

SITE SELECTION AND CERTIFICATION

North Central Regional Project • NC-141
Atmospheric Deposition

NATIONAL ATMOSPHERIC DEPOSITION PROGRAM

A research program sponsored by the
Association of State Agricultural Experiment Stations
of the North Central Region • NC-141



SITE SELECTION AND CERTIFICATION

Prepared by Site Selection Committee
Richard Semonin - Chairman
Herbert Volchok - Co-Chairman

1978

Site Selection and Certification

1. INTRODUCTION

A change in the chemical composition of precipitation is a good indicator of changes in atmospheric composition since precipitation is a very good scavenging agent of many atmospheric substances (both solid and gaseous). The nutrient status, growth, and development of plants on land and in surface waters are influenced by the availability of beneficial nutrient elements and the deposition of injurious substances dispersed in the atmosphere. Similarly, the health and reproductive capacity of domestic and wild animals, and fish populations are influenced by atmospheric constituents.

Previously, it was believed that most nutrient elements essential for the growth of plants were obtained after release from decomposing organic matter, weathering of soil minerals, or addition as fertilizers. It is now recognized that substances deposited in precipitation, and as dry particulate matter and aerosols significantly augment the supply of both essential elements and potentially injurious substances.

Since the amount of substances dispersed in the atmosphere and deposited in precipitation, particulate matter, and aerosols is projected to increase, there is an increasing need for careful measurement of the amounts, nature, and biological effects of these substances. Such measurements are essential for responsible management of the agricultural, forest lands, and aquatic ecosystems of the United States and Canada. A total of approximately 40

precipitation collection sites are planned to be established in the U.S., primarily in the eastern two-thirds of the nation, to provide observational data for topical research on precipitation chemistry.

2. SITE SELECTION

The collection sites for the Network will be selected to give accurate and representative information concerning the temporal and spatial variation of precipitation and dry particulate deposition of important chemical constituents. The location of individual sites will be chosen to represent major physiographic regions and major agricultural, aquatic, and forested areas within each cooperating state and region. It is important that local sources not bias a sample by locating it next to a point or line source of contamination not representative of the region. However, if a region is typified by a certain type of agricultural land use or is in a heavily industrialized region, the sampler should be located within this region to provide representation of such extensive pollution sources.

The sampler should be sited to conform as nearly as possible with the following criteria:

1. No moving sources of pollution, such as routine air, ground, or water traffic shall be within 100 meters of the site.
2. No surface storage of agricultural products, fuels, or other foreign materials shall be within 100 meters of the site.
3. No continuous sources of pollution shall be within 50 kilometers in the direction of the mean wind direction for the site, and 30 kilometers in all other directions.
4. Sampler shall be installed over undisturbed land, preferably grass covered with no objects within 5 meters of the sampler.

5. No object shall project onto the sampler with an angle greater than 30° from the horizontal. Give particular attention to overhead wires.

It may not be possible to meet all of the above criteria at individual sites. The questionnaire which is described in the following paragraphs will clarify the degree of departure from the desired site requirements.

2.1 Site Description Questionnaire

A site Description Questionnaire covering the important points to consider for either selecting a new site or evaluating an existing one has been formulated and attached. The following paragraphs discuss each topic covered in the questionnaire. All measurements should be reported in the metric system and directions in degrees from north or 16 points of the compass. Throughout the questionnaire when a distance is requested the distance from the collector should be inserted. If additional space is needed for extended remarks concerning local problems, please attach additional pages. This form should be completed for each active or potential site and returned to the NC-141 Director as soon as possible.

2.1.1 A. Site Identification

The station name should be descriptive and unique. Numbers for each site will be assigned later. The elevation should be that of a specific object at the site. The needs for the requested information are obvious. The mailing address should be clear to facilitate information and data transfer between the project administration, central analytical laboratory, and the field observing participants.

2.1.2 B. Logistics

These questions are very important for the continued operation of a quality site. While not necessary, it is also desirable to provide a simple hand drawn map showing the relative location of the site to roadways and the nearest electricity transmission lines.

2.1.3 C. Equipment on Hand

The rain gage is strongly recommended to provide concurrent measurement of precipitation. Specifically, the recording rain gage allows the added feature of determining precipitation rates needed to interpret the deposition observations. Similarly, a wind recorder will allow correlation between observed precipitation chemistry and wind speed and direction. The pH and conductivity meters are essential for preliminary assessment of the sample chemical quality.

