Topic/Lesson:	**Tracking Sturgeon: Mapping the Data**
Subject:	Social Studies - reading and creating maps from Atlantic Sturgeon tracking data
Author:	Kate Sundquist
Time Duration:	Three Days
Overview:	Students will first review their knowledge of maps and mapping. They will then read maps and data tables developed from the Atlantic Coast Sturgeon Tagging Database (US Fish and Wildlife 2009). Students will analyze "Figure 1. Number and locations of recaptured tagged Atlantic sturgeon as reported by fishermen." Using this population map, students will identify regions in which tagged sturgeon are most likely to be recaptured. Next, students will read data collected by the SCUTES Atlantic Sturgeon tracking efforts. This data will be presented in tables and will include tracking information over time for individual sturgeon. Using this data, students will create a map showing their specific sturgeon's path over the course of time. Students will draw conclusions based on these movements.
Objectives:	Students will be able to: • Use mapping skills to interpret population maps showing sturgeon movement over time. • Use tracking data to map absolute locations over time on a mapping template.
Background Knowledge:	• Students should understand that all maps include a title, a compass rose or other orientation, scale, and a legend or key. • Students should be able to determine absolute locations of places studied by using a map to find latitude and longitude. Students should have a basic understanding of latitude and longitude. • Students should be able to identify the purpose of specialized maps, including population, income, climate change, etc.
Materials:	• A variety of maps to be used for brainstorming • "Figure 1. Number and locations of recaptured tagged Atlantic sturgeon as reported by fishermen" (US Fish and Wildlife 2009). • Reading Figure 1 Worksheet • Atlantic Sturgeon Tracking Data Tables

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	• Tracking Data Instructions • Atlantic Sturgeon Mapping Templates, transparencies, or access to Google Earth and Mapping Rubric • Tracking Data Writing Prompt and Rubric
Vocabulary:	**Latitude:** The angular distance of a place north or south of the earth's equator. **Longitude:** The angular distance of a place east or west of the meridian at Greenwich, England. **Absolute Location:** A point on the earth's surface expressed by a coordinate system such as latitude and longitude. **Compass Rose:** A circle showing the principal directions printed on a map or chart. **Political Map:** A map designed to show governmental boundaries of countries, states, and counties. **Physical Map:** A map designed to indicate the location of landforms like deserts, mountains, and plains. Also usually include country borders, major cities, and significant bodies of water.
Procedures:	**Day One** Students begin by looking through a collection of maps (any that are available in the classroom but these should include some examples of political, physical, and specialty maps such as population or temperature). Students are asked to think of what all of the maps have in common and what makes some different. By the end of the brainstorming, students should have drawn on their prior knowledge to point out that all maps include a title, a compass rose or other orientation, a scale, and a legend or key. Next, the teacher asks a student volunteer to remind the class what latitude and longitude are. Students identify lines of latitude and longitude on their maps and can explain how latitude and longitude are numbered. To practice, students challenge one another to locate a specific absolute location on the globe when given coordinates. Students are told that over the next two classes, they will be looking at maps and absolute locations to draw conclusions about a population of Atlantic sturgeon. **Day One Homework** Students are asked to analyze "Figure 1. Number and locations of recaptured tagged Atlantic sturgeon as reported by fishermen" (US Fish and

