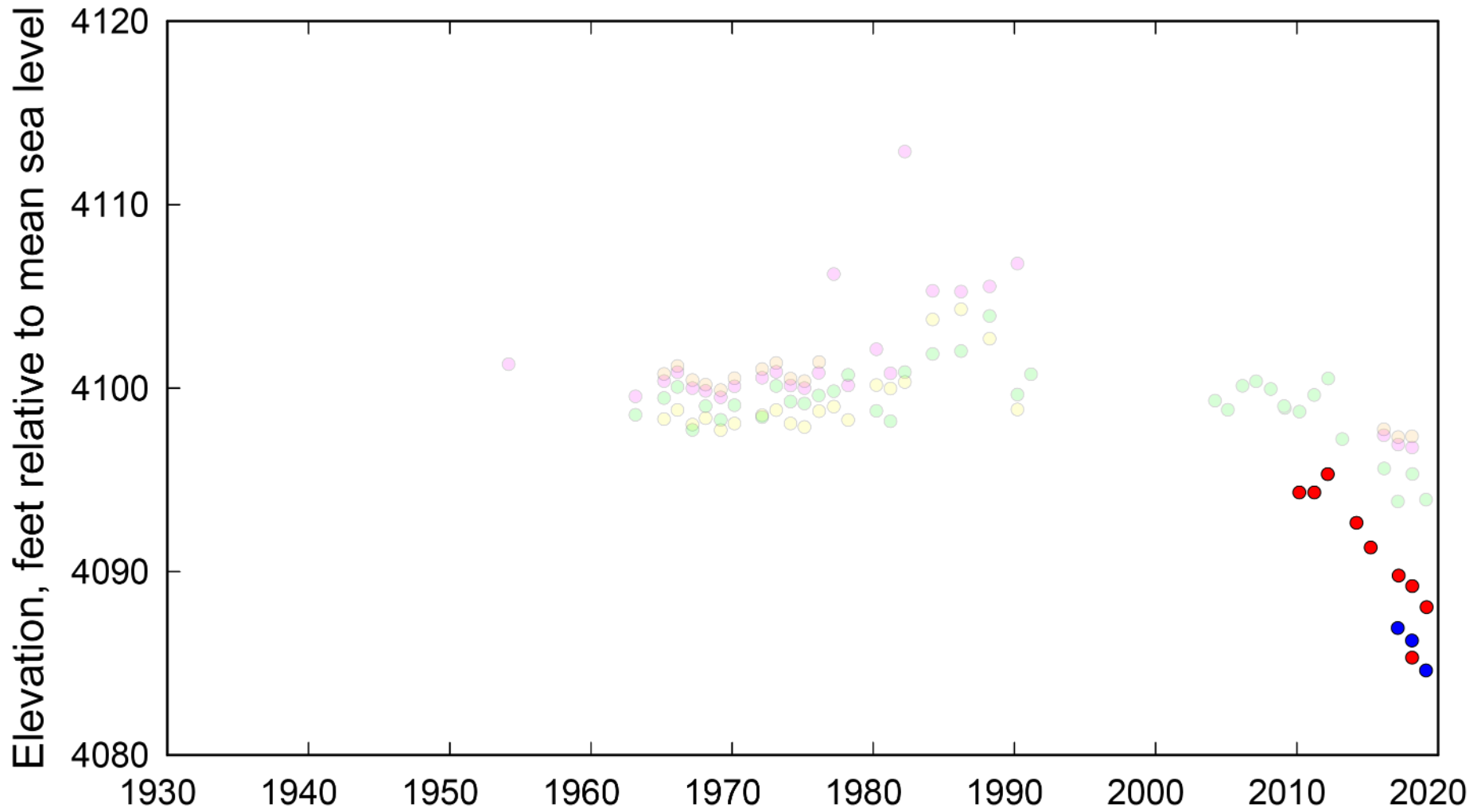


Virginia Valley

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Virginia Valley



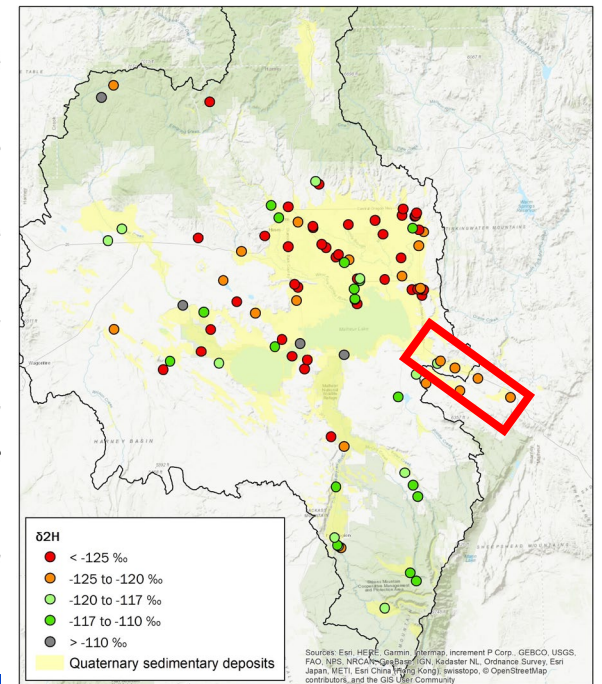
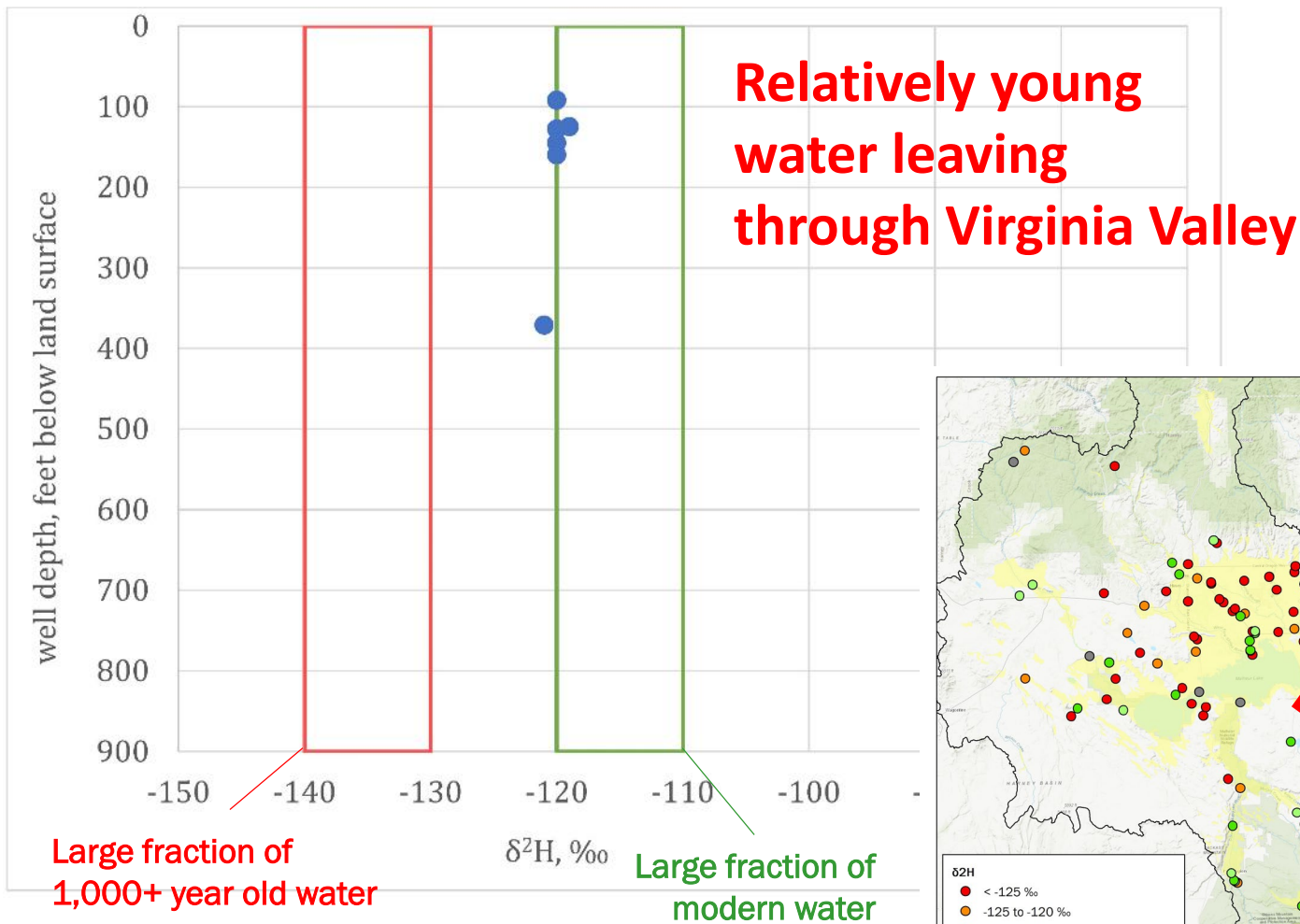


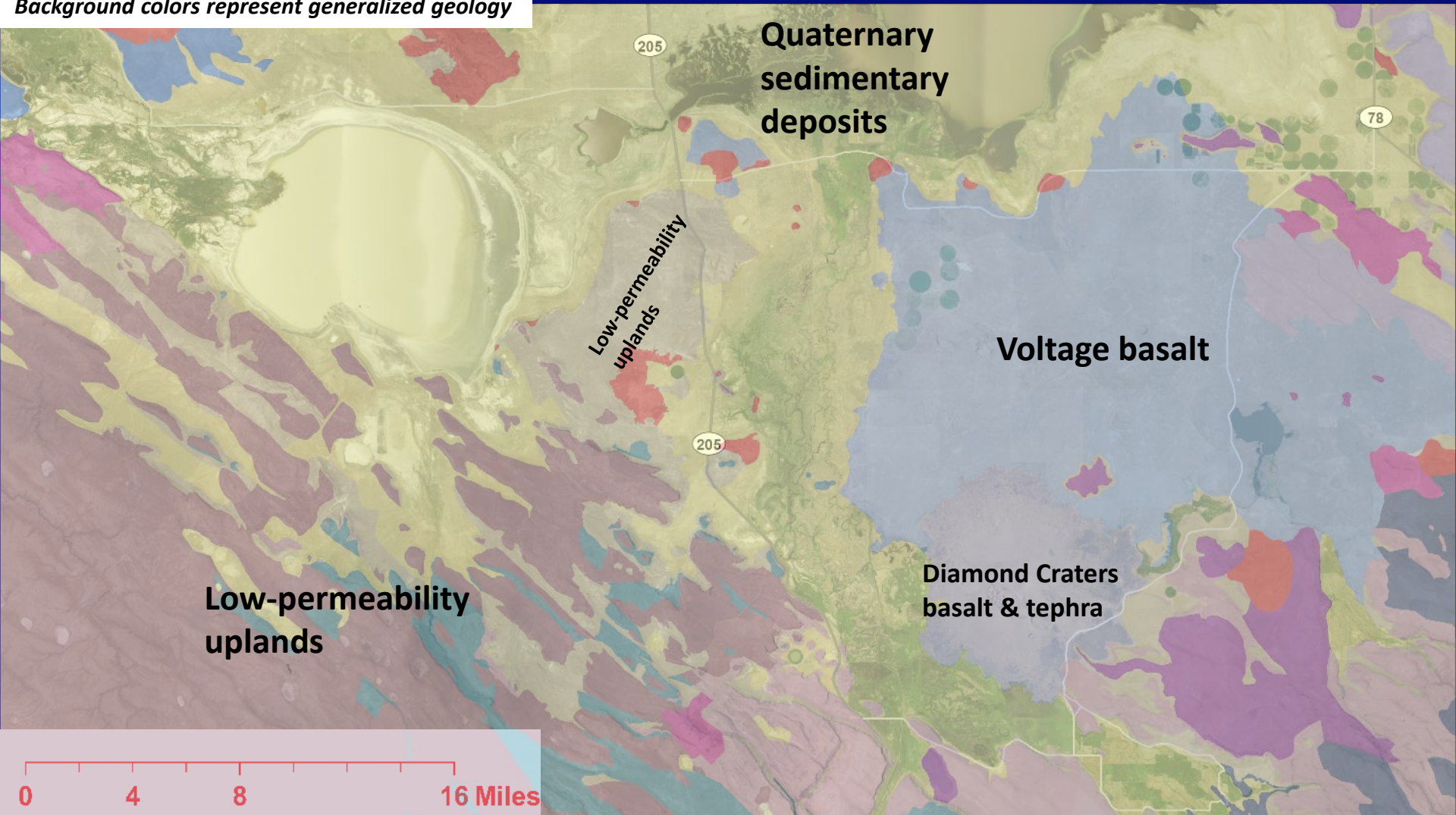
Figure X. $\delta^2\text{H}$ ratio in well samples, Harney Basin, Oregon.

