



**IMPROVE**  
Interagency Monitoring of Protected Visual Environments

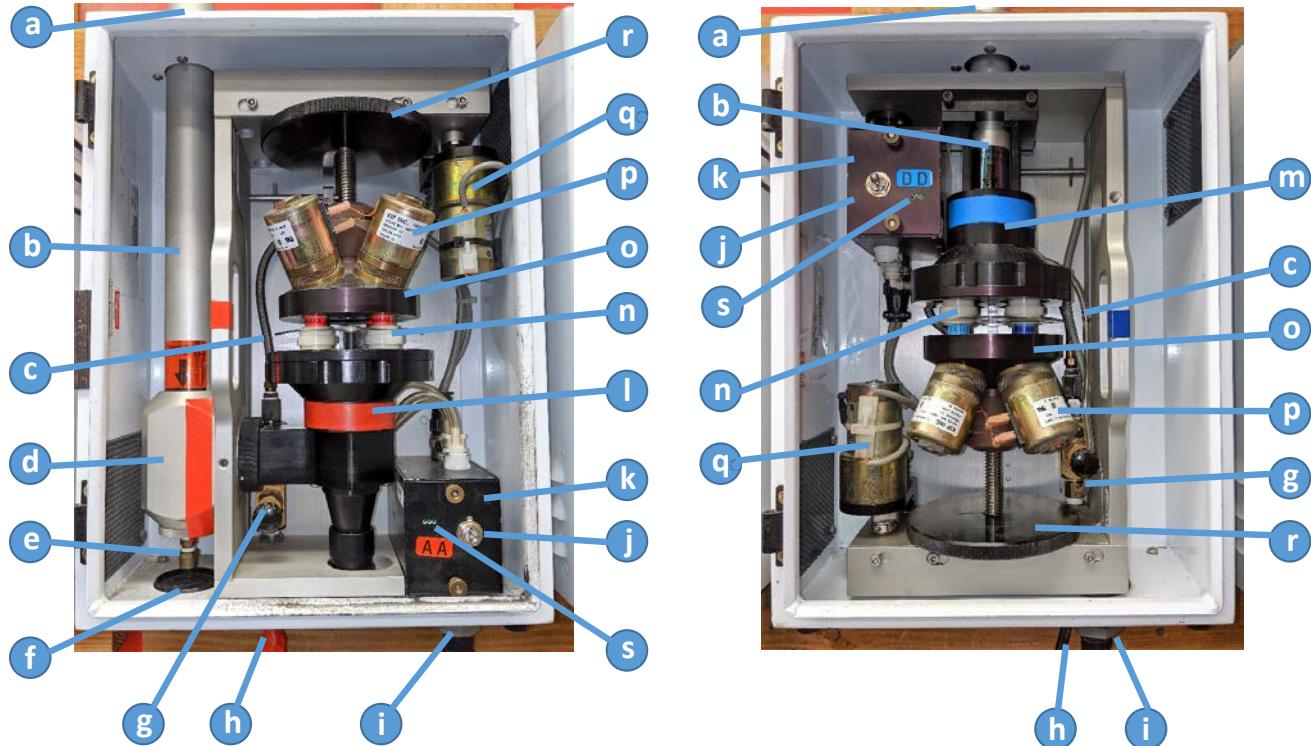
2021 CALENDAR

**IMPROVE is a collaborative association of state, tribal, and federal agencies, and international partners.** US Environmental Protection Agency is the primary funding source, with contracting and research support from the National Park Service. The Air Quality Research Center (AQRC) at the University of California, Davis provides field maintenance and operator support, sample handling, elemental analysis, and data processing; Research Triangle Institute (RTI) performs ions analysis; and Desert Research Institute (DRI) performs carbon analysis. IMPROVE data and

documentation are available from the website <http://vista.cira.colostate.edu/improve/> maintained by the Cooperative Institute for Research in the Atmosphere (CIRA).

For questions or problems with optical or scene monitoring equipment, contact Mark Tigges, Air Resource Specialists, Fort Collins, CO at 970-224-9300. For questions or problems with air sampler controllers, filters or flow checks, contact Air Quality Research Center, UC Davis at 530-752-1123, [improvehelpdesk@ucdavis.edu](mailto:improvehelpdesk@ucdavis.edu), or visit <https://aqrc.ucdavis.edu/resources-for-operators>.