	Wildlife 2009). They then complete "Reading Figure 1 Worksheet." **Day Two** The teacher reviews the homework with the class. Students correct their work. Next, students are told that over the course of the next two classes, they will be using tracking data to map the locations of individual Atlantic Sturgeon over time. The teacher may choose to have students work individually, in partners, or in small groups. Each group (or individual) receives "Tracking Data Instructions" and one of the "Atlantic Sturgeon Tracking Data" sheets. These are the coordinates that each group will plot. Students with access to Google Earth may use this program to input coordinates. Students without access to Google Earth should select the most appropriate mapping template. Alternatively, the teacher may set up a projector and use a transparency of the mapping template to project it in very large scale onto paper on the wall where students can mark their coordinates with different colored markers. Students must add the required elements to their mapping templates, and then map each absolute location from their data table and label them appropriately. If students are finished early, they may color their maps appropriately and/or assess their own work using the "Tracking Data Rubric." **Day Three** Students continue to work on mapping their tracking data. Students should then compare their maps with others and complete the "Tracking Data Writing Prompt." Students can also have the option of presenting their information in a PowerPoint presentation.
Conclusions:	Student volunteers share their maps and their "Tracking Data Writing Prompts" with the class. The class should recognize patterns in seasonal movements of Atlantic sturgeon.
Massachusetts State Social Studies and History Curriculum Standards:	**Social Studies and History: Grade 6** <u>Geography</u> 1. Use map and globe skills learned in prekindergarten to grade five to interpret different kinds of projections, as well as topographic, landform, political, population, and climate maps. (G) 3. Interpret geographic information from a graph or chart and construct a graph or chart that conveys geographic information (e.g., about rainfall, temperature, or population size data). (G)
Resources:	http://www.fws.gov/northeast/marylandfisheries/reports/2009%20STG%20Coastal%20Report.pdf SCUTES Tracking Database, NOAA Fisheries

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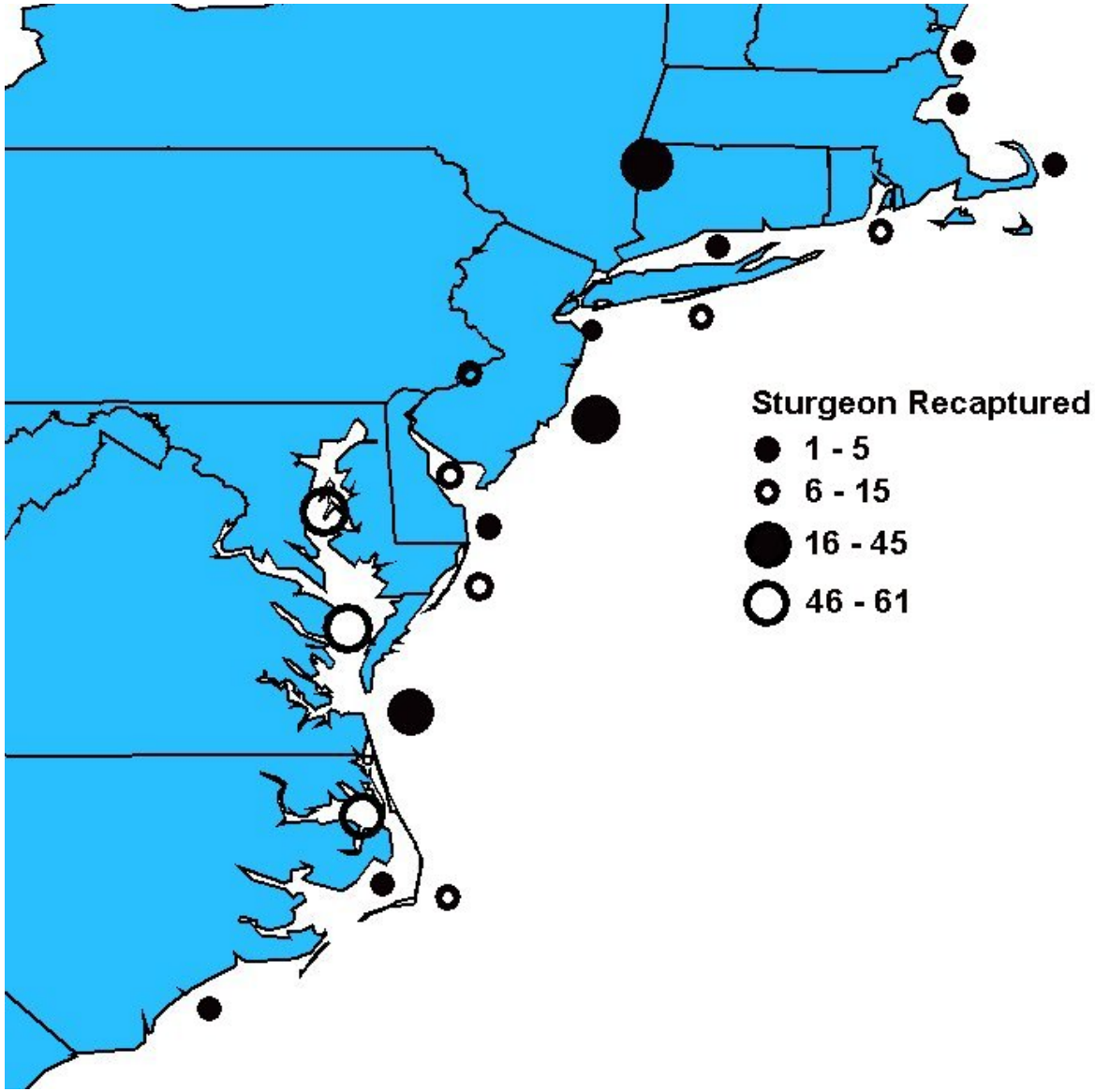
Figure 1. Number and locations of recaptured tagged Atlantic sturgeon as reported by fishermen.