2.1.4 D. Background Data

The climatology of the area, as interpreted for the local site, will be useful to ascertain the regional representativeness of the location. As records are accumulated, the site climatology will be continuously updated and compared with nearby long-term records to detect anomalous behavior.

2.1.5 E. Topography

Careful evaluation of these items will determine the sampling quality of the site. The surface grade should be reported in percent positive upward and negative downward in various directions from the sampler site. If available, soil analyses close to the site will be useful to characterize the site environment. The description of physical objects in proximity to the site will permit evaluation of potential sample contamination for wind-blown precipitation.

2.1.6 F. Civilization

The questions are designed to differentiate between ground, air, and water moving sources. Stationary source locations are required to ascertain their potential influence on precipitation quality. Unusual or intermittent sources such as quarry operations, stockpiles of coal, farm wastes, and similar materials should be recognized as potential sources of contamination under high wind conditions.

3. GENERAL SITE REQUIREMENTS

The sites will be evaluated on the basis of available knowledge of wind trajectories, sources of substances in the atmosphere, prevalent forms of deposition, frequency of precipitation events (rain, snow, hail, and dust storms), and other meteorological and atmospheric processes that influence the deposition of substances in each state or region. Of critical importance at the local scale is the proximity of the collector to obstacles (disturbances to airflow around the collector opening) and consideration of land-development in future years. Since it is many times not possible to predict future land-use change, consideration should be given to alternate sites in the event that the original selection is no longer representative of the region. The collection stations should be sited, whenever possible, in the proximity to locations where research on either water resources, management, quality, or distribution is ongoing. Such judicious placement of collectors will allow additional use of the Network data by those with a direct need for the information.

3.1 Site Classification and Certification

Each site will be initially classified and certified as promptly as possible, based upon the information in the questionnaire and, if necessary, a site visit. A final certification will be made after a year or more of routine operation of each site.

Classification will be at four levels:

Class A

1. Required wet/dry collector and weighing rain gauge on site.
2. Acceptable pH and conductivity instruments on site.
3. All logistical, topographical and local source criteria are satisfactory.
4. Recording wind speed and direction instruments on site.

Class B

The same as Class A, but lacking wind instruments.

Class C

The same as Class A, but unsatisfactory (or uncertain) of logistical, topographical or local source criteria.

Class D

The same as Class A, but lacking wind instruments and also unsatisfactory (or uncertain) of logistical, topographical or local source criteria.

4. FIELD OBSERVER INSTRUCTIONS

A manual is provided for each observer to establish uniform procedures for sample handling and reporting. It is anticipated that revisions will be necessitated by field experience and will be issued periodically. The Instructions are prepared in such a way that numbered revisions can be easily inserted to keep the manual current at all times.

EXAMPLE

NC-141 SITE DESCRIPTION QUESTIONNAIRE

U. S. Dept. of Energy - Environmental Measurements Lab

Agency, Organization or Institution

A. SITE IDENTIFICATION

1. Station Chester 2. County Morris 3. State N.J.
4. Latitude 40 ° 47 ' 5. Longitude 74 ° 40 ' 6. Elevation 262 (m)
7. Name of Supervisory Official Dr. Herber L. Volchok
- Alternate Mr. Donald Freeswick
8. Mailing Address 376 Hudson St., New York, NY 10014
(number -- street) (city -- state) (zip code)
9. Phone 212 / 620-3619, 3607 / 1660 -- 3619, 3607
(commercial) (FTS)
-
-

B. LOGISTICS

- summer: X Good, _____ Fair, _____ Poor?
1. Is road access to proposed site in _____ and _____
winter: _____ Good, X Fair, _____ Poor?
2. Type of road surface? Dirt - gravel with tar filler
3. How far from the road will collector be sited? 90 (m)
4. How close can a vehicle approach the collector? 90 (m)
5. What electrical power is available on site? 120/240 (Volts) 200 (Amps)
- If none, how soon will it be provided? N/A
(date)
6. Is there adequate security against vandalism, etc? X (Yes) _____ (No)
7. Are there any special logistical problems? Please describe: None
-
-