**a.** stack compression sleeve  
**b.** inlet stack  
**c.** braided hose  
**d.** inlet tee  
**e.** tee plug

**f.** black cap  
**g.** flow control valve  
**h.** pump hose connector  
**i.** module cable connector  
**j.** motor control toggle switch

**k.** electronics box (ebox)  
**l.** cyclone  
**m.** funnel  
**n.** cartridge with 4 filter cassettes  
**o.** solenoid manifold

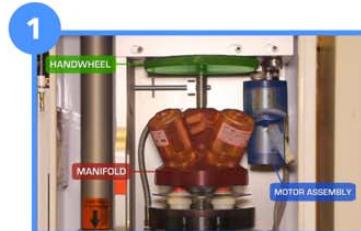
**p.** solenoid valve (4)  
**q.** motor assembly to raise solenoid manifold  
**r.** handwheel (flywheel) to raise manifold  
**s.** Ebox status LED lights



## QUICK REFERENCE: MODULE SCHEMATIC



### Disengaging Manifold Motor to Manually Raise/Lower the Manifold



Locate the motor assembly in the module.



Separate the motor assembly from the coupling sliding the assembly down. Then pivot it towards the hand wheel.



A gentle wiggle may be required to slide the assembly up or down.



For the A, B, and C modules spin the hand wheel to the left to raise the manifold.



Spin the hand wheel to the right to lower the manifold.



The spinning direction to raise and lower the manifold is opposite for the D module.



If the motor starts to work again it can be reengaged with the hand wheel. Pivot the motor assembly back to its original location.



Rotate the hand wheel until the coupling snaps into alignment.

## Electronics-Box Replacement

(For A,B, and C modules. For the D module skip steps 3 and 9)



Disconnect the Orifice (ORI) and Cyclone (CYC) hoses by depressing the metal clasp and pulling on the hose.



Disconnect the grey cable located on top of the box by turning the metal collar counter-clockwise.



Disconnect the grey module cable at the bottom of the module, by turning the connector body counter-clockwise.



Loosen the brass knobs located on the black electronics box.



Remove old electronics box and insert the new box.



Tighten the brass knobs.



Re-connect grey cable on the top of the box.



(line up the key and keyway when connecting the electronic connectors)



Re-connect the hoses to the electronics box.



Re-connect the bottom grey module cable.

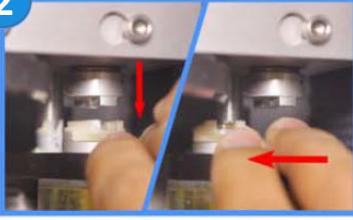
### Replacing Plastic Motor Coupler

1



Locate the motor assembly in the module

2



Separate the motor assembly from the coupling sliding the assembly down. Then pivot it towards the hand wheel.

3



Remove the old plastic coupler and place the new one in. Make sure to center it on the metal hub.

4



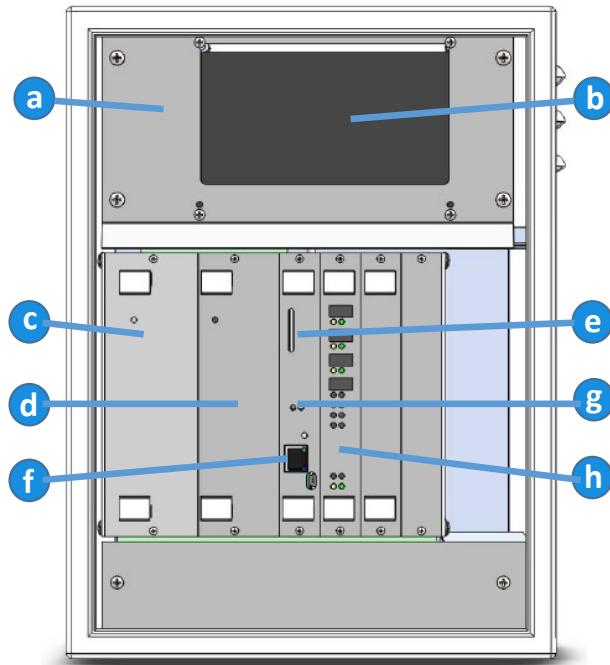
If the plastic motor coupler does not line up with the upper hub, use the hand wheel to put it into place