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Date: _____

Reading "Figure 1. Number and locations of recaptured tagged Atlantic sturgeon as reported by fishermen" Worksheet

1. What type of map is this (political, physical, or specialty), and what is it used for?

_____

_____

2. According to this map, how many tagged Atlantic sturgeon were recaptured off the east coast of Cape Cod?

_____

_____

3. According to this map, how many tagged Atlantic sturgeon were recaptured in Chesapeake Bay?

_____

4. This map shows a significant number of Atlantic sturgeon being caught well inland near the border between Connecticut and New York. How can this be explained?

_____

_____

_____

_____

_____

5. Use this map to draw a conclusion on what type of waters tagged Atlantic sturgeon are most likely to be captured in.

_____

_____

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Date: _____

Reading "Figure 1 Number and locations of recaptured tagged Atlantic sturgeon as reported by fishermen" Worksheet

1. What type of map is this (political, physical, or specialty), and what is it used for?

This is a specialty map used for showing the population of recaptured Atlantic sturgeon reported by fishermen.

2. According to this map, how many tagged Atlantic sturgeon were recaptured off the east coast of Cape Cod?

According to this map, between 1-5 tagged Atlantic sturgeon were recaptured off the east coast of Cape Cod.

3. According to this map, how many tagged Atlantic sturgeon were recaptured in Chesapeake Bay?

According to this map, between 46-61 tagged sturgeon were recaptured at two different sites in the Chesapeake Bay, making a total of between 92-121 tagged sturgeon recaptured in the Chesapeake.

4. This map shows a significant number of Atlantic sturgeon being caught well inland near the border between Connecticut and New York. How can this be explained?

The recaptured Atlantic sturgeon reported near the border between Connecticut and New York must have been recaptured up the inland rivers, most likely the Hudson or Housatonick.

5. Use this map to draw a conclusion on what type of waters tagged Atlantic sturgeon are most likely to be captured in.

Tagged Atlantic sturgeon are most likely to be recaptured in coastal or inland waters. They are not likely to be recaptured in exposed offshore waters, and are also less likely to be captured well inland.

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Date: _____

Atlantic Sturgeon Tracking Data Instructions

In an effort to better understand the migratory patterns of Atlantic sturgeon, scientists have undertaken a number of tracking efforts. One of these efforts fits captured Atlantic sturgeon with a transmitter that can be detected at receiving stations up to 900 meters away (about the length of a football field). These receiving stations are located in areas where Atlantic sturgeon are likely to be found. When a tagged Atlantic sturgeon gets within range of a receiver, the date, location, and time are recorded.

You will receive a data set of receiver information from one Atlantic sturgeon. Although your sturgeon was likely detected hundreds of times over the course of a year or two, this data has been filtered to show only significant movements. For months when no significant movement occurred, the same receiving station may be shown repeatedly. When no receiving stations were activated by this fish over a long period of time, you might find that there is no available location information for several months in a row.