Donner und Blitzen floodplain



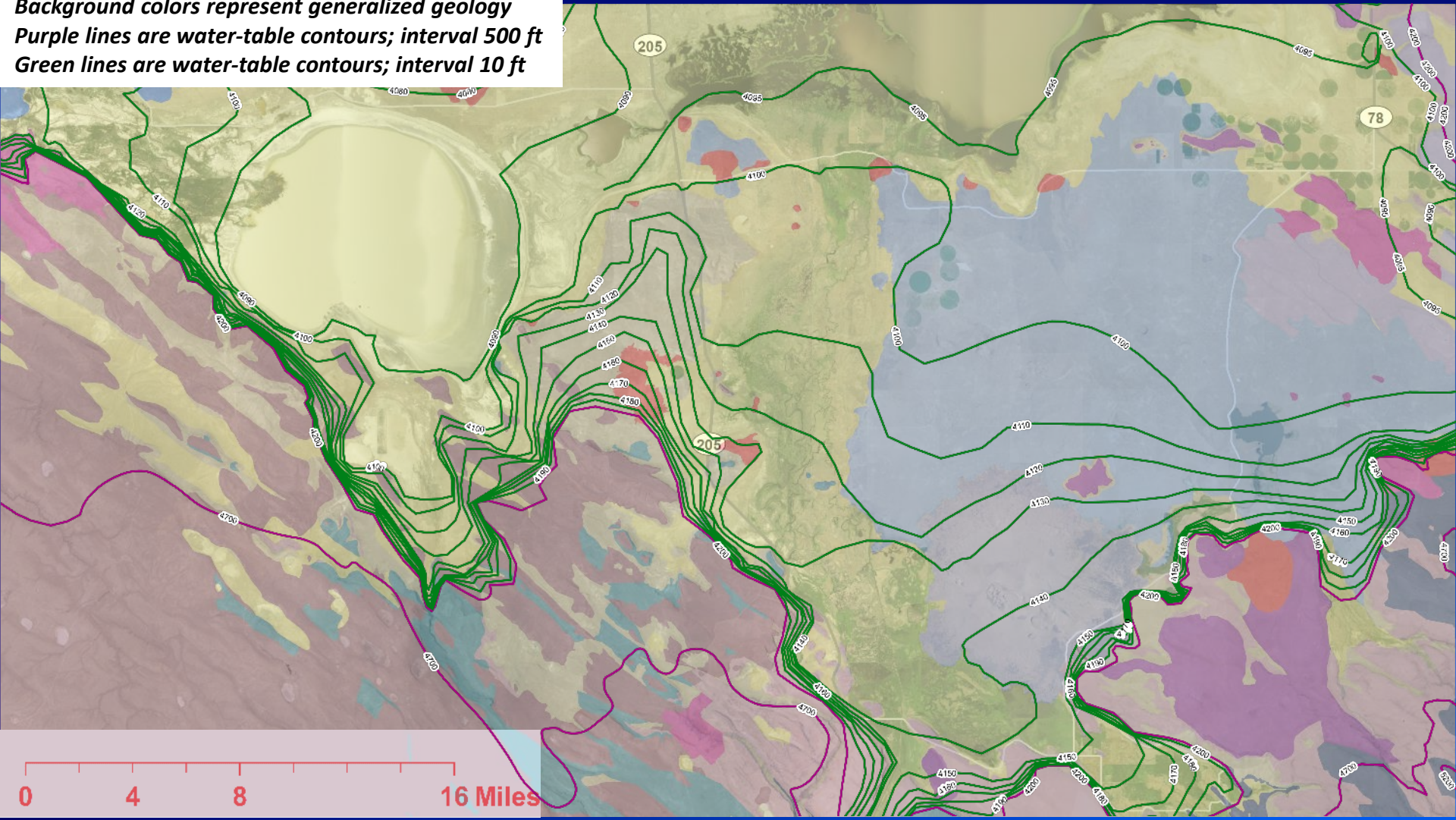
Donner und Blitzen floodplain

Background colors represent generalized geology



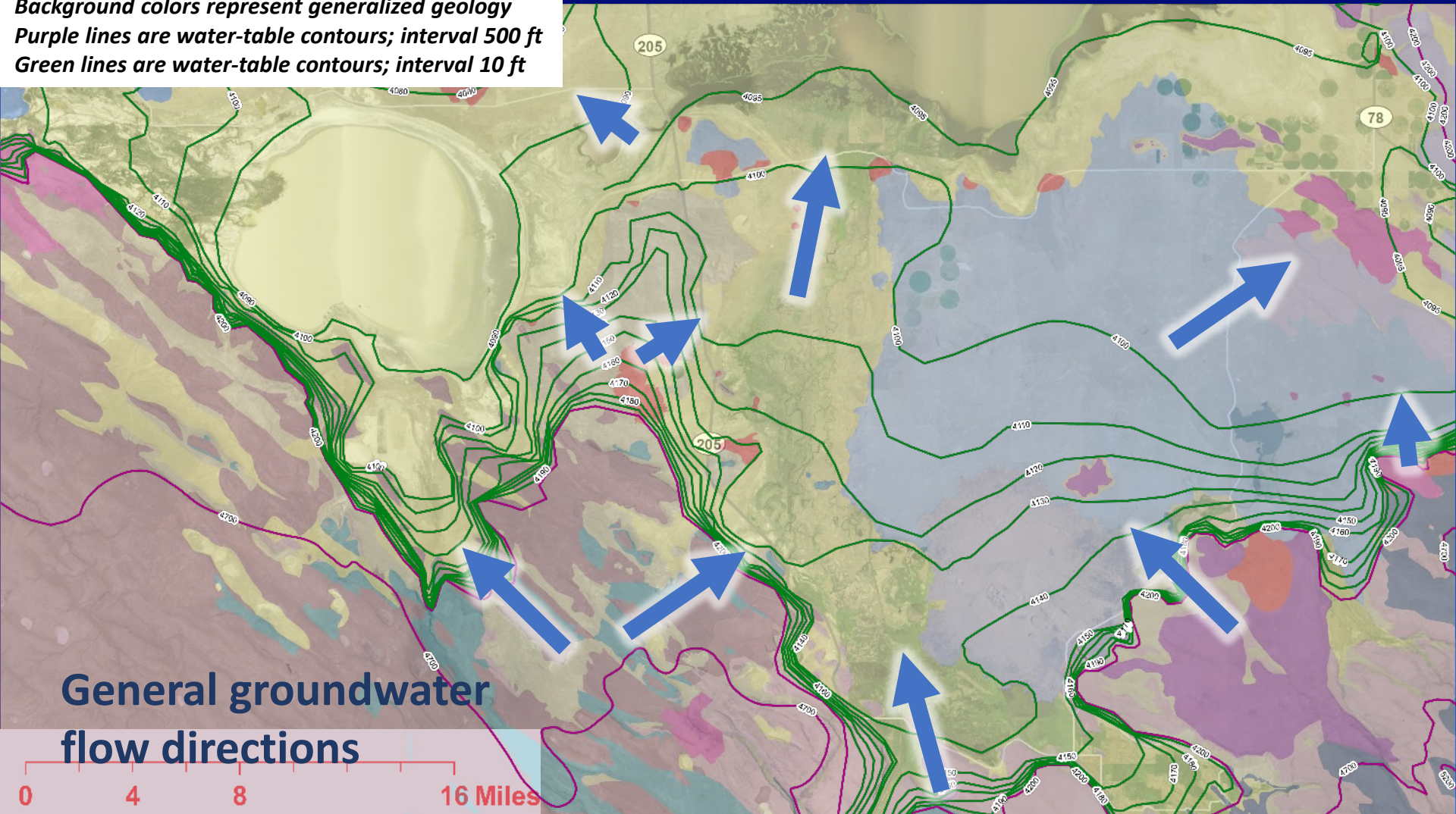
Donner und Blitzen floodplain

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Donner und Blitzen floodplain