5



The motor should slide into place and the upper and lower hubs should fit securely into the plastic motor coupler

## Controller Information



- a. Display Faceplate
- b. LCD Touch Screen
- c. 5 V Power Supply Card
- d. 24 V Power Supply Card
- e. SD Card Slot
- f. Ethernet Port
- g. CPU Card
- h. Hub Card

Home Page Description

The screenshot shows the home page of the controller. The top right corner displays the date and time (01/29/18 12:58:23). Below this, a status box shows the site name (ABCD9), the controller has been up for 1 hour, the temperature is -1.10°C, and week 2 filters are installed. The page title is "Sampling". A "Filter Readings" button is visible. The bottom of the page includes a "Help", "Info", and "Menu" menu bar. A legend on the left side of the page describes the icons and buttons:

- ① Today's date and time
- ② Site name
- ③ How long the controller has been running
- ④ Temperature probe Readings
- ⑤ Current week's filters
- ⑥ Sampling status
- ⑦ Perform Filter Readings
- ⑧ Help Page
- ⑨ Controller and module information
- ⑩ Configuration menu for configuring controller and modules

Callouts explain the navigation icons and status indicators:

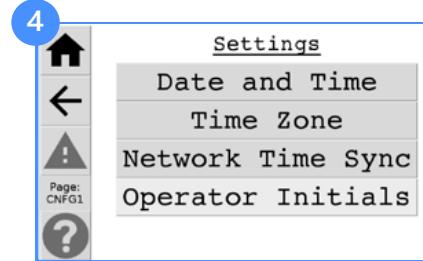
- Click here at anytime to go to the home page.
- Click here at anytime to go to the previous page.
- This indicates the controller's status. If it's red or yellow a problem has been detected. Press button to enter troubleshooting mode.
- The current page ID.
- While viewing most page, clicking this button will give you more information.

## Change Date/Time on New Controller

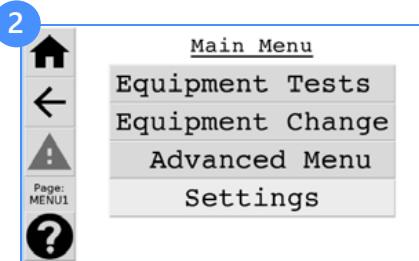
(If the controller is connected to the internet please only edit the time zone)



Press the 'Menu' on the home screen.



Press 'Time Zone'



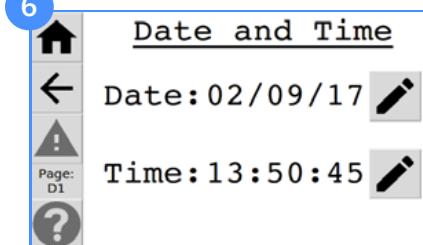
Press 'Settings'



Use up/down arrows to select the time zone offset based on step 3



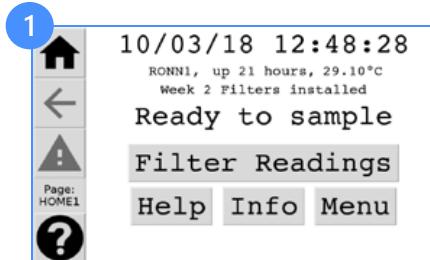
Look up your time zone on the reference map and note the corresponding GMT offset in **Bold**



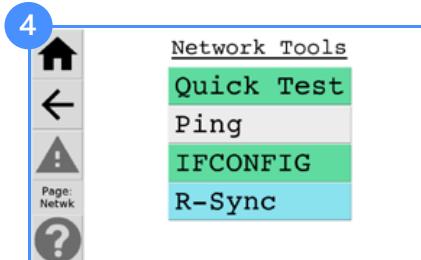
Only if your site is **not** connected to the internet do you select the "Date and Time" option in step 4 to manually edit the time.