Your task is to map the movements of your fish. If you have computer access, your teacher might show you how to do this using Google Earth. If you do not, you will need to choose an appropriate mapping template or use one that your teacher has projected onto the wall. Make sure that you provide a title and any other necessary key features for your map. You might need to create a legend in order to keep your data clearly presented in crowded areas on the map.

Once you have considered how your data will be presented and you have laid out your map with key mapping features, you will plot each coordinate using the latitude and longitude scale. Make sure to keep your mapping neat. When you are finished, you should review maps created by other classmates to identify similarities and differences. Keep in mind that you will be asked to consider seasonal movements of Atlantic sturgeon in the final writing prompt for this activity.

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Name: _____

Date: _____

Atlantic Sturgeon #12718 Tracking Data

Date	Latitude (N)	Longitude (W)
7/15/08 0:00	44.67	-68.820
8/15/08 0:00	44.703	-68.837
9/15/08 0:00	44.690	-68.827
9/24/08 0:00	44.609	-68.831
10/16/08 0:00	43.818	-69.804
11/12/08 0:00	43.818	-69.804
5/5/09 0:00	43.818	-69.804
5/10/09 0:00	44.104	-68.989
5/10/09 0:00	44.382	-68.843
5/11/09 0:00	44.468	-68.792
5/15/09 0:00	44.667	-68.820
6/15/09 0:00	44.690	-68.827
7/17/09 0:00	44.667	-68.820
8/14/09 0:00	43.818	-69.804
9/22/09 0:00	43.818	-69.804
10/14/09 0:00	42.677	-70.565
5/15/10 0:00	44.690	-68.827

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Name: _____

Date: _____

Atlantic Sturgeon #46056 Tracking Data

Date	Latitude (N)	Longitude (W)
10/18/10 17:30:00	42.8182	-70.8126
11/18/10 10:09:07	42.8184	-70.7931
12/11/10 03:58:29	42.8184	-70.7931
05/10/11 02:45:47	43.8769	-69.7947
07/10/11 02:53:14	43.8769	-69.7947
08/10/11 00:06:32	44.0053	-69.8207
08/30/11 10:28:08	43.9080	-69.8023
08/31/11 11:12:23	43.8769	-69.7947
09/05/11 09:14:59	43.8769	-69.7947

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Name: _____

Date: _____

Atlantic Sturgeon #46059 Tracking Data

Date	Latitude (N)	Longitude (W)
10/13/10 14:00:00	42.8169	-70.8110
10/31/10 12:17:00	43.6625	-69.7833
11/03/10 16:50:00	43.6801	-69.7867
05/14/11 06:59:10	43.9080	-69.8023
06/25/11 20:27:34	44.0053	-69.8207
07/30/11 00:04:58	44.0053	-69.8207
08/30/11 00:02:53	44.0053	-69.8207
09/16/11 06:01:58	42.8184	-70.7931
09/26/11 03:02:56	42.8184	-70.7931

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Students Collaborating to Undertake Tracking Efforts for Sturgeon

Name: _____

Date: _____

Atlantic Sturgeon #46063 Tracking Data

Date	Latitude (N)	Longitude (W)
10/20/10 22:22:56	42.8175	-70.8201
11/20/10 02:27:06	42.8184	-70.7931
12/12/10 00:12:30	42.8184	-70.7931
04/23/11 03:49:00	43.9080	-69.8023
05/25/11 20:21:00	43.9080	-69.8023
06/13/11 00:02:00	44.0053	-69.8207
07/22/11 06:47:04	42.8184	-70.7931
08/22/11 20:14:29	42.8184	-70.7931
08/22/11 20:14:29	42.8184	-70.7931