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft

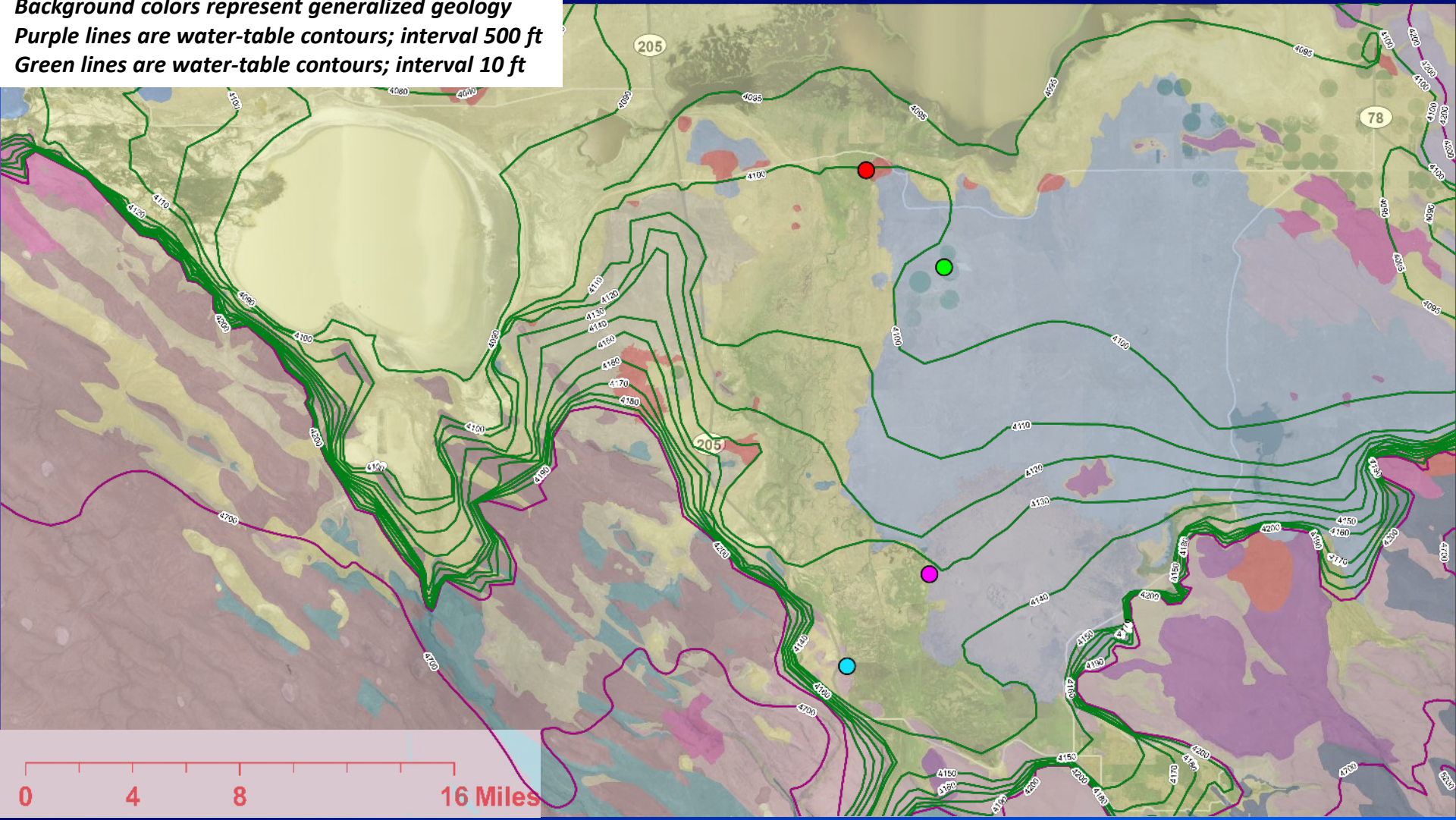


General groundwater
flow directions

0 4 8 16 Miles

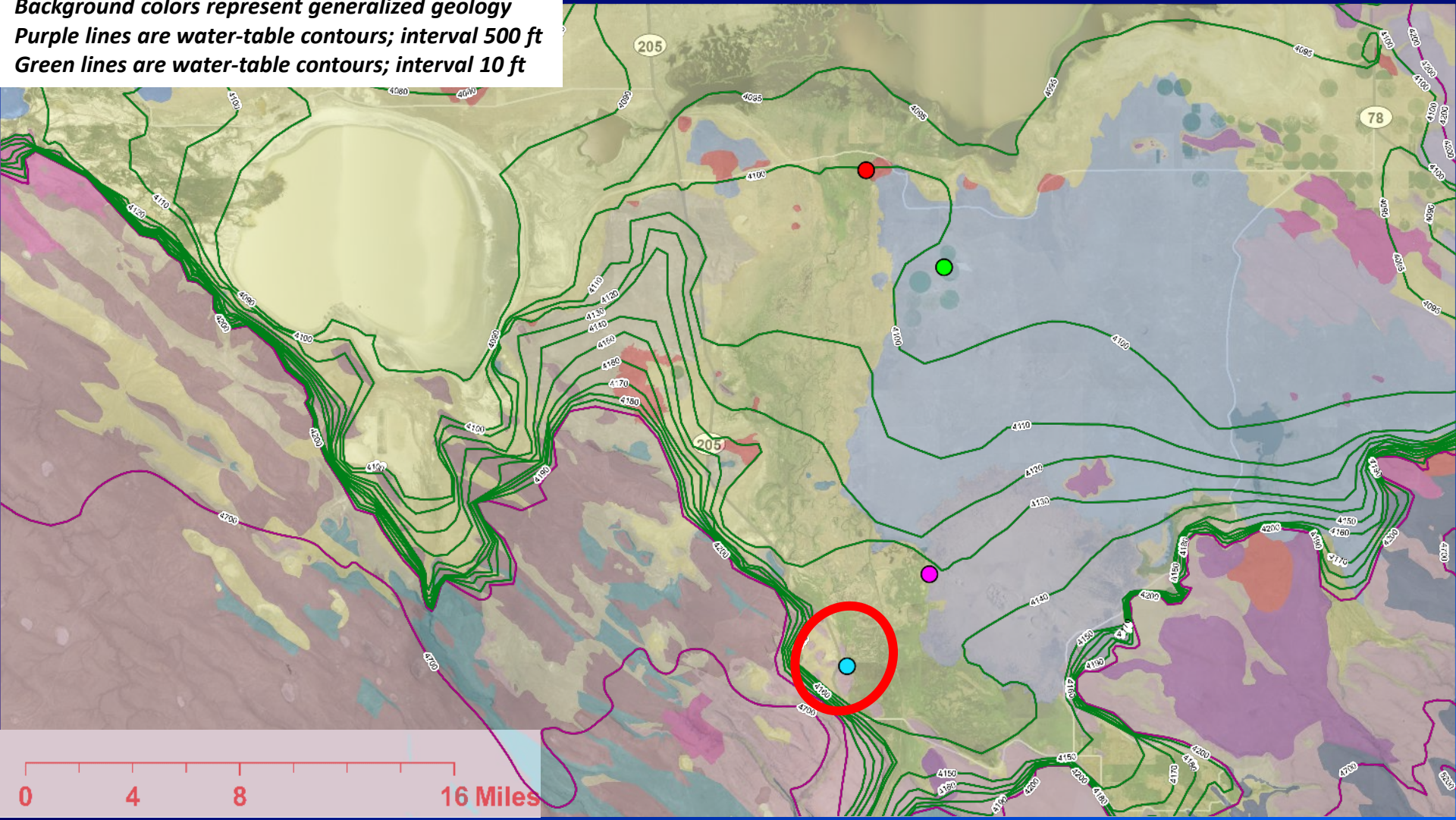
Donner und Blitzen floodplain

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft

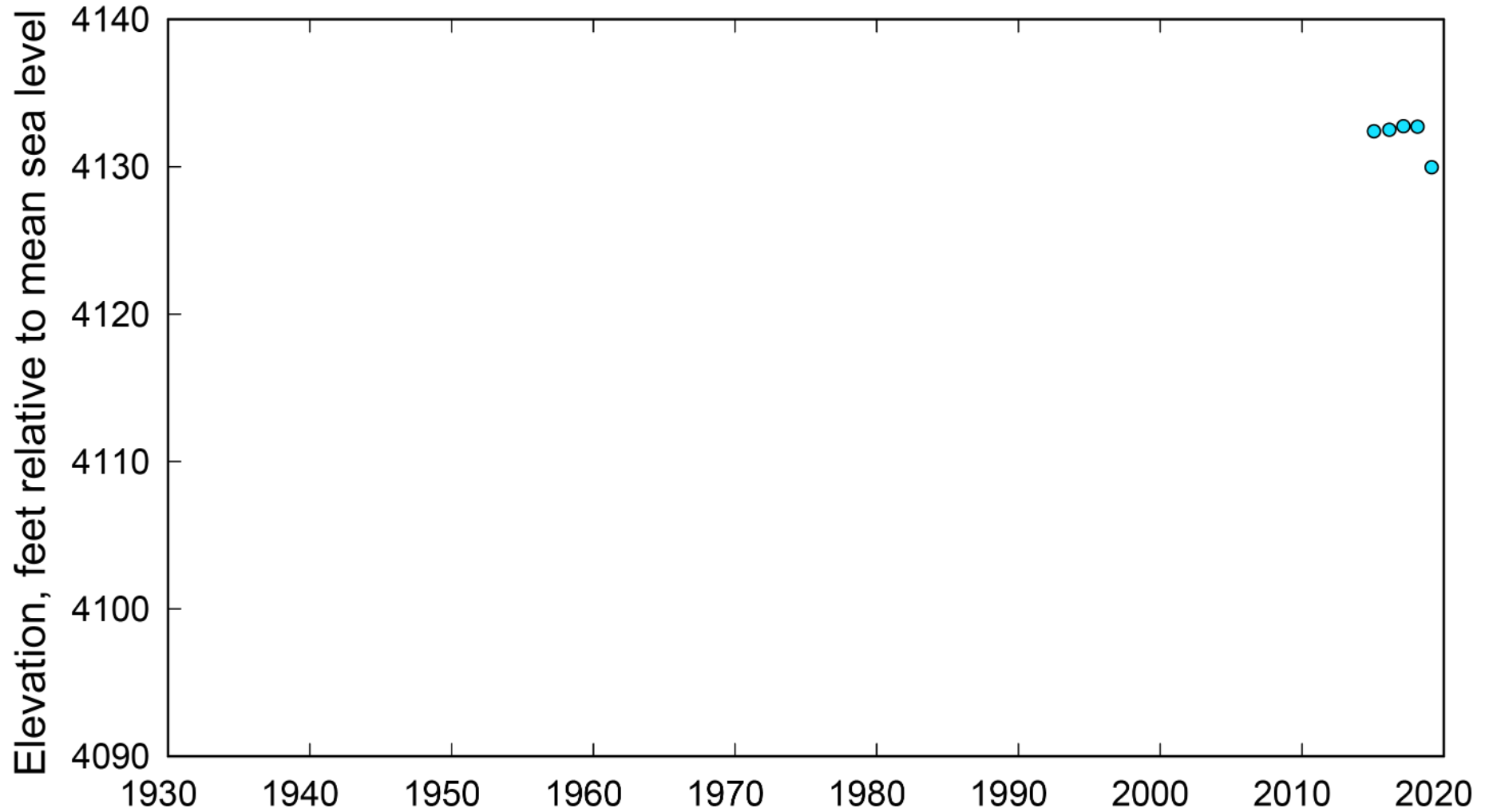


Donner und Blitzen floodplain

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft

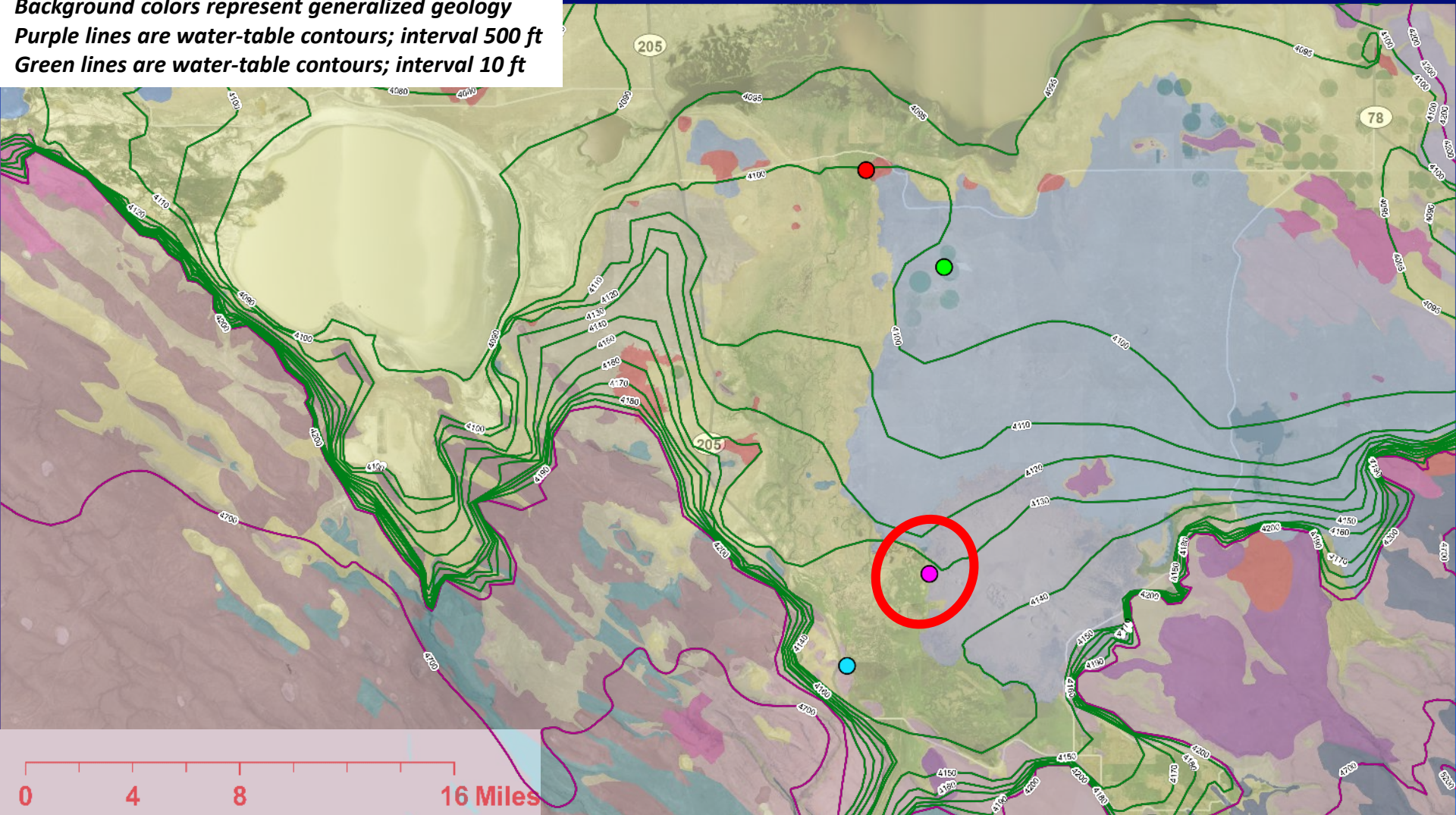