Press the  icon to edit the time

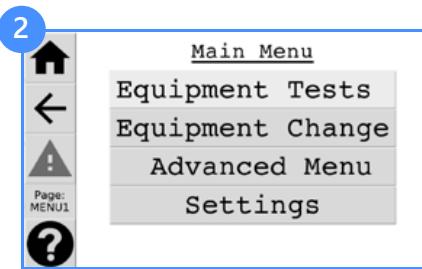
## Test Network Connection and Send Data to Server



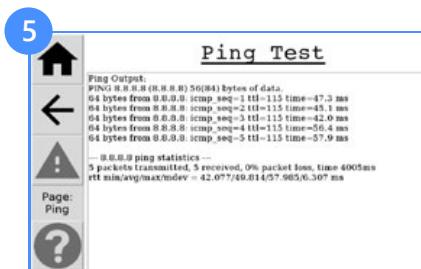
Press the 'Menu' on the home screen.



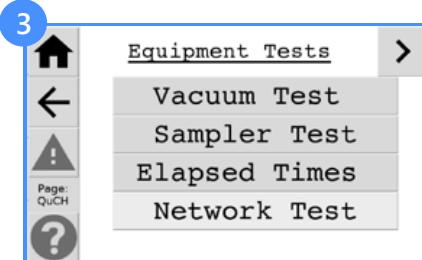
Press 'Ping'



Press 'Equipment Tests'



Read the output of the test. If the 2nd to last line reads '**5 packets transmitted, 5 received, 0% packet loss**' then the controller is successfully connected to the internet

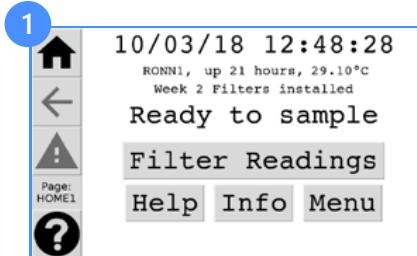


Press 'Network Test'

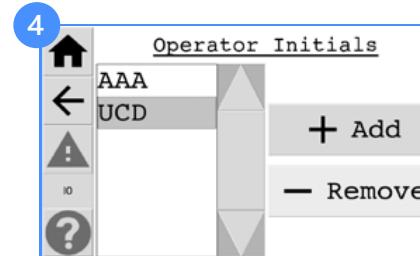


Press the button to go back to 'Network Tools' then select the 'R-Sync' option. This will send the controller data back to the server.

## Manage Operator Initials on New Controller

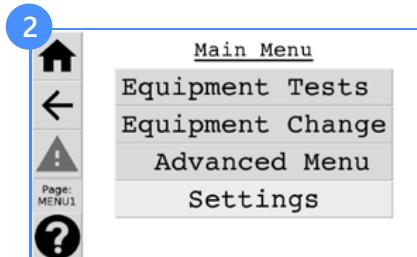


Press the 'Menu' on the home screen.

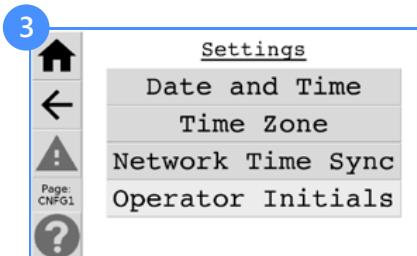


Select the initials you wish to remove, then press 'Remove'

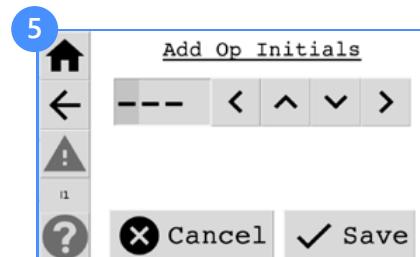
If you wish to add initials press 'Add'



Press 'Settings'



Press 'Operator Initials'



When adding initials use the up/down arrows to edit a letter, and left/right arrows to move the cursor.

Please use 3 letter initials for clarity.