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Name: _____

Date: _____

Atlantic Sturgeon #60220 Tracking Data

Date	Latitude (N)	Longitude (W)
8/14/09 14:09	41.188	-72.369
8/21/09 9:51	41.251	-72.385
9/21/09 17:37	41.248	-72.314
11/3/09 14:23	38.77667	-75.05917
1/25/10 0:53	35.074	-75.667
3/1/10 0:00	35.217	-75.525
4/26/10 13:00	38.486	-75.024
5/23/10 9:16	38.930	-74.856
6/28/10 7:05	41.251	-72.385
7/28/10 13:59	41.251	-72.385
4/30/11 16:03	38.324	-75.061
5/14/11 2:51	38.981	-75.127

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Students Collaborating to Undertake Tracking Efforts for Sturgeon

Name: _____

Date: _____

Atlantic Sturgeon #60218 Tracking Data

Date	Latitude (N)	Longitude (W)
8/18/09 23:17	41.188	-72.369
9/27/09 9:25	41.251	-72.385
2/21/10 10:03	35.159	-75.700
3/20/10 16:27	35.145	-75.695
5/22/10 2:27	38.777	-75.059
5/24/10 18:47	38.983	-74.770
7/5/10 5:17	41.251	-72.385
7/8/10 8:23	41.249	-72.363

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Students Collaborating to Undertake Tracking Efforts for Sturgeon

Name: _____

Date: _____

Atlantic Sturgeon #60216 Tracking Data

Date	Latitude (N)	Longitude (W)
8/26/09 7:21	41.251	-72.385
9/27/09 5:04	41.335	-72.359
1/28/10 8:59	35.173	-75.707
2/16/10 15:32	35.118	-75.682
3/8/10 14:14	35.103	-75.676
5/20/10 1:28	38.777	-75.059
5/21/10 3:08	38.908	-75.038
6/29/10 5:01	41.251	-72.385
7/29/10 8:28	41.335	-72.359
8/9/10 20:54	41.249	-72.363
4/23/11 2:05	38.565	-75.042
4/30/11 2:03	38.942	-75.013