Donner und Blitzen floodplain

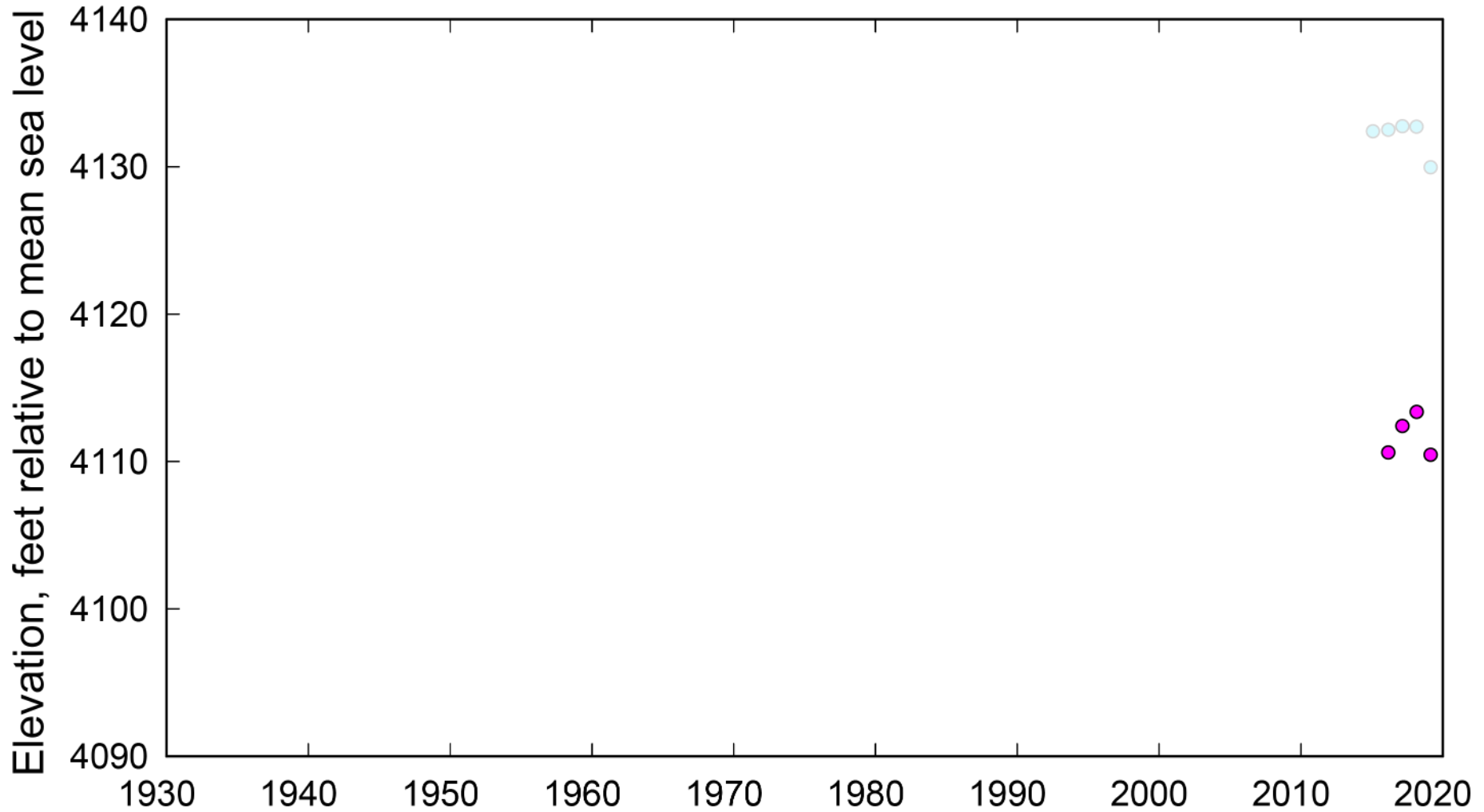


Donner und Blitzen floodplain

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft

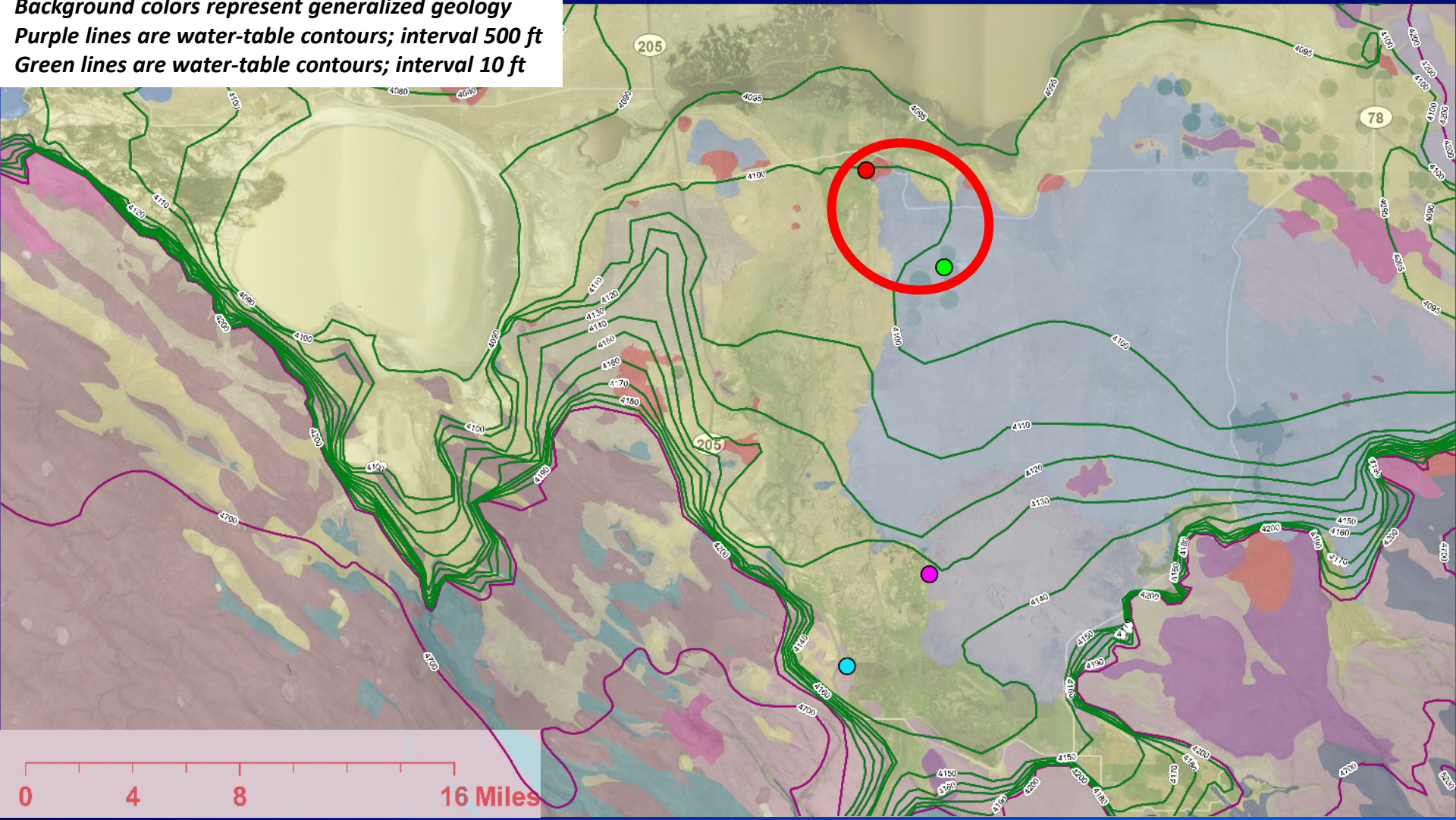


Donner und Blitzen floodplain

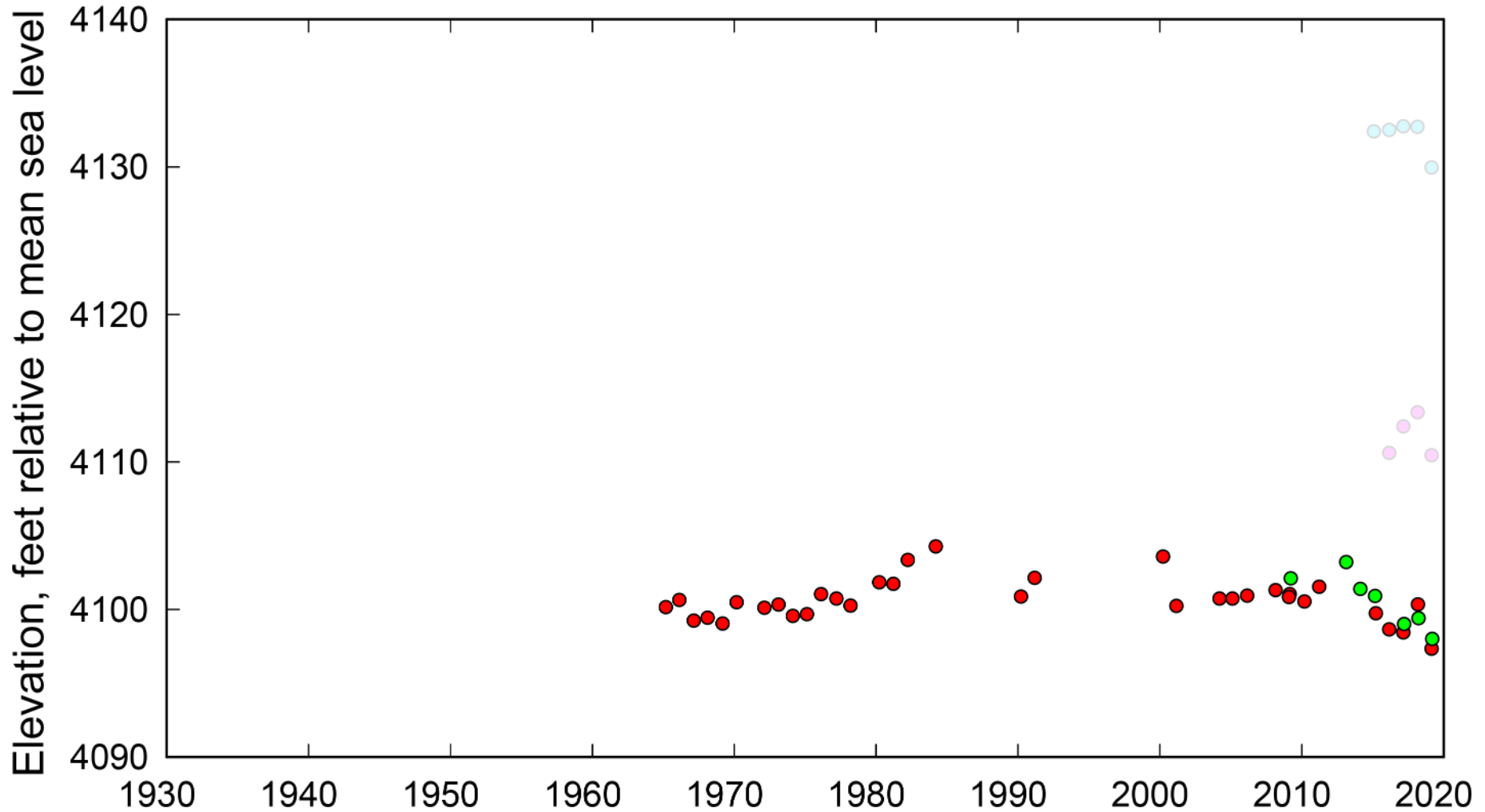


Donner und Blitzen floodplain

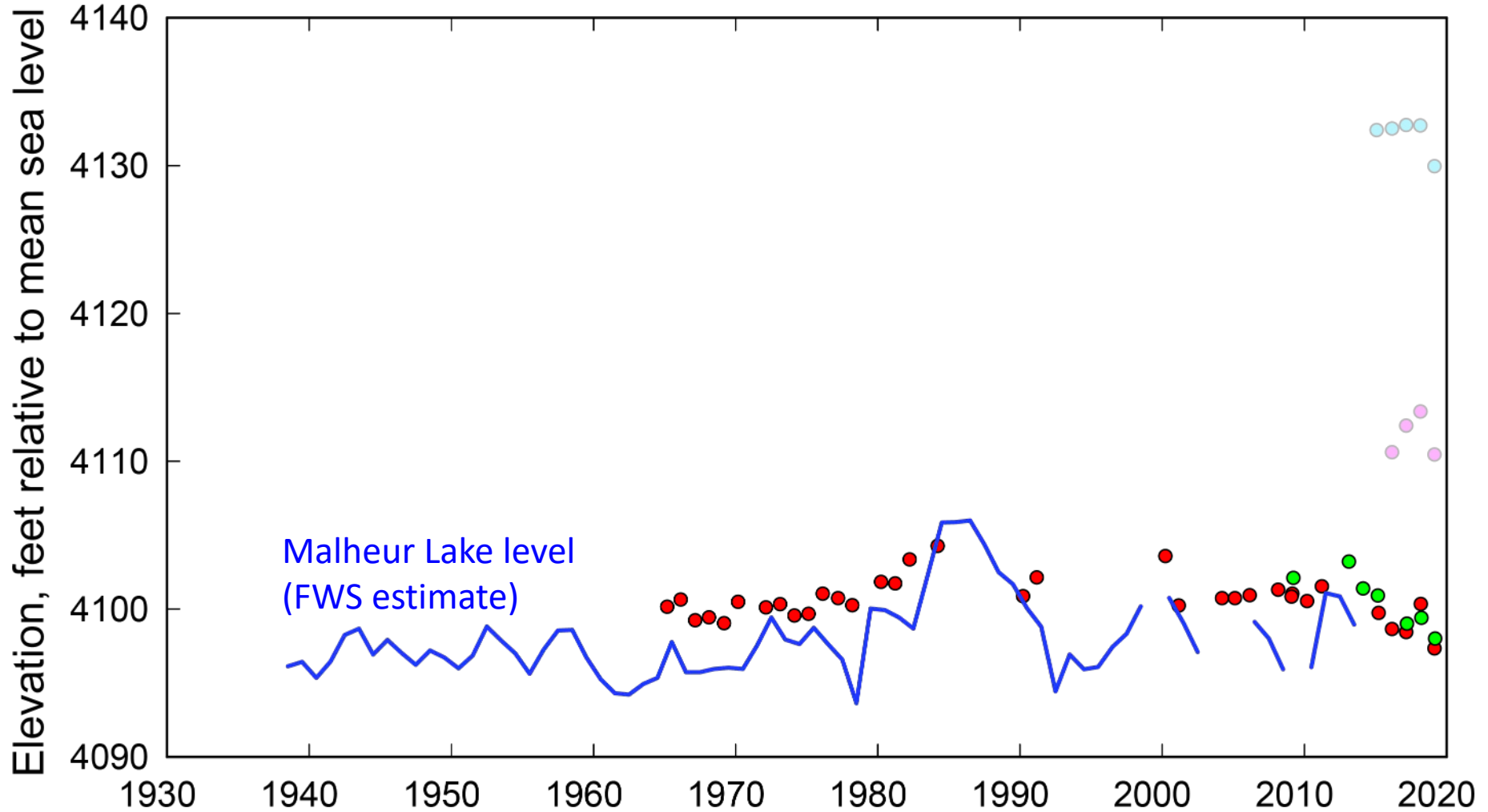
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Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



