# 3.0 Evaluation of Long-Term Sampling Locations

Records reviewed for this report (see Section 2.0, "Historical Records") revealed that the locations of 16 of 21 soil sampling sites listed in the original 1979 locations manual (Blummer 1979) are identical to those in use today. The Taylor Flats #1 location was sampled only from 1978 through 1982 when the access road was closed due to a landslide. Therefore, 20 of the 21 locations are discussed in this section. Of those 20 sampling locations, specific sampling sites at the Wye Barricade and Byers Landing were relocated a short distance from their original locations. In addition, two locations, 200 ESE and Benton City (see discussion under Section 2.2, "Sampling Locations"), apparently were moved a short distance before the 1979 locations manual was published. Previous reviews of soil sampling results (Price 1988; Poston et al. 1995) revealed that 9 of the 21 sampling locations listed in the 1979 locations manual were established in 1971, the first year of sampling, and that most of the 21 locations were sampled nearly continuously from the time they were established until 1994, the last year of sampling. Thus, much of the data for soil samples recorded in the PNNL data base are for 20 of the 21 sampling locations listed in the 1979 locations manual. Together, these long-term sampling locations provide a continuous record of radionuclides measured in soil collected from the Hanford environs. Figure 3.1 shows the locations of the 20 long-term sampling locations. Appendix B lists analytical results for the 20 long-term sampling locations and two supplemental locations. The results shown for each sampling location represent all data in the PNNL computer data base for strontium-90, cesium-137, plutonium, plutonium-238, and plutonium-239,240 for the years 1971 through 1994, the last year of sampling.

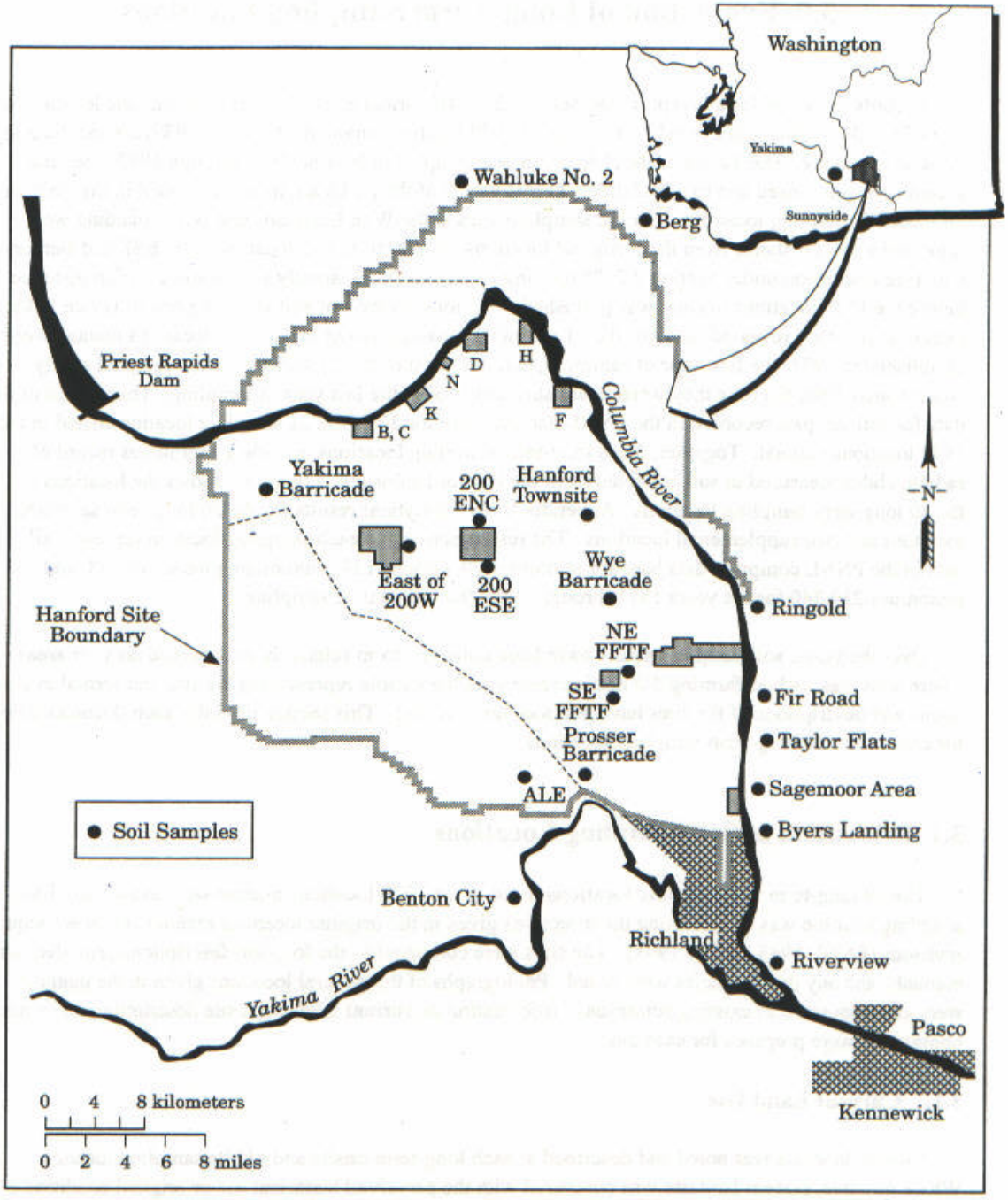
Over the years, soil samples usually have been collected from relatively undisturbed areas or areas where activities such as farming did not interfere with the sample representing the site, but formal evaluations and descriptions of the sites have not been documented. This section provides such documentation for each of the 20 long-term sampling locations.