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Name: _____

Date: _____

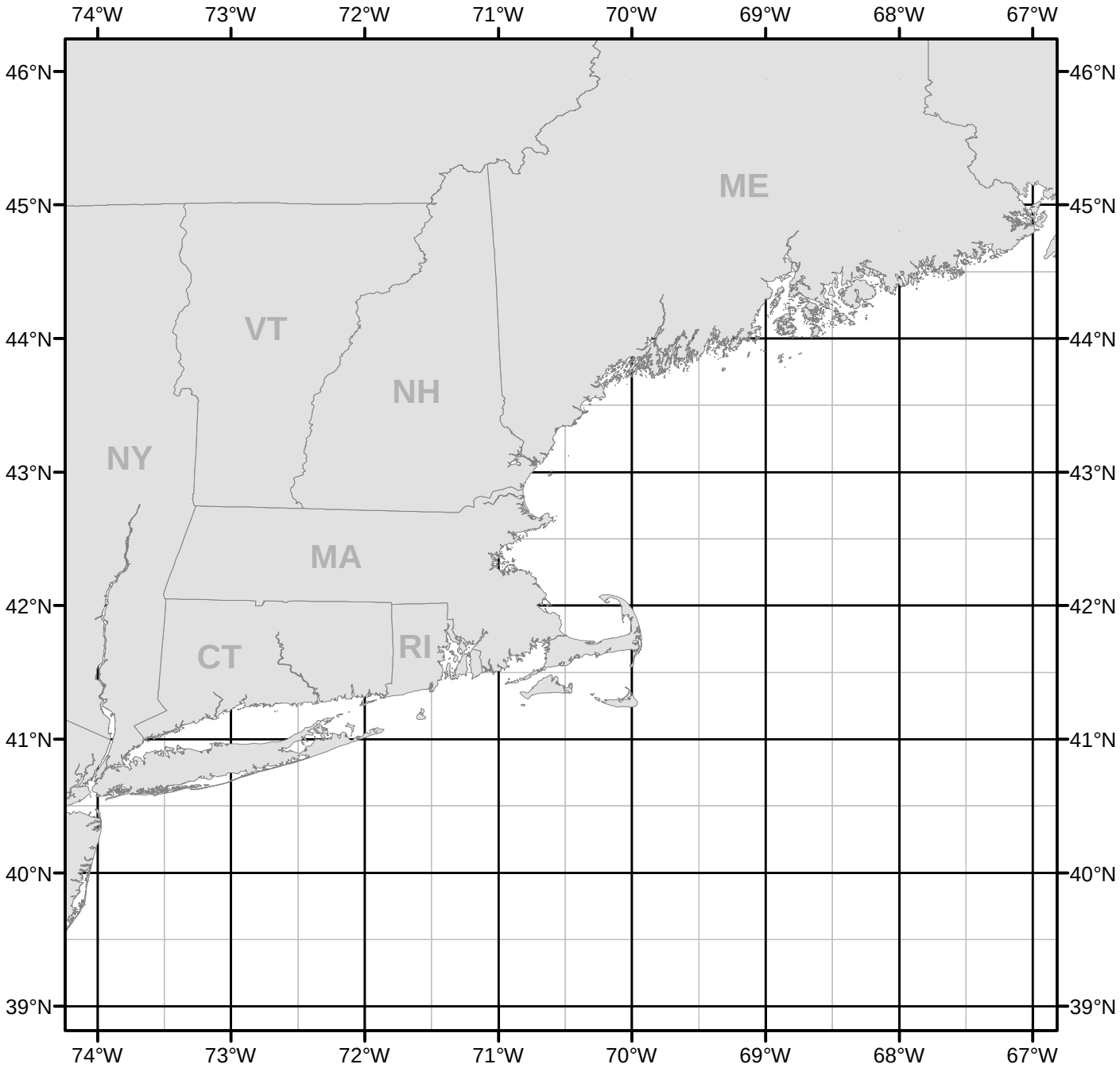
Atlantic Sturgeon #60217 Tracking Data

Date	Latitude (N)	Longitude (W)
08/11/09 13:15:00	42.8354	-70.9046
08/23/09 16:25:11	42.7641	-71.0344
09/22/09 10:35:31	42.8400	-70.9243
10/22/09 03:31:49	42.8175	-70.8201
05/02/10 07:01:00	41.2708	-72.3316
06/04/10 02:52:00	41.2495	-72.3651
07/04/10 22:59:00	41.2511	-72.3257
07/21/10 08:40:00	41.1380	-72.5560
08/20/10 00:38:00	41.2502	-72.3844
04/03/11 00:01:25	40.5710	-73.8041
04/24/11 16:12:38	40.5443	-73.8540