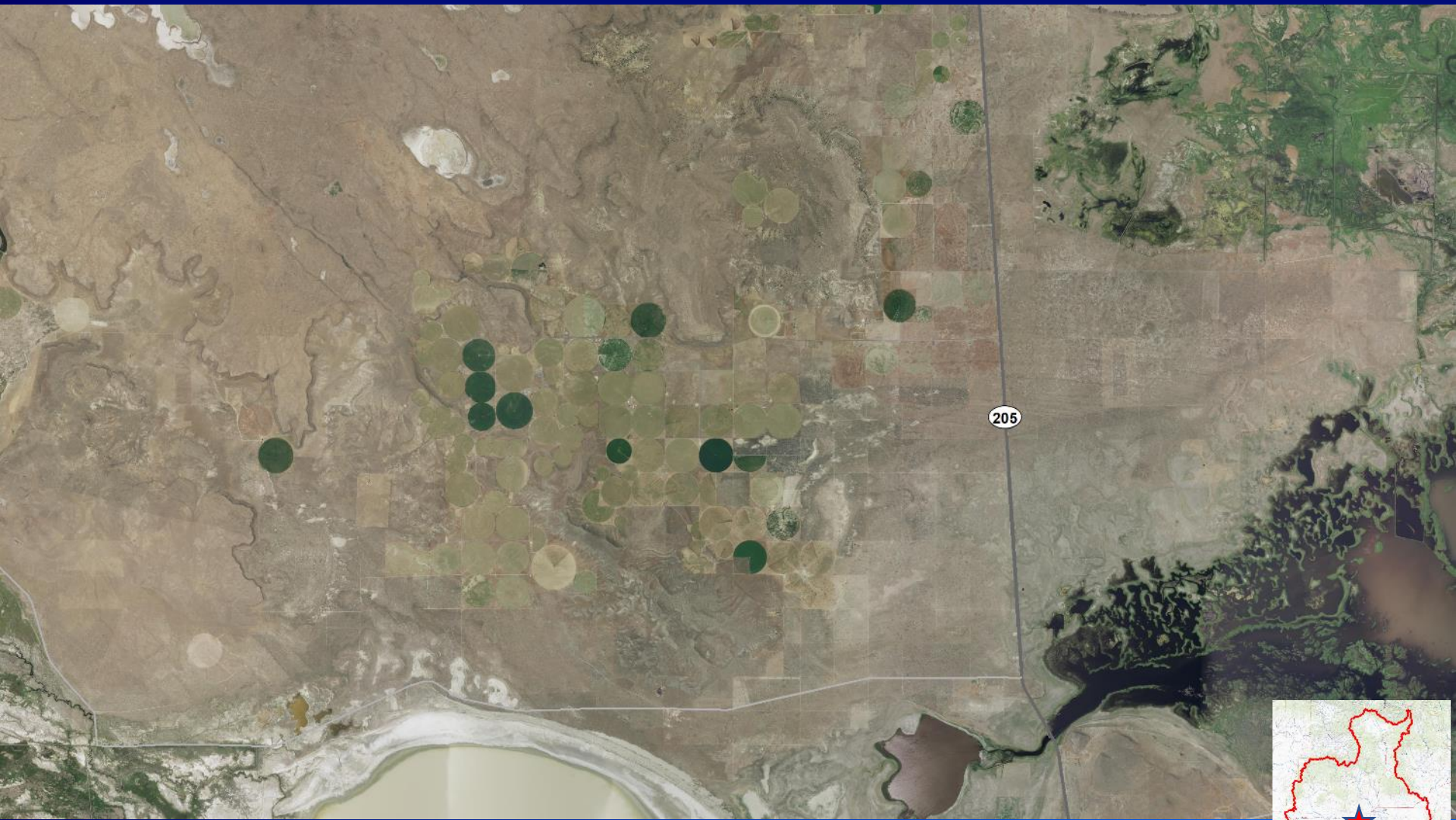
Donner und Blitzen floodplain



Donner und Blitzen floodplain

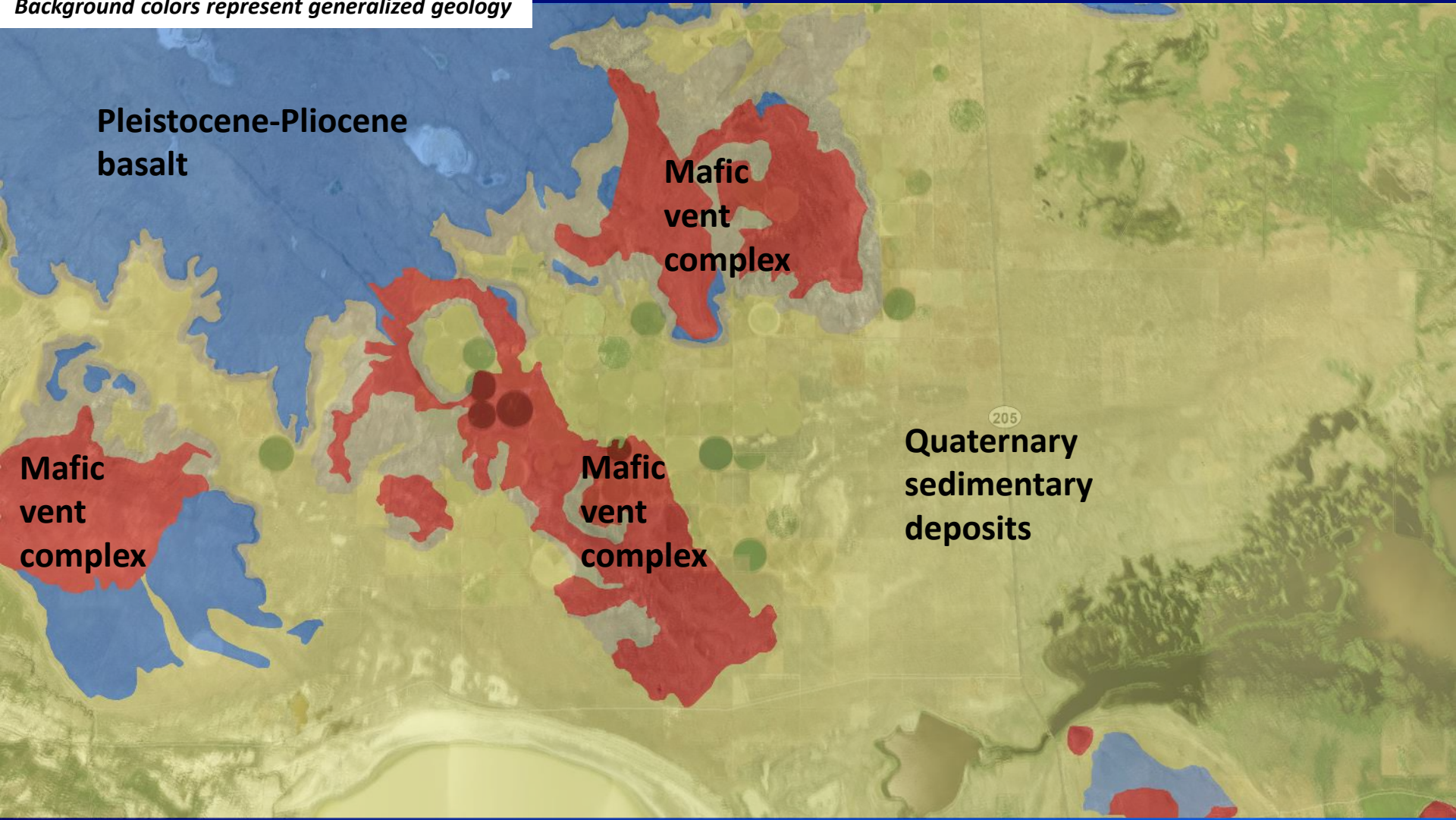


Sunset Valley



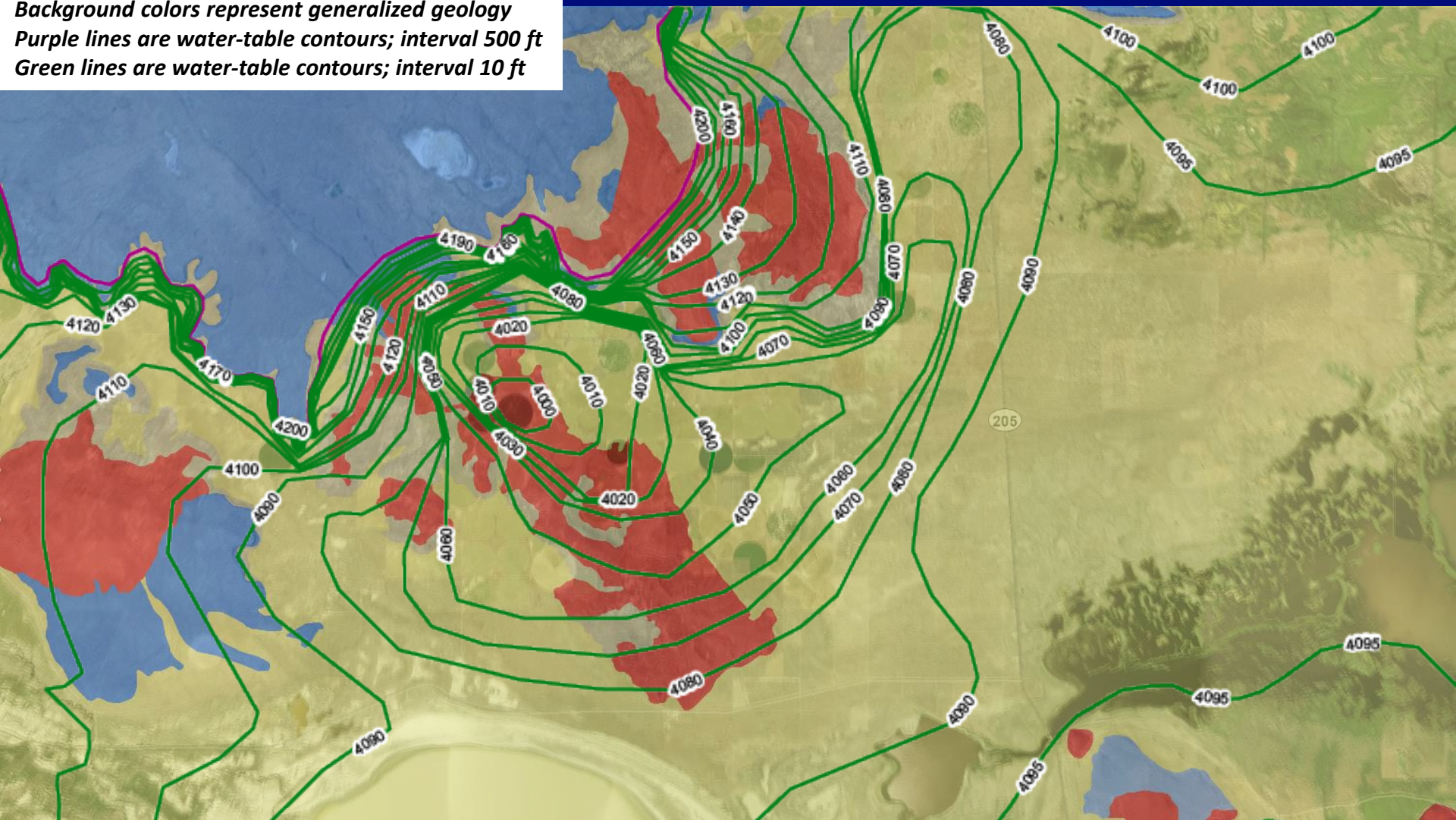
Sunset Valley

Background colors represent generalized geology



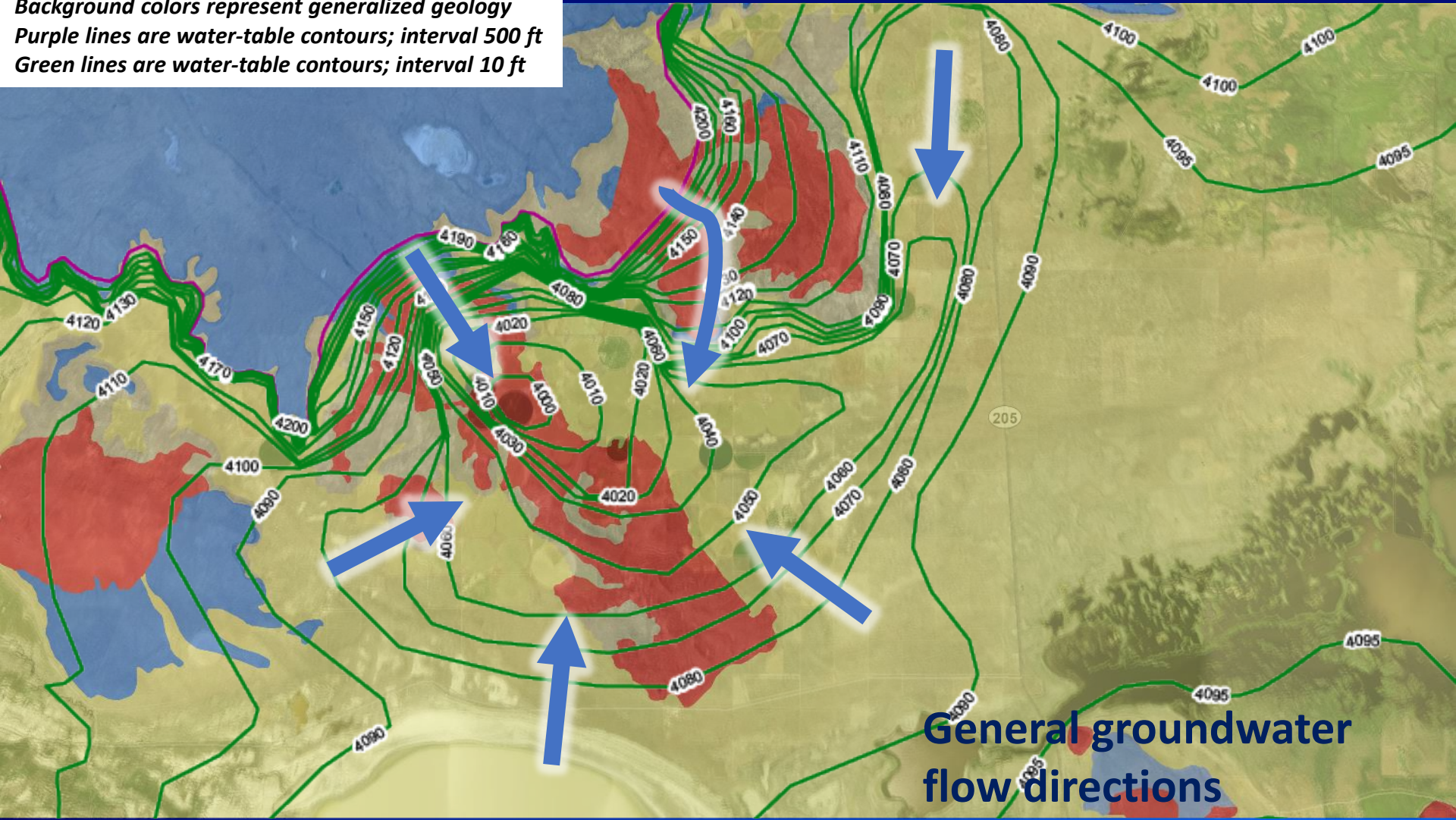
Sunset Valley

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Sunset Valley

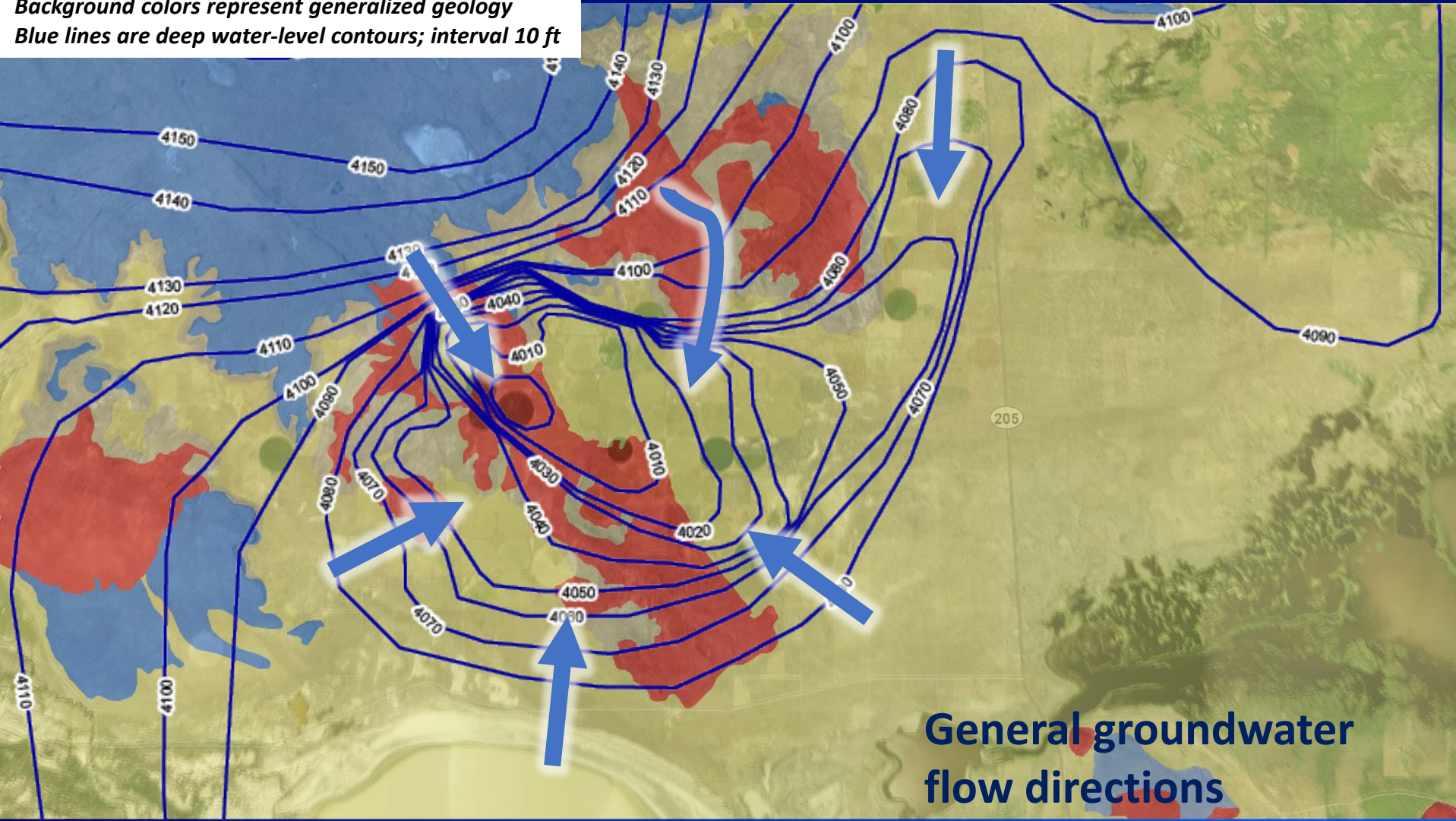
Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