# IMPROVE

Interagency Monitoring of  
Protected Visual Environments

**UCDAVIS**  
UNIVERSITY OF CALIFORNIA





Gros Ventre Road, Grand Teton National Park. Scott Copeland

# JANUARY 2021

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
DECEMBER 2020 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	FEBRUARY 2021 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28				New Year's Day 1  IMPROVE Particle Sampling Day	2
3	4 IMPROVE Particle Sampling Day	5 3-2-2 Week 3 2-3-2 Week 1 Change IMPROVE Particle cartridges	6 Alternate Sample Change Day	7 IMPROVE Particle Sampling Day	8	9
10 IMPROVE Particle Sampling Day	11 Alternate Sample Change Day	12 3-2-2 Week 1 2-3-2 Week 2 Change IMPROVE Particle cartridges	13 IMPROVE Particle Sampling Day	14	15	16 IMPROVE Particle Sampling Day
17 Alternate Sample Change Day	18 Alternate Sample Change Day	19 3-2-2 Week 2 2-3-2 Week 3 Special cartridge change: move cassette 3 from old cartridge to new. IMPROVE Particle Sampling Day	20 Alternate Sample Change Day	21 Alternate Sample Change Day	22 IMPROVE Particle Sampling Day	23
24	25 IMPROVE Particle Sampling Day	26 3-2-2 Week 3 2-3-2 Week 1 Change IMPROVE Particle cartridges	27 Alternate Sample Change Day	28 IMPROVE Particle Sampling Day	29	30
31 IMPROVE Particle Sampling Day						