Name: _____

Date: _____

Title: _____



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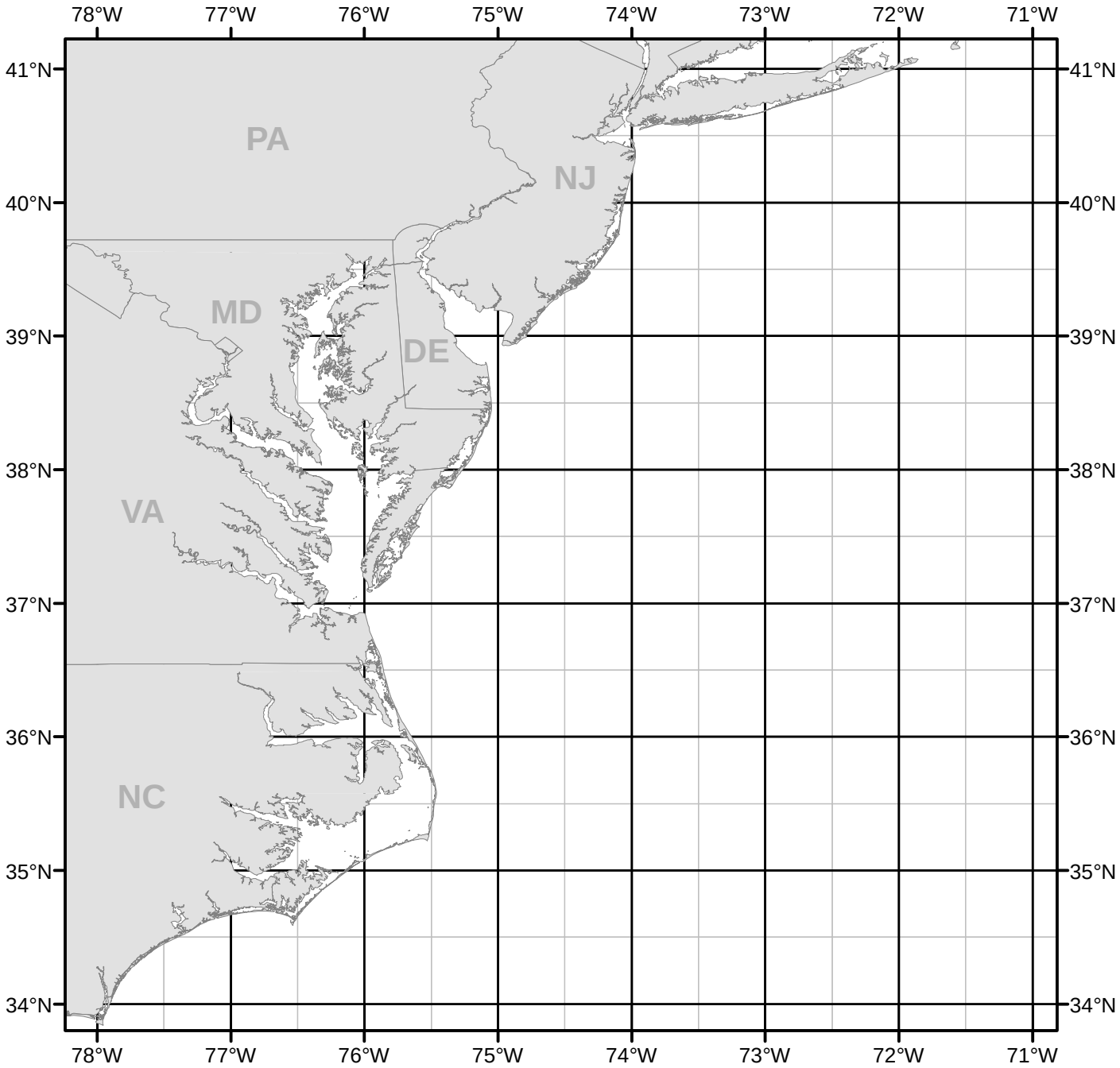