General groundwater flow directions

Sunset Valley

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

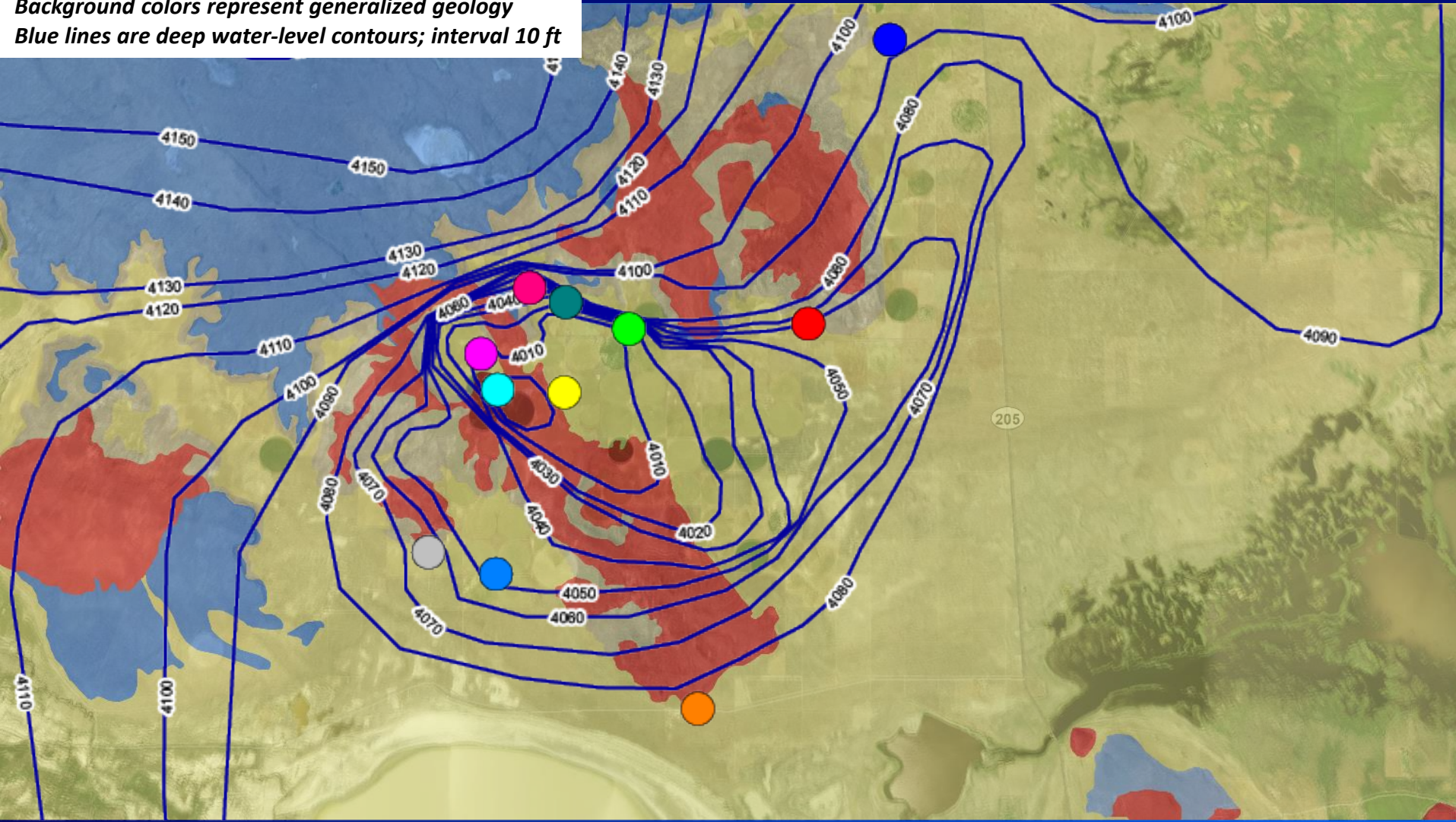


General groundwater
flow directions



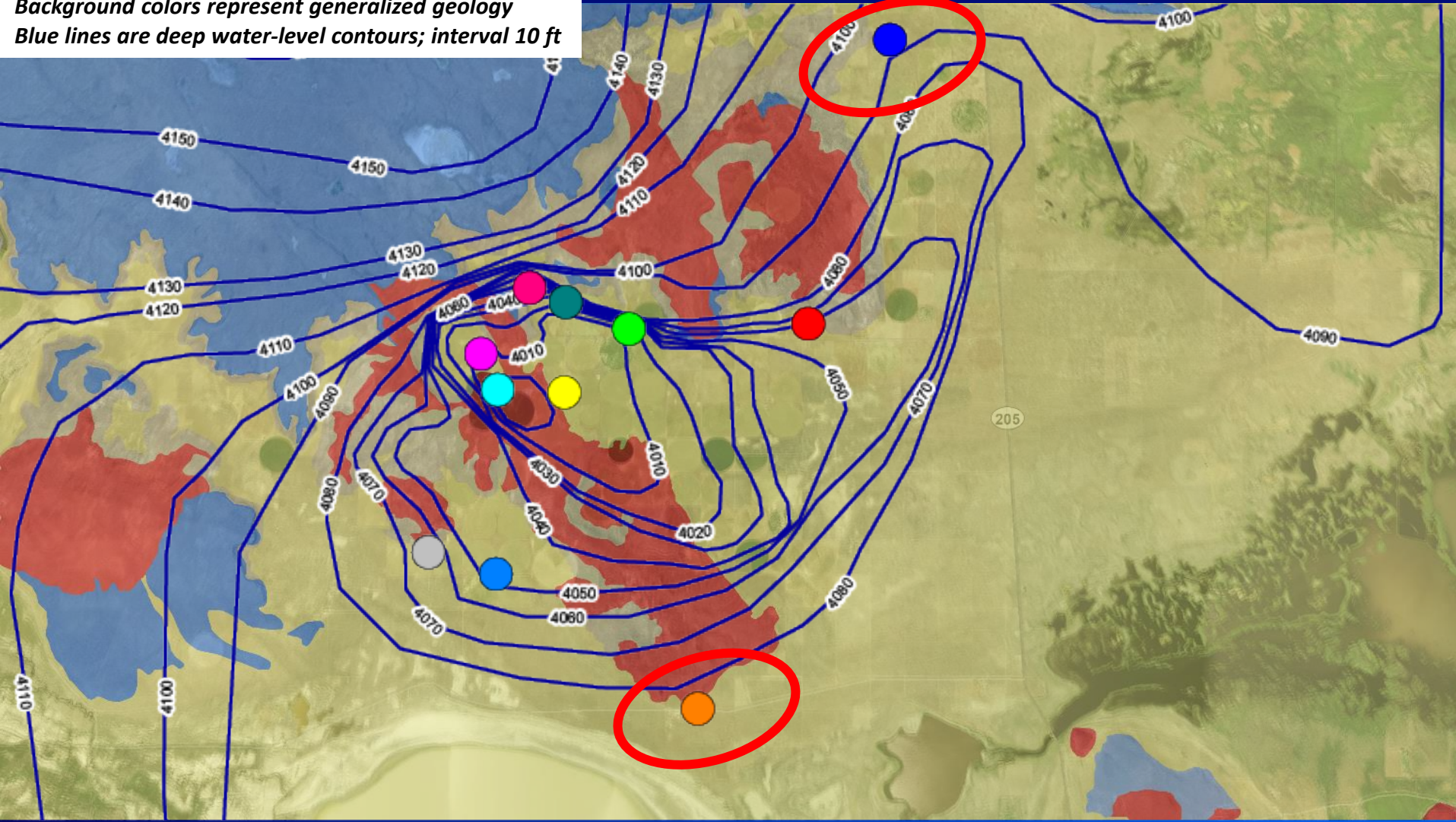
Sunset Valley

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

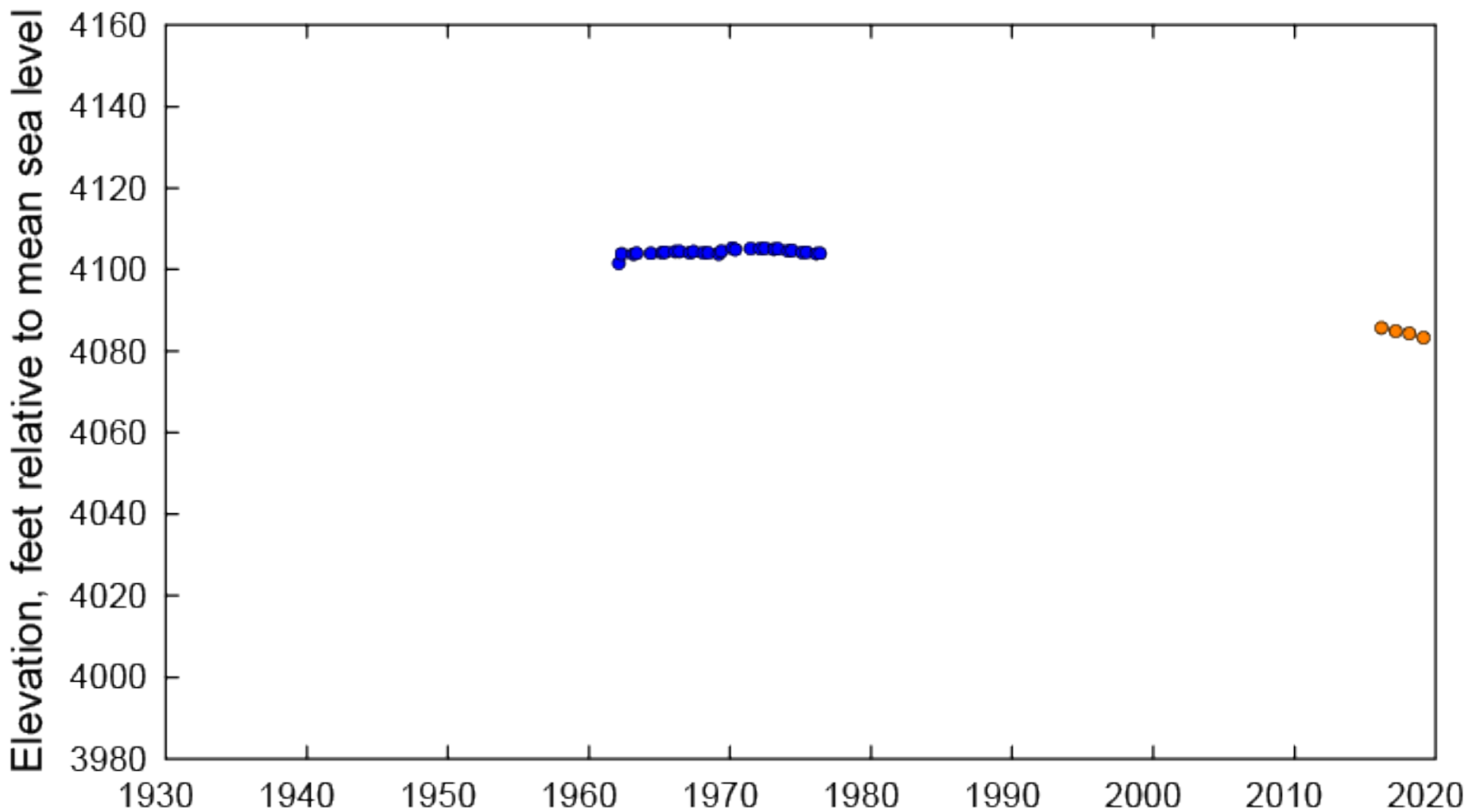


Sunset Valley

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

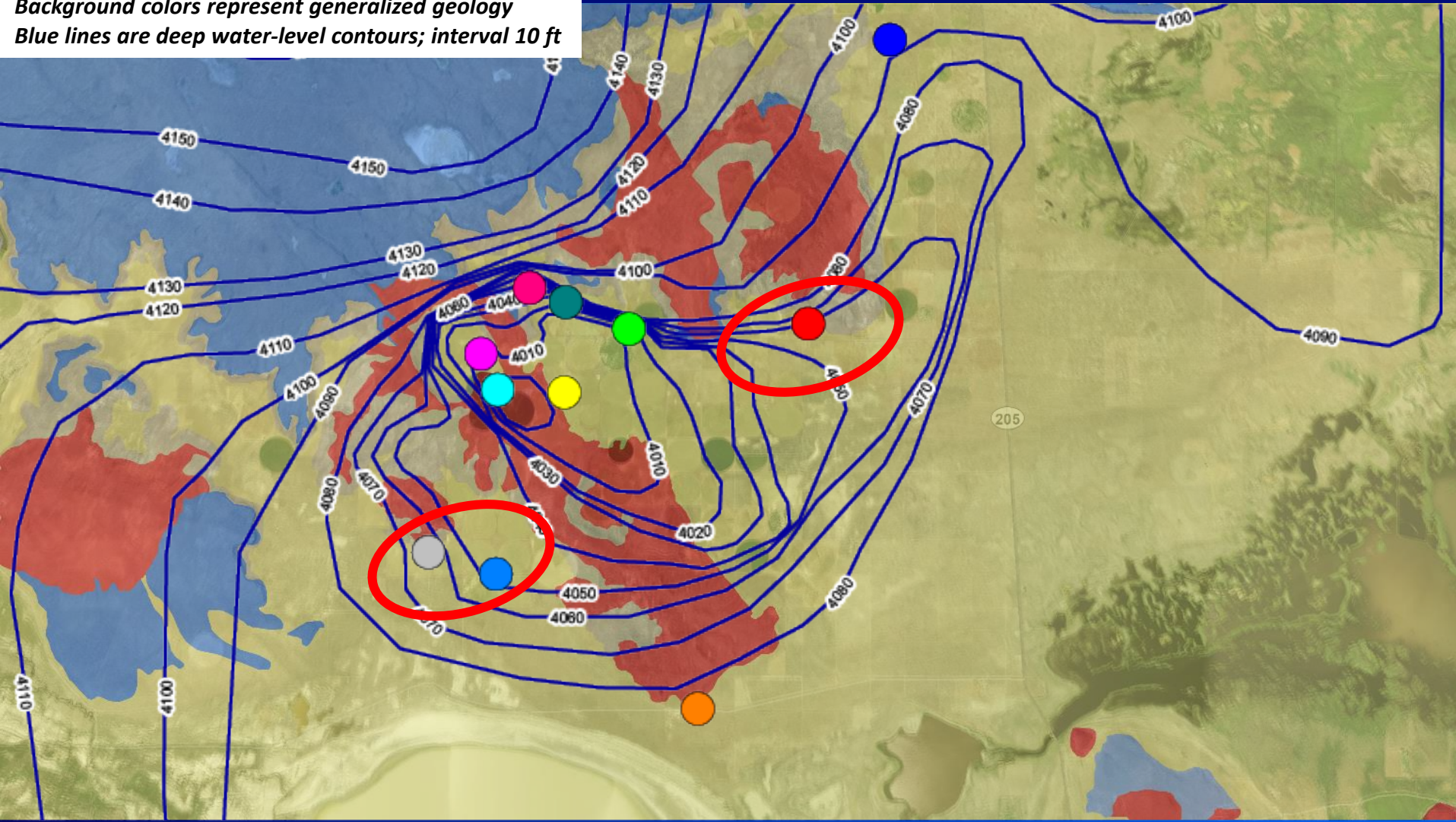


Sunset Valley

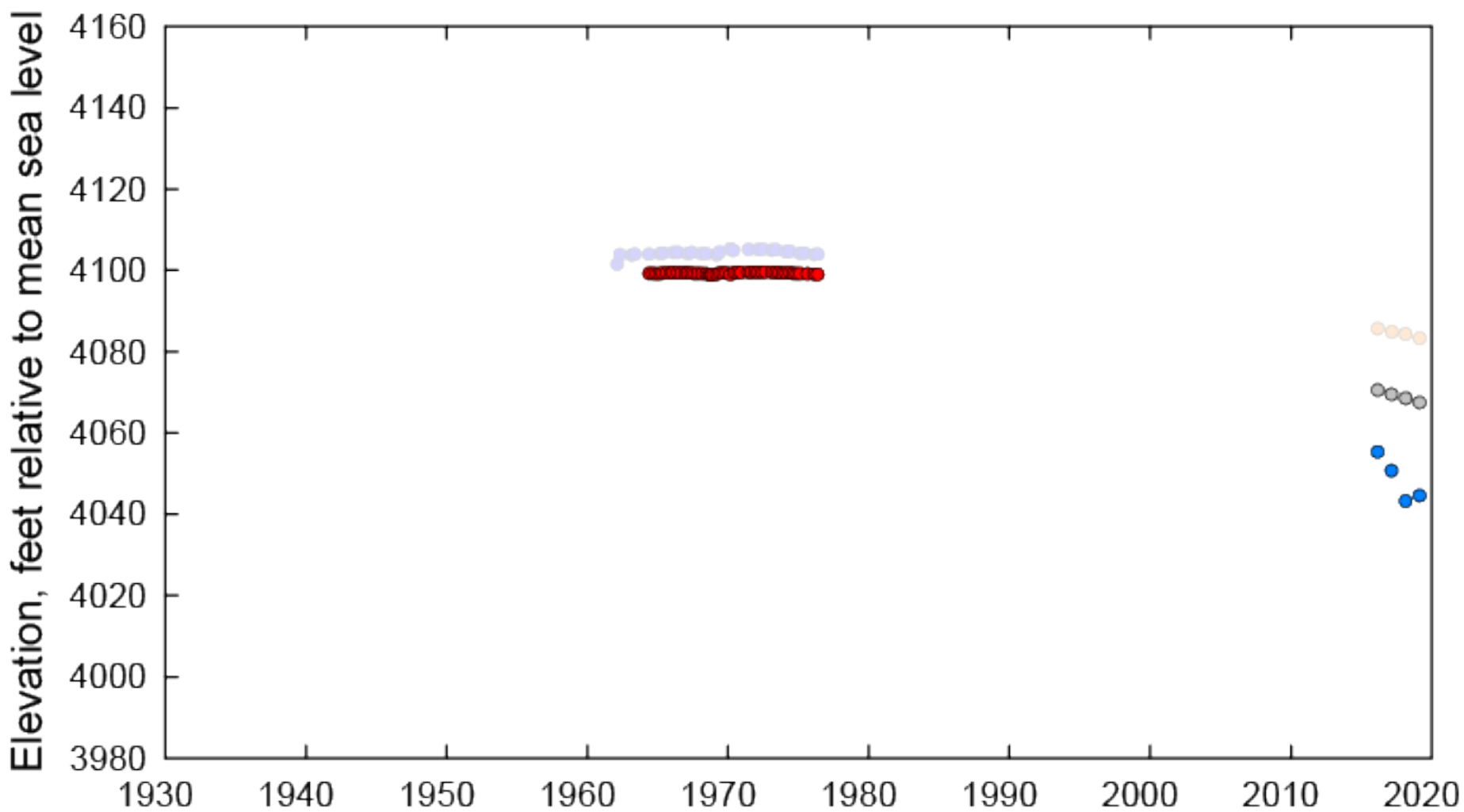