C. EQUIPMENT ON HAND

1. Raingage: None Recording X Non-Recording _____
Weighing X Tipping Bucket _____ Other _____
Opening 20.3 (cm) Manufacturer Belfort Model 5-780
Distance 2.4 (m)
2. Wind: None _____ Speed X Direction X Distance 15 (m)
Recording X Non-Recording _____ Manufacturer Weathermeasure
Model Skyvane II Height above ground 10 (m)
3. pH Meter: None _____ Manufacturer Orion Model 801
4. Conductivity Meter: None _____ Manufacturer Barnstead
Model PM-70CB
5. Available Lab Space: None _____ Good X Fair _____ Poor _____
Distance 60 (km)
6. Other related equipment (please list): Temperature, dewpoint, pressure,
nephelometry and various air pollutant sensors.

=====

D. BACKGROUND DATA

1. Precipitation at the site:
Yes X Years 1 1/2 yr Annual Precipitation 1308 mm
No _____ Nearest gage _____ (km) Years _____
Annual rain _____ (mm) Annual snow _____ (cm)
 2. Wind at site: Yes X No _____ Years 1 1/2 Distance to
nearest measurement _____ (km)
(Please attach wind rose if available.)
 3. If air quality or precipitation chemistry data available at or near the site, please describe:
Air -- NO_x, SO_x, visibility, mass, solar radiation, ozone & radiation.
Precip - trace metals, major anions & cations, & radioactivity.
- _____

E. TOPOGRAPHY

1. Ground slope at site: Direction from sampler SE Amount +/- -12 %
2. Soil type: within 10 m of site ?, within 1 km ?
% Cultivated _____, % Orchard _____, % Lawn _____
% Pasture 100, % Forest _____, % Other _____
within 1/4 section containing site.

(Please attach standard soil analysis if available.)

3. Tall objects in area:

A. Trees Oak, elm, maple, apple Max. Height 10 (m)
Species

Distance 80 (m) Direction S

B. Buildings Trailer Height 3.5 (m)
Type

Use: Instrumentation Distance 10 Direction SE

C. Other (e.g., overhead wires, masts, etc.)

(1) Object Meteorological tower, Height 10 (m)

Direction N, Distance 8 (m)

(2) Object Telephone pole, Height 12 (m)

Direction SW, Distance 25 (m)

(3) Object _____, Height _____ (m)

Direction _____, Distance _____ (m)

F. CIVILIZATION

1. Large highways (expressways): Distance 8 (km) (m) Route # 10
Direction from sampler NE.
2. Other paved roads: Distance 175 (km) (m) Direction from sampler NW
traffic: Heavy _____, Medium _____, Light X.
3. Unpaved road: Distance 90 (km) (m) Direction from sampler SE
traffic: Heavy _____, Medium _____, Light _____.
4. Parking lot: Distance 1 (km) (m) Direction from sampler SW
Unpaved _____ Surface material Macadam Use: continuous X
intermittent _____ car volume 20 large truck volume 2
5. Lake/river or rail traffic: Distance ? (km, m) Direction from sampler _____
barge _____, lake steamer _____, ocean vessels _____, rail _____,
traffic: Heavy _____, Medium _____, Light _____.
6. Airport (~~✗~~): Distance 5 (km) (m) Direction from sampler N
traffic: Heavy _____, Medium _____, Light X.
7. Stationary sources:
Power plant(s): Distance Not known (km) Direction from sampler _____ Fuel _____
Electrical capacity _____ (KW_e, MW_e)
Light industry: Distance _____ (km) Direction from sampler _____ Product _____
Heavy industry: Distance _____ (km) Direction from sampler _____ Product _____
8. Other sources: Significant agricultural operations: Distance _____ (km, m)
Direction from sampler _____ Other (please describe) Dairy farm

Distance 1.1 (km) (m) Direction from sampler SW.

G. OTHER

It would be very useful for the Site Selection and Certification Subcommittee to have one or more of the following submitted with the questionnaire.

1. Topographic map, 1:24,000, revision year 1970 not available _____
2. Topographic map, 1:250,000, revision year _____ not available _____
3. Aerial photograph, 1:1200, year _____ not available _____
4. Photos of the site in the 8 directions.

The site and items noted in Section F should be indicated on the figures.