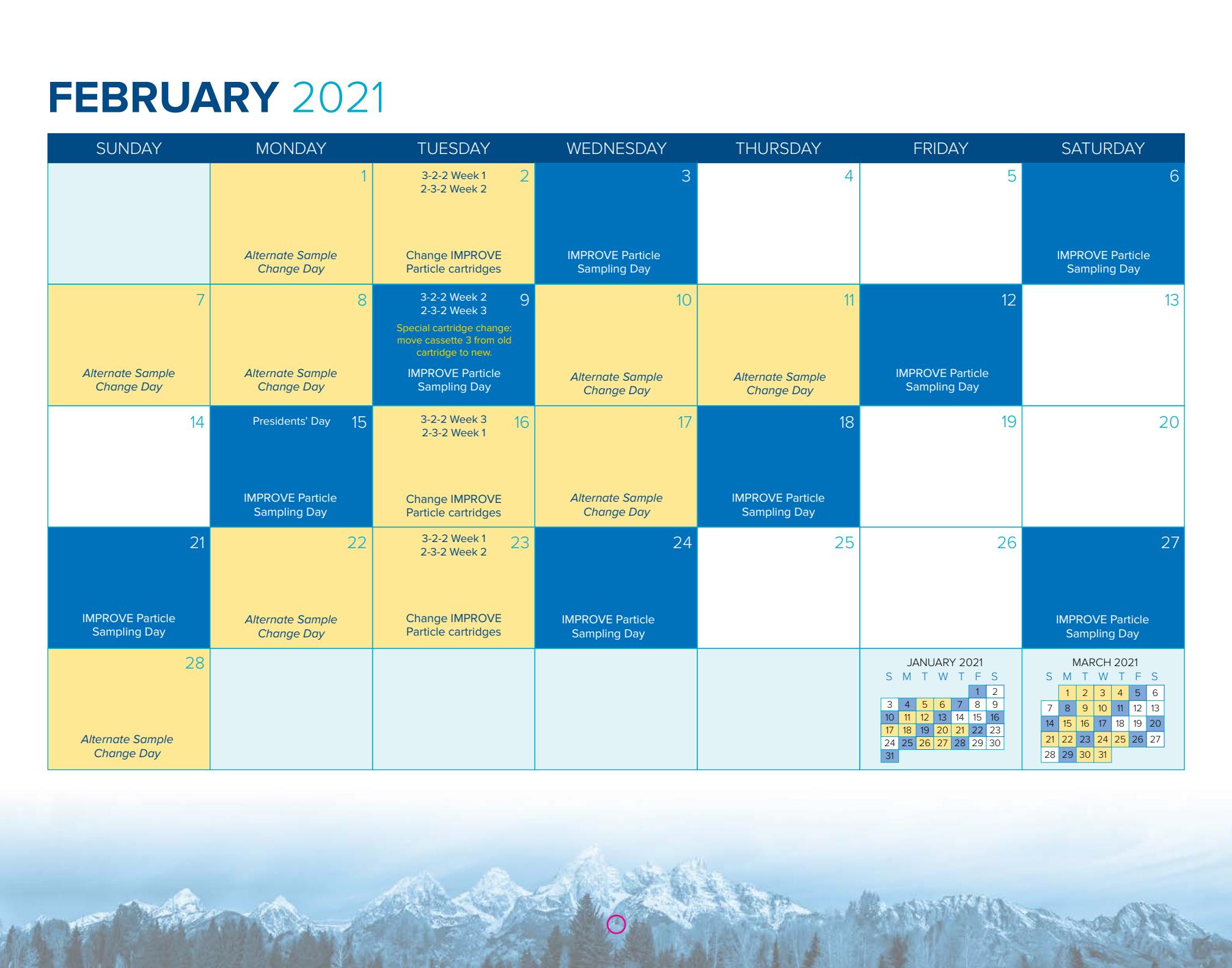




Beehive Geyser, Yellowstone National Park(YELL2). Scott Copeland

# FEBRUARY 2021

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 <i>Alternate Sample Change Day</i>	3-2-2 Week 1 2-3-2 Week 2  Change IMPROVE Particle cartridges	2	3	4	5  IMPROVE Particle Sampling Day
7  <i>Alternate Sample Change Day</i>	8  <i>Alternate Sample Change Day</i>	3-2-2 Week 2 2-3-2 Week 3  Special cartridge change: move cassette 3 from old cartridge to new.  IMPROVE Particle Sampling Day	9	10  <i>Alternate Sample Change Day</i>	11  <i>Alternate Sample Change Day</i>	12  IMPROVE Particle Sampling Day
14	15  Presidents' Day  IMPROVE Particle Sampling Day	3-2-2 Week 3 2-3-2 Week 1  Change IMPROVE Particle cartridges	16	17  <i>Alternate Sample Change Day</i>	18  IMPROVE Particle Sampling Day	19  20
21  IMPROVE Particle Sampling Day	22  <i>Alternate Sample Change Day</i>	3-2-2 Week 1 2-3-2 Week 2  Change IMPROVE Particle cartridges	23	24  IMPROVE Particle Sampling Day	25	26  27  IMPROVE Particle Sampling Day
28  <i>Alternate Sample Change Day</i>					JANUARY 2021 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	MARCH 2021 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31





Cirque of the Towers, Popo Agie Wilderness. Scott Copeland

# MARCH 2021

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Franklin Lakes, New Jersey. Faris Jawda

# APRIL 2021

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Lake Tahoe, D.L. Bliss State Park (BLIS1). Scott Copeland

# MAY 2021

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<b>APRIL 2021</b> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	<b>JUNE 2021</b> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30					1  IMPROVE Particle Sampling Day
2  Alternate Sample Change Day	3  Alternate Sample Change Day	4  3-2-2 Week 2 2-3-2 Week 3  Special cartridge change: move cassette 3 from old cartridge to new.  IMPROVE Particle Sampling Day	5  Alternate Sample Change Day	6  Alternate Sample Change Day	7  IMPROVE Particle Sampling Day	8
9  IMPROVE Particle Sampling Day	10  IMPROVE Particle Sampling Day	11  3-2-2 Week 3 2-3-2 Week 1  Change IMPROVE Particle cartridges	12  Alternate Sample Change Day	13  IMPROVE Particle Sampling Day	14	15
16  IMPROVE Particle Sampling Day	17  Alternate Sample Change Day	18  3-2-2 Week 1 2-3-2 Week 2  Change IMPROVE Particle cartridges	19  IMPROVE Particle Sampling Day	20	21	22  IMPROVE Particle Sampling Day
23  Alternate Sample Change Day	24  Alternate Sample Change Day	25  3-2-2 Week 2 2-3-2 Week 3  Special cartridge change: move cassette 3 from old cartridge to new.  IMPROVE Particle Sampling Day	26  Alternate Sample Change Day	27  Alternate Sample Change Day	28  IMPROVE Particle Sampling Day	29
30  Memorial Day	31  IMPROVE Particle Sampling Day					