Sunset Valley

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

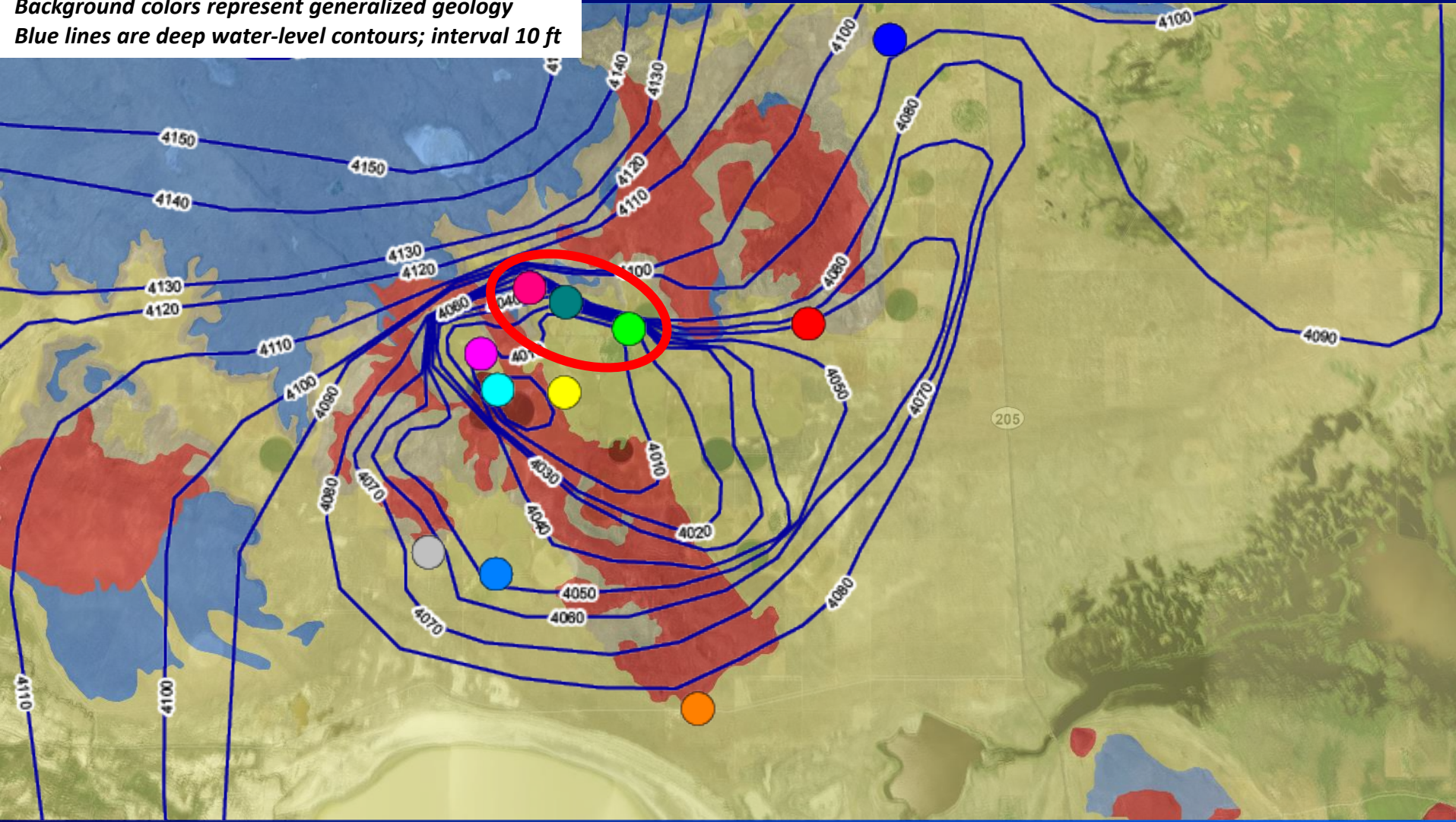


Sunset Valley

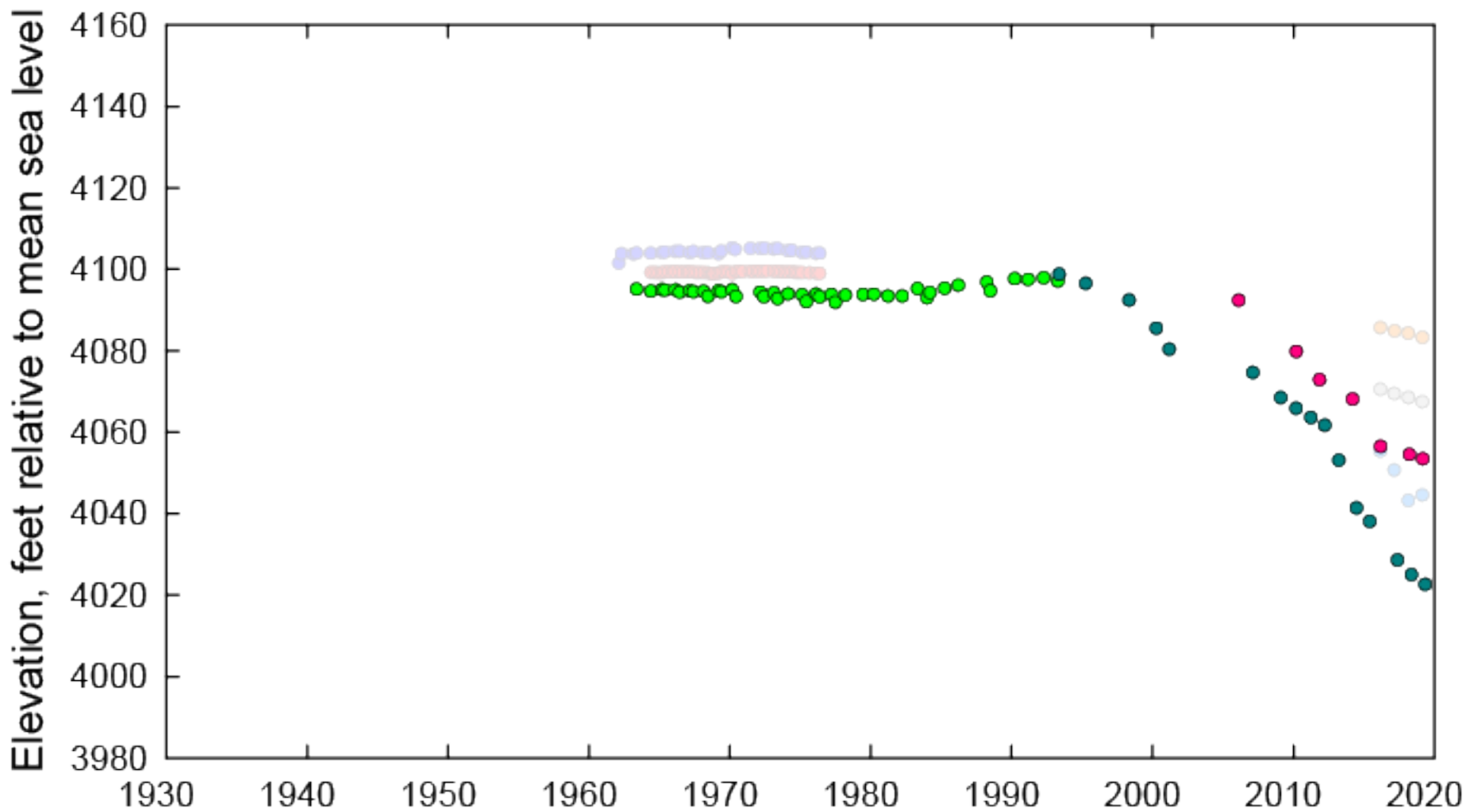


Sunset Valley

Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft

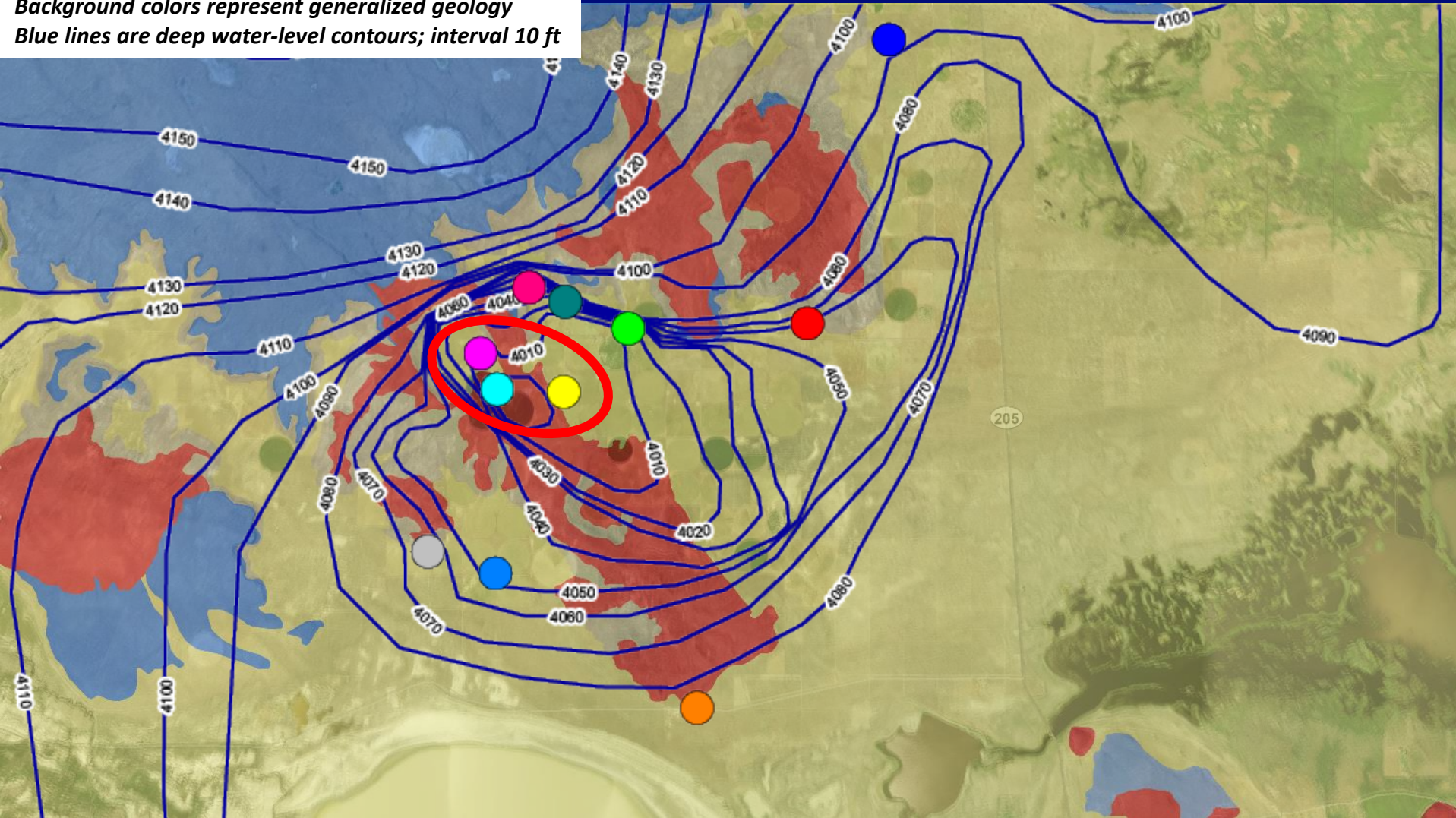


Sunset Valley

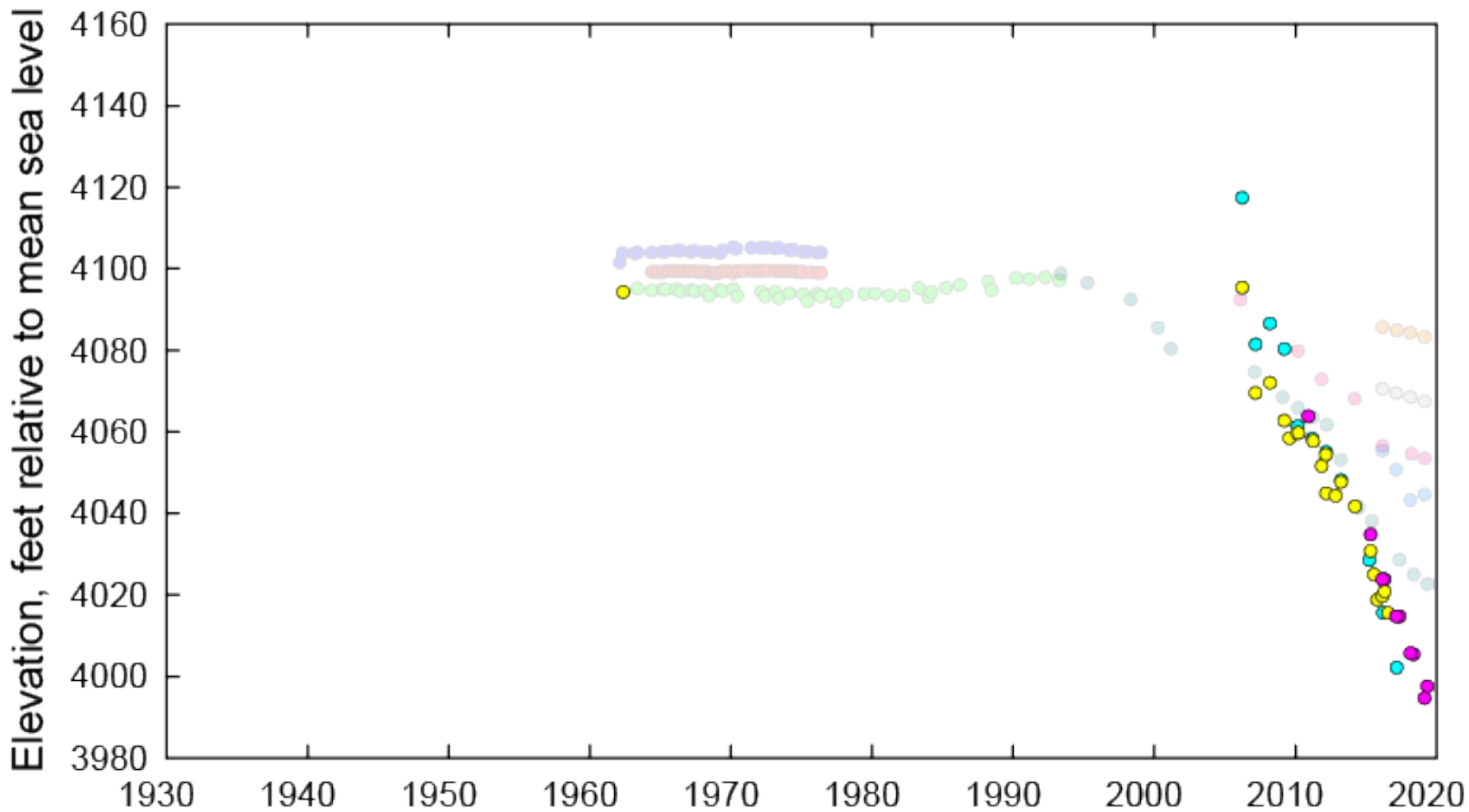


Sunset Valley

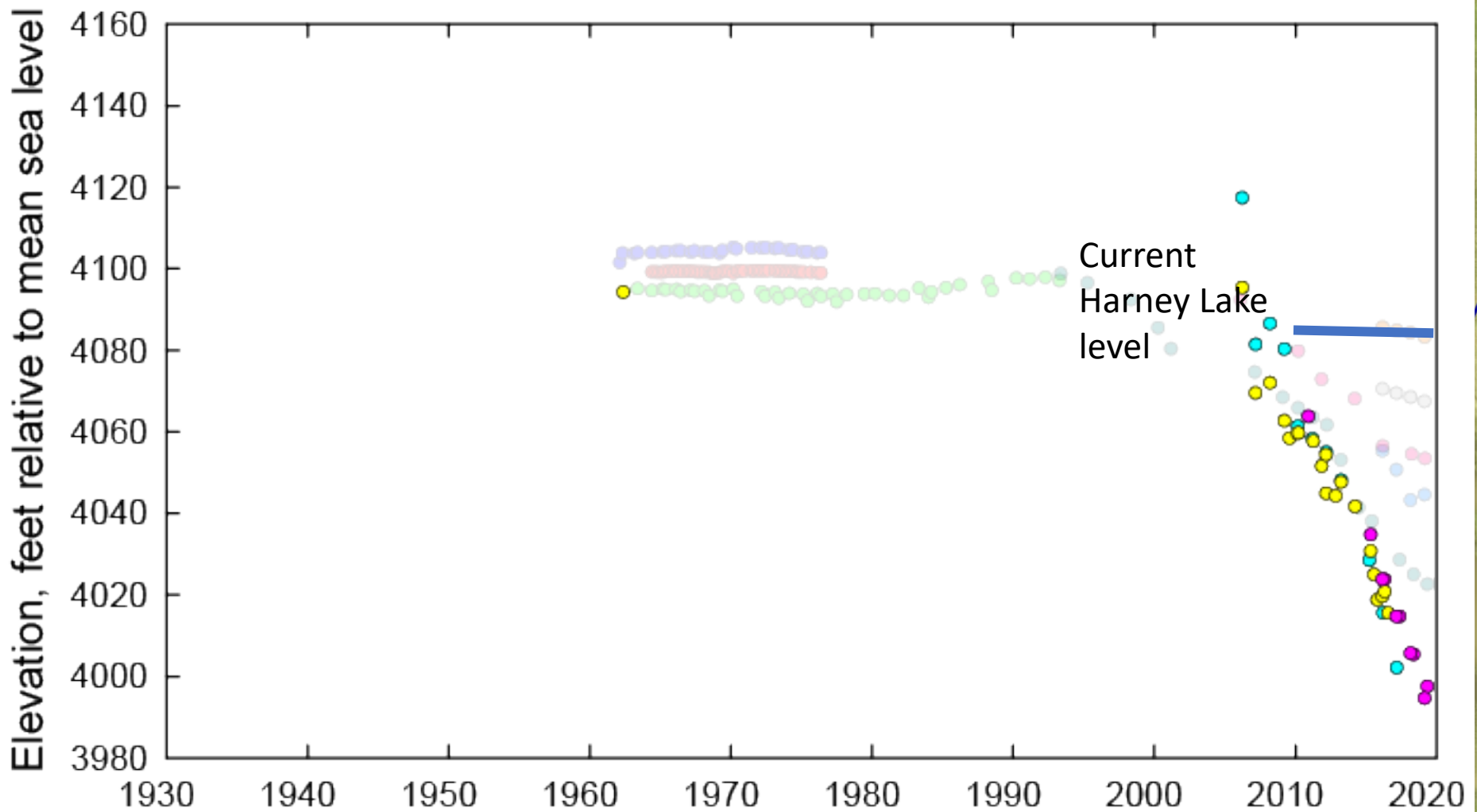
Background colors represent generalized geology
Blue lines are deep water-level contours; interval 10 ft