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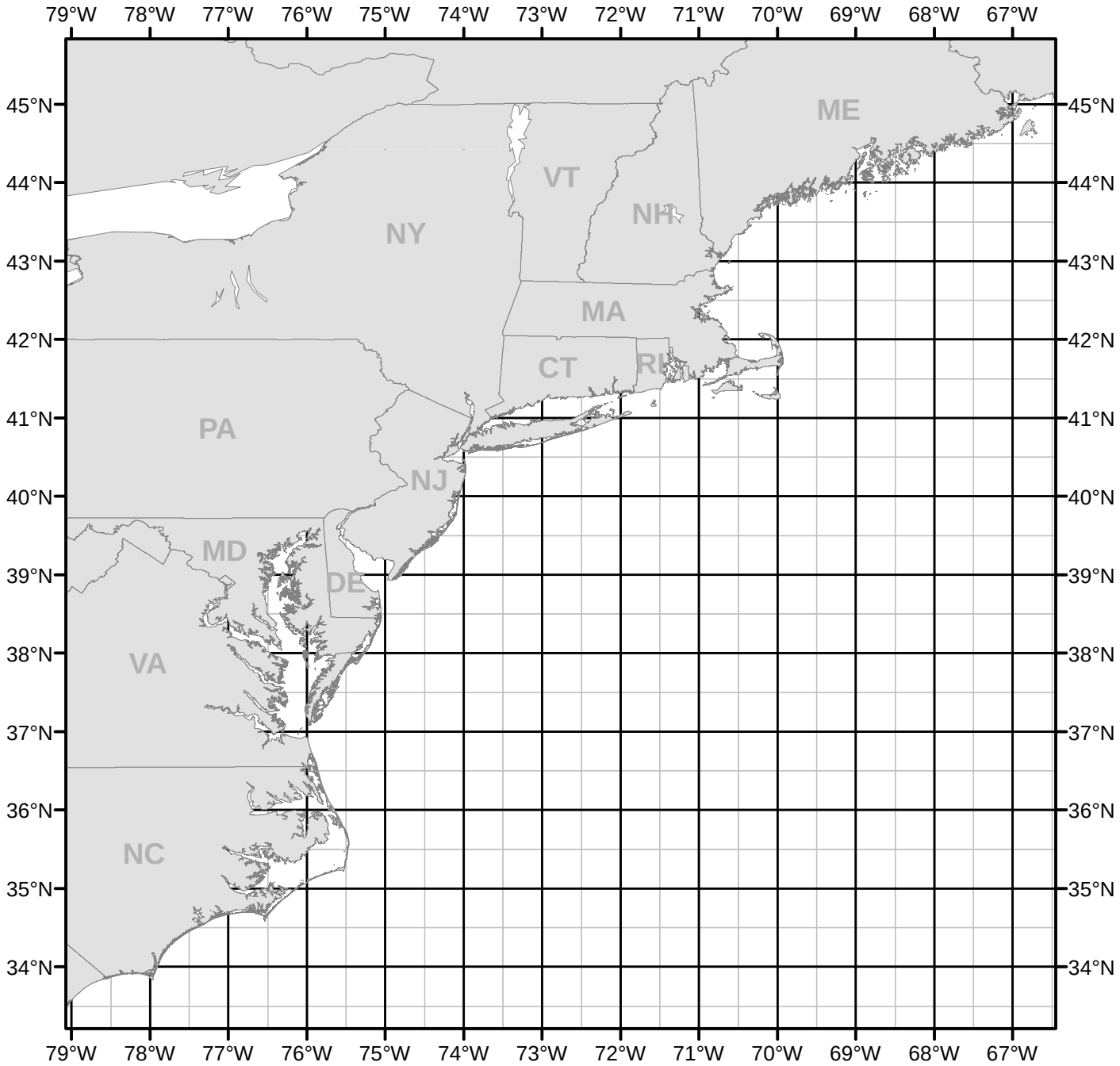

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Date: _____

Tracking Data Rubric

SCORE	DESCRIPTION
4	The map demonstrates a thorough understanding of plotting coordinates, effective use of mapping features, and clear presentation of the data.
3	The map demonstrates a general understanding of plotting coordinates, effective use of mapping features, and clear presentation of the data.
2	The map demonstrates a limited understanding of plotting coordinates, effective use of mapping features, and clear presentation of the data.
1	The map demonstrates a minimal understanding of plotting coordinates, effective use of mapping features, and clear presentation of the data.
0	The map is incorrect or contains some work that is irrelevant to the skills or concept being measured.

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Name: _____

Date: _____

Tracking Data Writing Prompt

Directions: After you have carefully reviewed your tracking data and that of your peers, please use the space below to write a thoughtful response to the following prompt. Please use specific examples to support your ideas and consult the scoring rubric to guide your thinking.

Describe the seasonal movements of Atlantic sturgeon as seen in the tracking data.

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Name: _____

Date: _____

Tracking Data Writing Prompt Rubric

SCORE	DESCRIPTION
4	The response demonstrates a thorough understanding of Atlantic sturgeon seasonal movements through the use of specific examples from the data.
3	The response demonstrates a general understanding of Atlantic sturgeon seasonal movements through the use of specific examples from the data.
2	The response demonstrates a limited understanding of Atlantic sturgeon seasonal movements through the use of specific examples from the data.
1	The response demonstrates a minimal understanding of Atlantic sturgeon seasonal movements through the use of specific examples from the data.
0	The response is incorrect or contains some work that is irrelevant to the skills or concept being measured.