Subway Approach, Zion National Park (ZION1). Scott Copeland

# JUNE 2021

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		3-2-2 Week 3 2-3-2 Week 1  Change IMPROVE Particle cartridges	1  Alternate Sample Change Day	2	3	4  5
6  IMPROVE Particle Sampling Day	7  Alternate Sample Change Day	8 3-2-2 Week 1 2-3-2 Week 2  Change IMPROVE Particle cartridges	9  IMPROVE Particle Sampling Day	10	11	12  IMPROVE Particle Sampling Day
13  Alternate Sample Change Day	14  Alternate Sample Change Day	15 3-2-2 Week 2 2-3-2 Week 3  Special cartridge change: move cassette 3 from old cartridge to new.  IMPROVE Particle Sampling Day	16  Alternate Sample Change Day	17	18	19
20  IMPROVE Particle Sampling Day	21  IMPROVE Particle Sampling Day	22 3-2-2 Week 3 2-3-2 Week 1  Change IMPROVE Particle cartridges	23  Alternate Sample Change Day	24  IMPROVE Particle Sampling Day	25	26
27  IMPROVE Particle Sampling Day	28  Alternate Sample Change Day	29 3-2-2 Week 1 2-3-2 Week 2  Change IMPROVE Particle cartridges	30  IMPROVE Particle Sampling Day		MAY 2021 S M T W T F S 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	JULY 2021 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31





Neowise Comet, Popo Agie Wilderness. *Scott Copeland*

# JULY 2021

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY																																																																																				
<b>JUNE 2021</b> <table border="1"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td></td><td></td></tr> <tr><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td></tr> <tr><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td></tr> <tr><td>27</td><td>28</td><td>29</td><td>30</td><td></td><td></td><td></td></tr> </table>	S	M	T	W	T	F	S	1	2	3	4	5			6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				<b>AUGUST 2021</b> <table border="1"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td></tr> <tr><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr> <tr><td>29</td><td>30</td><td>31</td><td></td><td></td><td></td><td></td></tr> </table>	S	M	T	W	T	F	S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31							1	2	3
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Squibnocket Beach, Martha's Vineyard (MAV1). *Faris Jawda*

# AUGUST 2021

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Bridger Forest, Bridger Wilderness (BRID1). Scott Copeland

# SEPTEMBER 2021

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Upstate New Hampshire near Great Gulf Wilderness (GRGU1). *Taylor McGregor*

# OCTOBER 2021

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10 IMPROVE Particle Sampling Day	11 Alternate Sample Change Day	12 3-2-2 Week 1 2-3-2 Week 2 Change IMPROVE Particle cartridges	13 IMPROVE Particle Sampling Day	14	15	16 IMPROVE Particle Sampling Day																																																																																				
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Hike to Marms Lake, Bridger Wilderness (BRID1). Scott Copeland