Sunset Valley

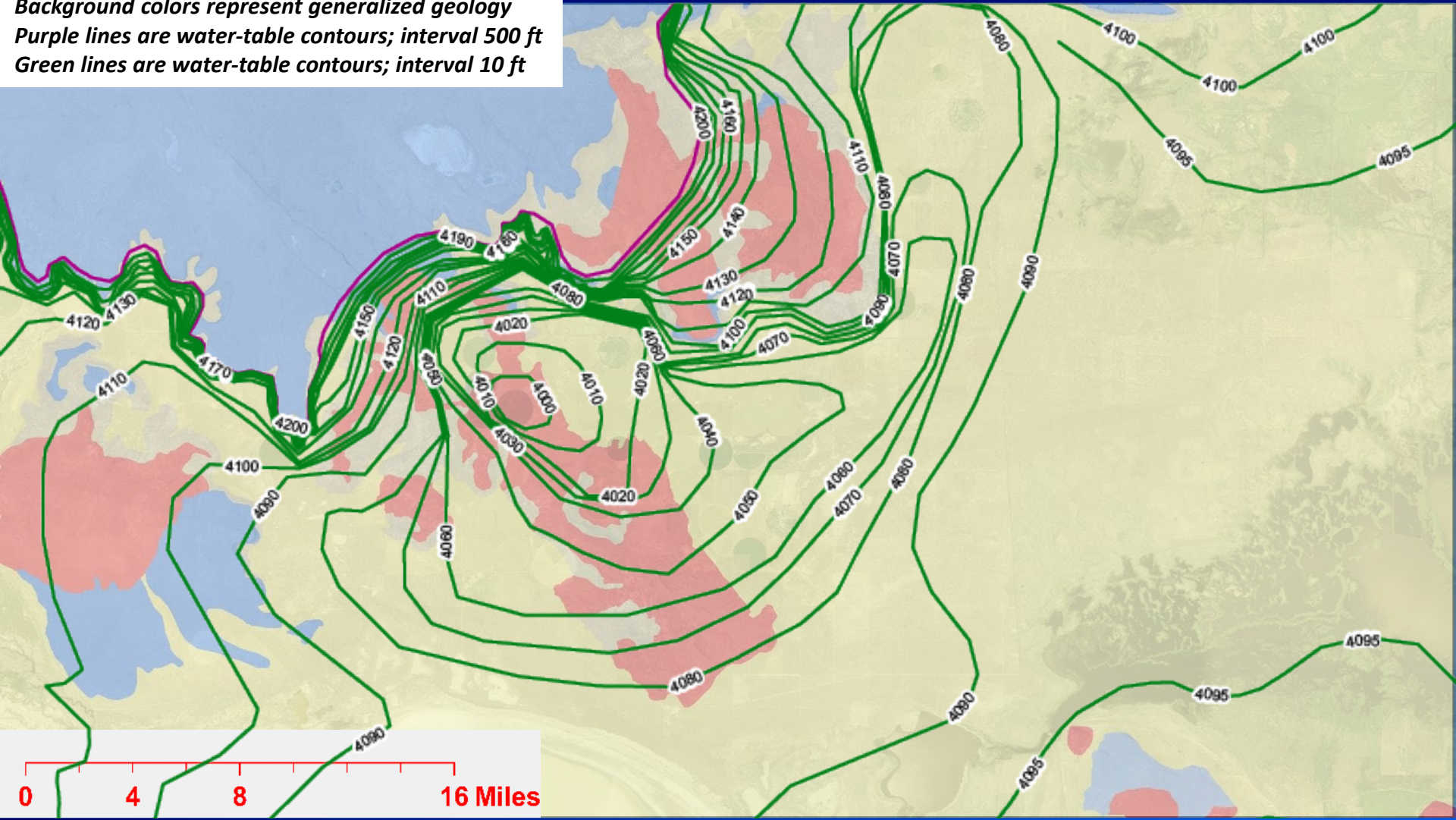


Sunset Valley



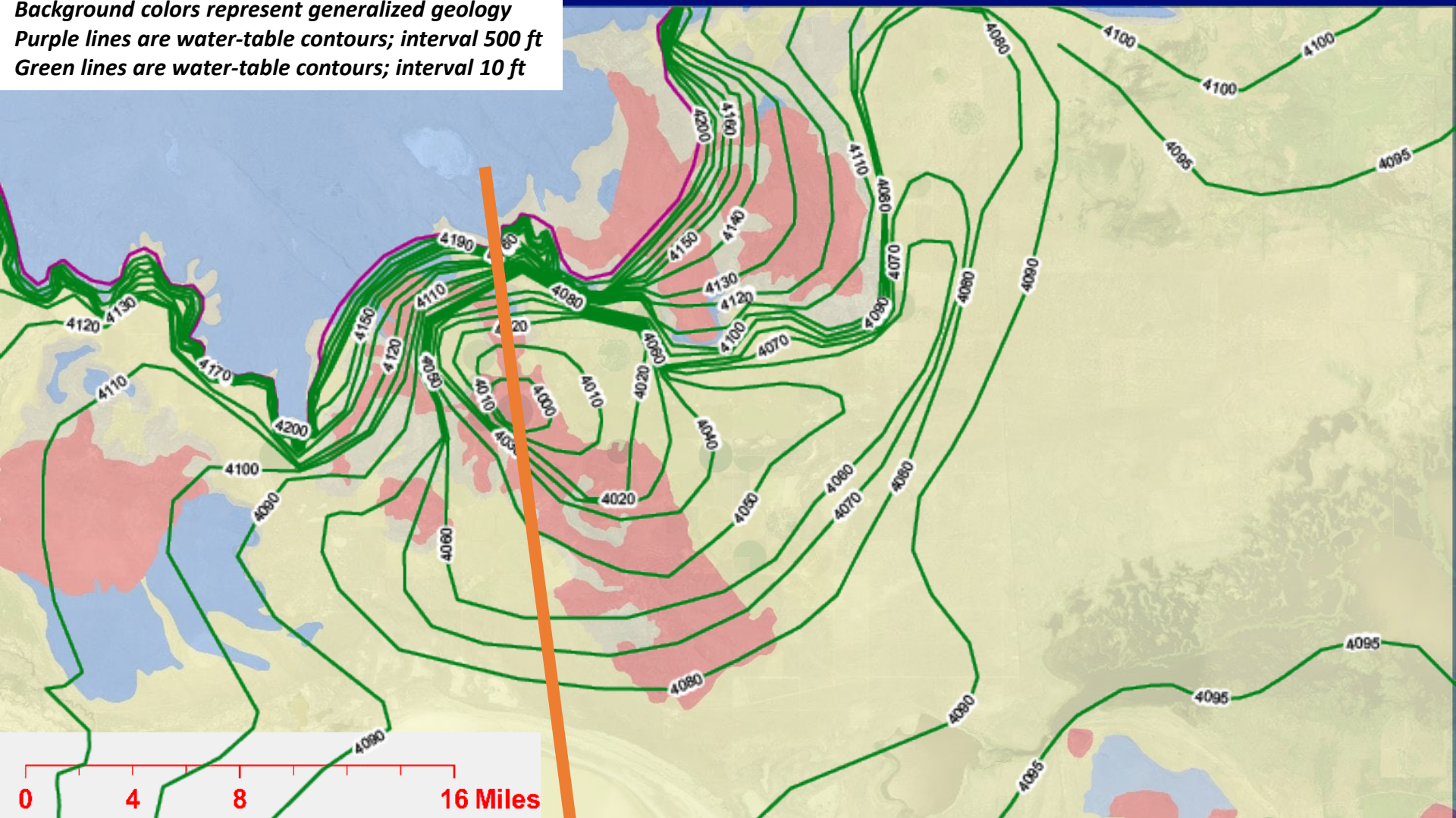
Sunset Valley

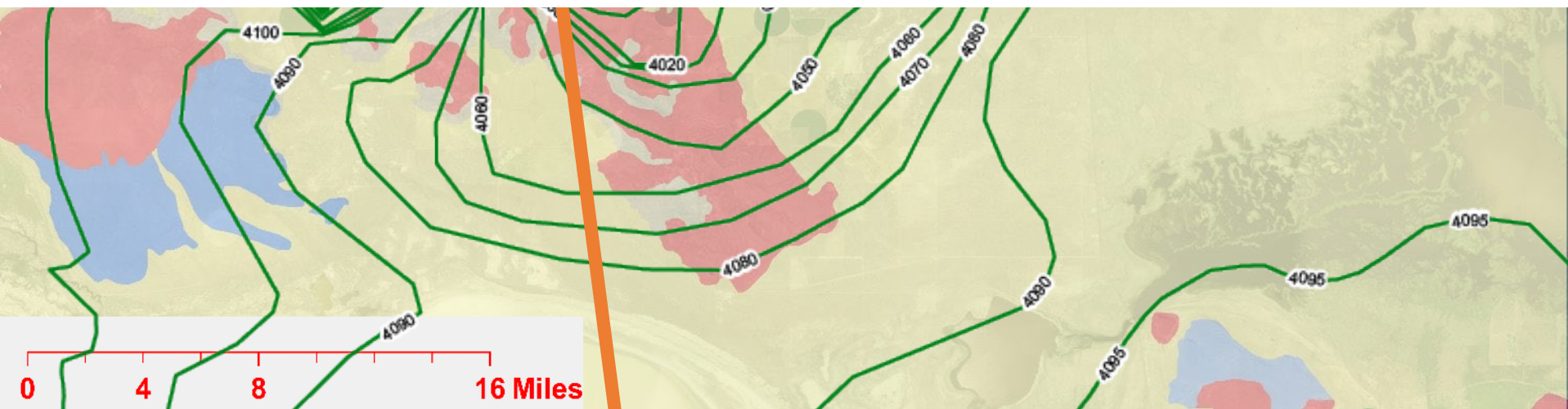
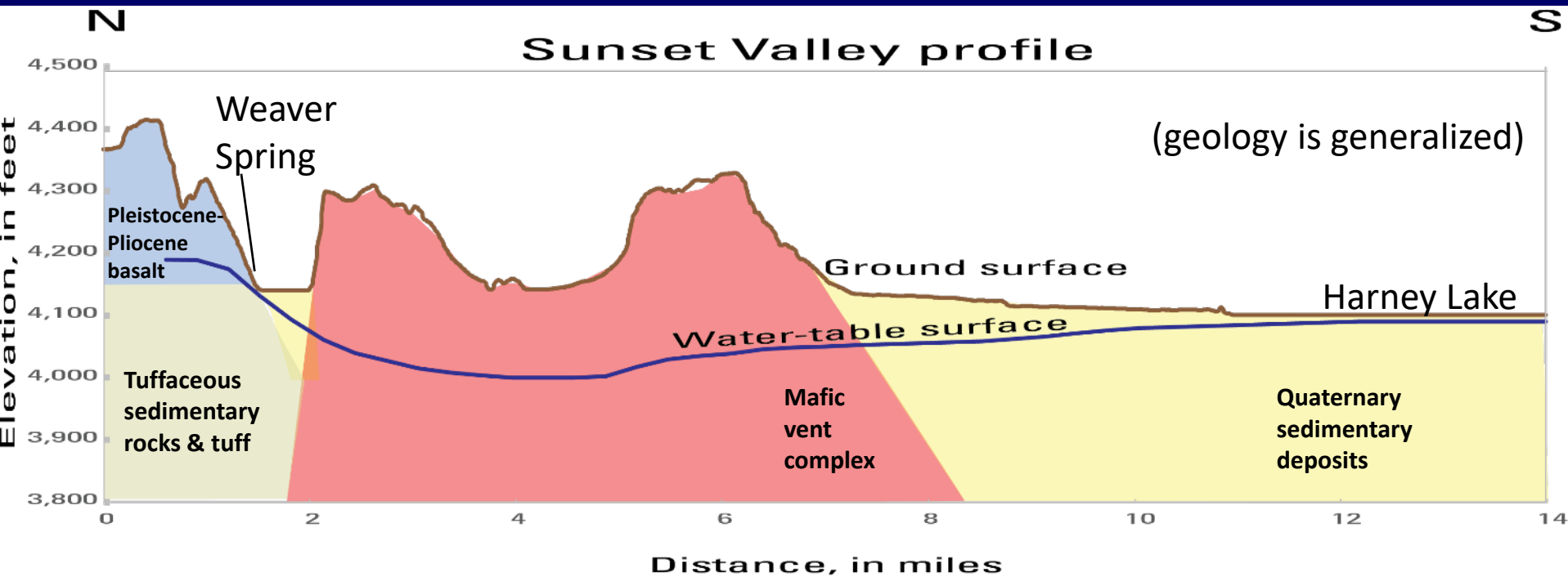
Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Sunset Valley

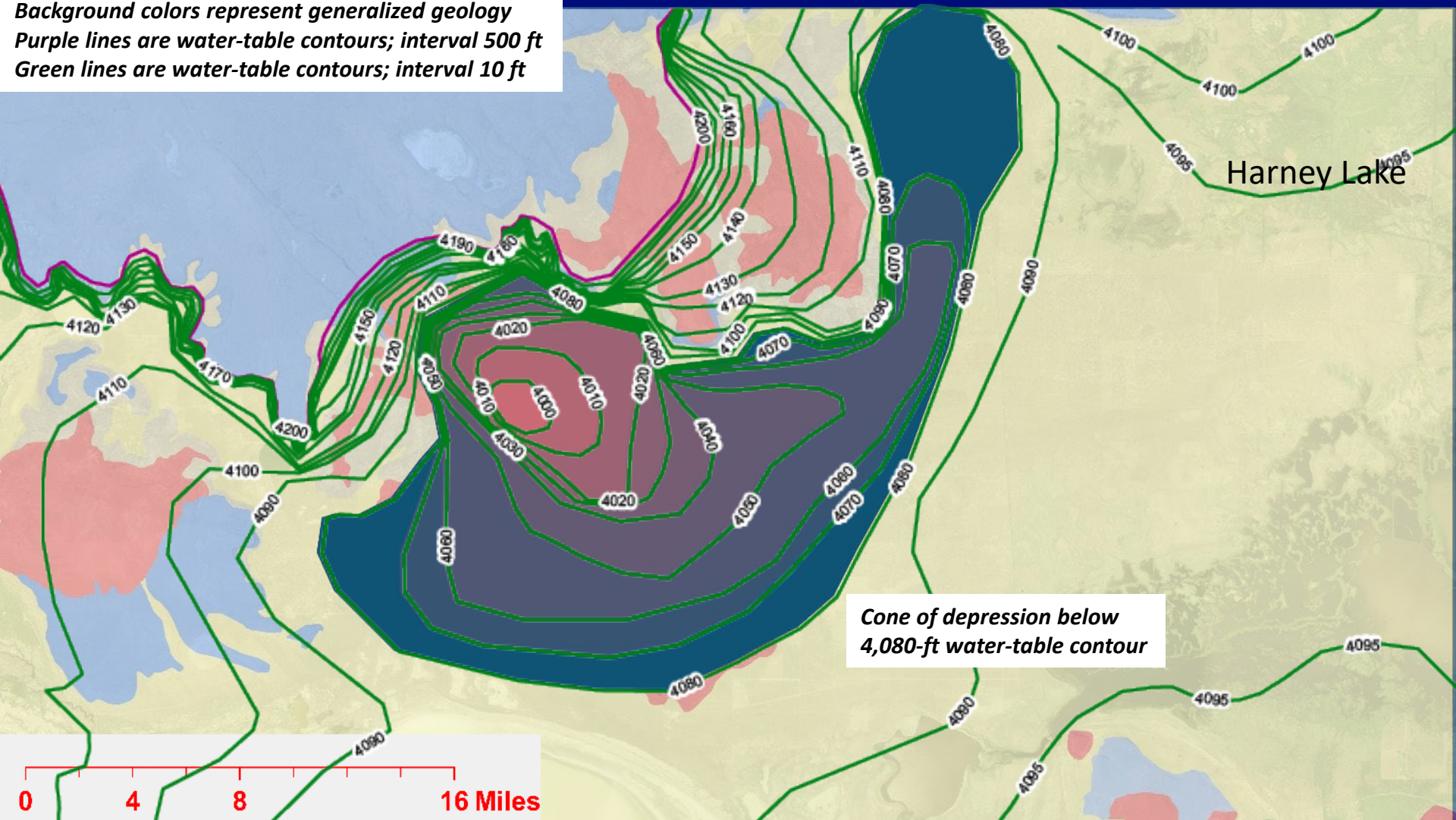
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Purple lines are water-table contours; interval 500 ft
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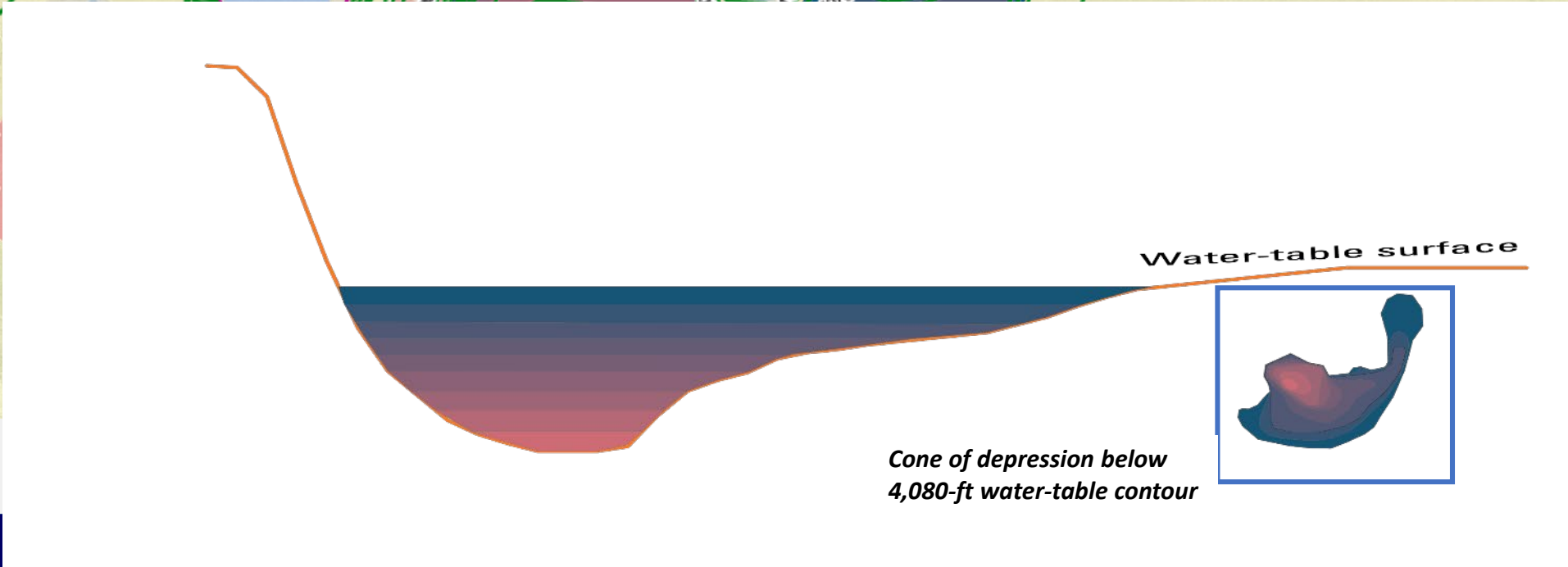
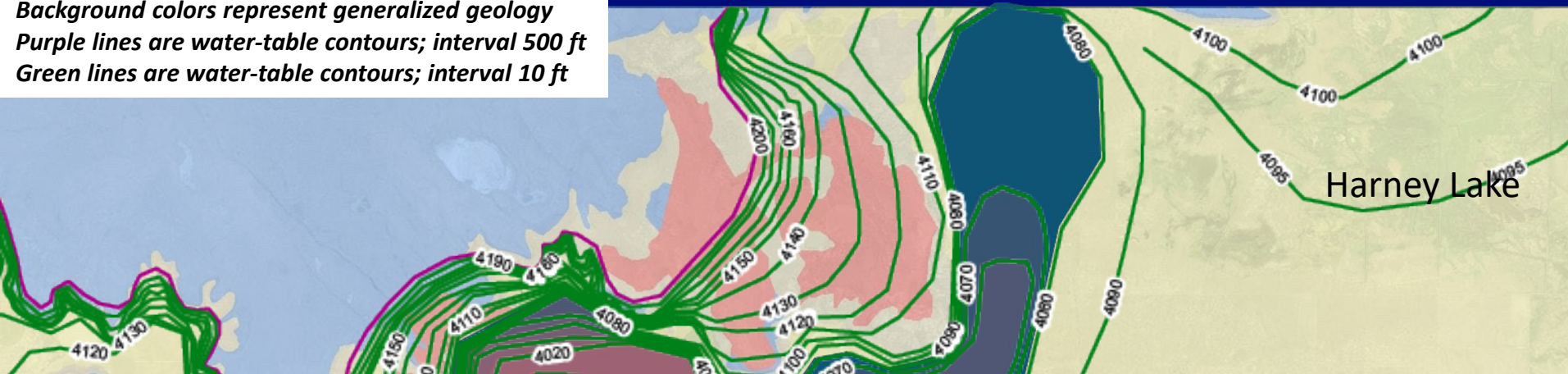
Sunset Valley

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Green lines are water-table contours; interval 10 ft



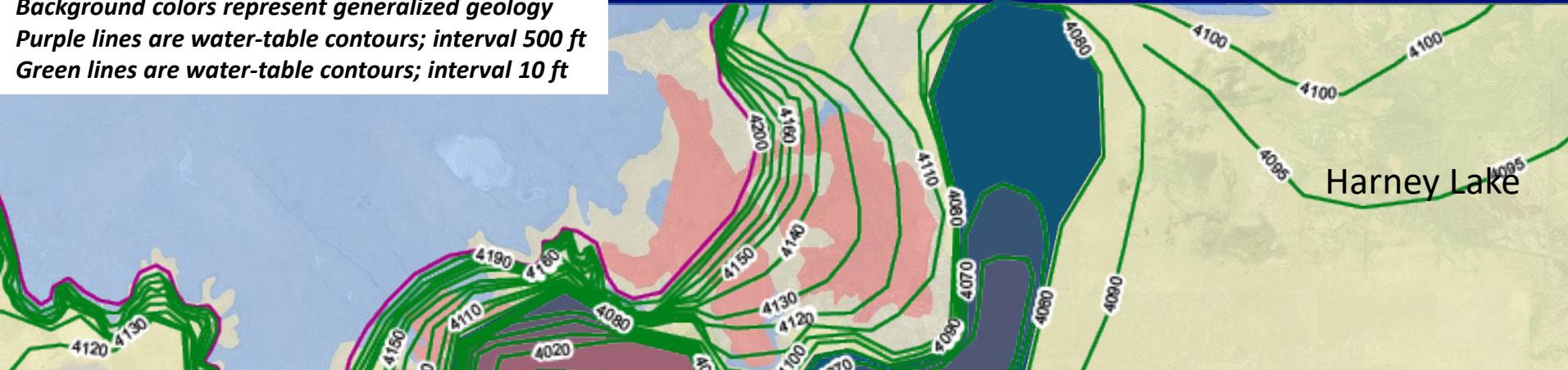
Sunset Valley

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Green lines are water-table contours; interval 10 ft



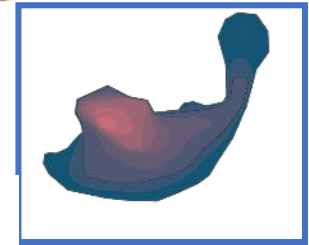
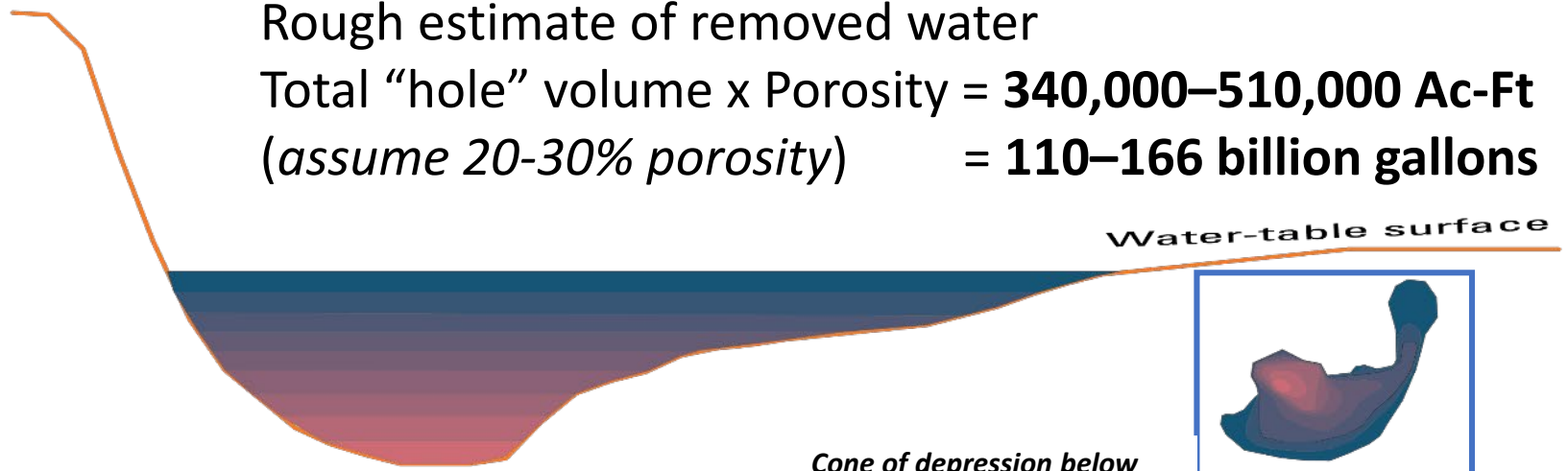
Sunset Valley

Background colors represent generalized geology
Purple lines are water-table contours; interval 500 ft
Green lines are water-table contours; interval 10 ft



Rough estimate of removed water

Total "hole" volume x Porosity = **340,000–510,000 Ac-Ft**
(assume 20-30% porosity) = **110–166 billion gallons**



Cone of depression below
4,080-ft water-table contour