# NOVEMBER 2021

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	1  <i>Alternate Sample Change Day</i>	3-2-2 Week 1 2-3-2 Week 2  <i>Change IMPROVE Particle cartridges</i>	2  <i>IMPROVE Particle Sampling Day</i>	3  <i>IMPROVE Particle Sampling Day</i>	4  <i>IMPROVE Particle Sampling Day</i>	5  <i>IMPROVE Particle Sampling Day</i>																																																																																											
7  <i>Alternate Sample Change Day</i>	8  <i>Alternate Sample Change Day</i>	3-2-2 Week 2 2-3-2 Week 3  <i>Special cartridge change: move cassette 3 from old cartridge to new.</i>  <i>IMPROVE Particle Sampling Day</i>	9  <i>Alternate Sample Change Day</i>	10  <i>Veterans Day</i>	11  <i>Alternate Sample Change Day</i>	12  <i>IMPROVE Particle Sampling Day</i>																																																																																											
14  <i>IMPROVE Particle Sampling Day</i>	15  <i>IMPROVE Particle Sampling Day</i>	3-2-2 Week 3 2-3-2 Week 1  <i>Change IMPROVE Particle cartridges</i>	16  <i>Alternate Sample Change Day</i>	17  <i>IMPROVE Particle Sampling Day</i>	18  <i>IMPROVE Particle Sampling Day</i>	19  <i>IMPROVE Particle Sampling Day</i>																																																																																											
21  <i>IMPROVE Particle Sampling Day</i>	22  <i>Alternate Sample Change Day</i>	3-2-2 Week 1 2-3-2 Week 2  <i>Change IMPROVE Particle cartridges</i>	23  <i>IMPROVE Particle Sampling Day</i>	24  <i>IMPROVE Particle Sampling Day</i>	25  <i>Thanksgiving</i>	26  <i>IMPROVE Particle Sampling Day</i>																																																																																											
28  <i>Alternate Sample Change Day</i>	29  <i>Alternate Sample Change Day</i>	3-2-2 Week 2 2-3-2 Week 3  <i>Special cartridge change: move cassette 3 from old cartridge to new.</i>  <i>IMPROVE Particle Sampling Day</i>	30  <i>IMPROVE Particle Sampling Day</i>			OCTOBER 2021 <table border="1"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></tr> <tr><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td></tr> <tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr> <tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr> <tr><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td></tr> <tr><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr> <tr><td>31</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table> DECEMBER 2021 <table border="1"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></tr> <tr><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr> <tr><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td></tr> <tr><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td></tr> <tr><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td></td></tr> </table>	S	M	T	W	T	F	S						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31							S	M	T	W	T	F	S						1	2	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
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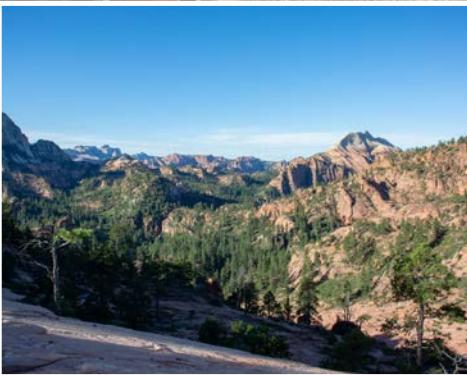


Firefall, Yosemite National Park (YOSE1). Scott Copeland

# DECEMBER 2021

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<b>NOVEMBER 2021</b> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	<b>JANUARY 2022</b> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			1 <i>Alternate Sample Change Day</i>	2 <i>Alternate Sample Change Day</i>	3 <i>IMPROVE Particle Sampling Day</i>
5 <i>IMPROVE Particle Sampling Day</i>	6 <i>Change IMPROVE Particle cartridges</i>	3-2-2 Week 3 2-3-2 Week 1 7 <i>Alternate Sample Change Day</i>	8 <i>IMPROVE Particle Sampling Day</i>	9	10	11
12 <i>IMPROVE Particle Sampling Day</i>	13 <i>Alternate Sample Change Day</i>	3-2-2 Week 1 2-3-2 Week 2 14 <i>Change IMPROVE Particle cartridges</i>	15 <i>IMPROVE Particle Sampling Day</i>	16	17	18 <i>IMPROVE Particle Sampling Day</i>
19 <i>Alternate Sample Change Day</i>	20 <i>Alternate Sample Change Day</i>	3-2-2 Week 2 2-3-2 Week 3 21 <i>Special cartridge change: move cassette 3 from old cartridge to new.</i> <i>IMPROVE Particle Sampling Day</i>	22 <i>Alternate Sample Change Day</i>	23 <i>Alternate Sample Change Day</i>	24 <i>Winter Holiday</i>	25
26 <i>IMPROVE Particle Sampling Day</i>	27 <i>Winter Holiday</i>	3-2-2 Week 3 2-3-2 Week 1 28 <i>Change IMPROVE Particle cartridges</i>	29 <i>Alternate Sample Change Day</i>	30 <i>Winter Holiday</i>	31 <i>Winter Holiday</i>	





Photographs taken by *Scott Copeland, Faris Jawda, Taylor McGregor.*

Cover Photo: Schwabacher Landing, Grand Teton National Park. *Scott Copeland*