## 3.1 Evaluation of Soil Sampling Locations

The 20 long-term soil sampling locations listed in the 1979 locations manual were evaluated. Each sampling location was visited using the directions given in the original locations manual and in subsequent revisions (PNNL 1983; PNNL 1991). The sites were compared to the location descriptions provided in the manuals, and any discrepancies were noted. Photographs of the general locations given in the manuals were also compared to existing conditions. Information on current land use, a site description, and a new photograph were prepared for each site.

### 3.1.1 Current Land Use

Current land use was noted and described at each long-term onsite and offsite sampling location. Where possible, current land use was compared with the perceived historical use or original condition of the land at the time the sampling site was established. Historical use was estimated by evaluating the


Washington
Yakima
Sunnyside
Wahluke No. 2
Berg
Priest Rapids Dam
D
H
N
K
B, C
F
Columbia River
Yakima Barricade
200 ENC
Hanford Townsite
East of 200W
200 ESE
Wye Barricade
Ringold
Hanford Site Boundary
NE FFTF
SE FFTF
Fir Road
Taylor Flats
Prosser Barricade
ALE
Sagemoor Area
Byers Landing
Soil Samples
Benton City
Richland
Riverview
Yakima River
Pasco
Kennewick
N
0 4 8 kilometers
0 2 4 6 8 miles
S9402063.92aa

degree of soil surface disturbance, the amount of use by livestock, and the type of vegetation present. A close-up photograph of the soil surface was taken where a definite soil crust of lichens and mosses was observed. The absence of manure and the presence of a soil crust were interpreted as indications of the absence of livestock use or other surface disturbances for a relatively long period of time. The presence of mature shrubs was interpreted as indicating the absence of intensive agricultural use, such as plowing, for a relatively long period of time.

### 3.1.2 Sampling Site Descriptions

A list of plant species growing in the vicinity of the sampling site was prepared for each location. The list was not comprehensive, but rather indicative of the dominant species present. Other site conditions were noted such as topography, the degree (percent) of plant canopy cover over the land surface, indications of current or past livestock use, evidence of recent wildfire, and other noteworthy conditions. Historically, soil samples have been collected from areas between shrubs. When shrubs were present at the sampling site, the percent plant cover was estimated for areas between shrubs. When shrubs were absent, the percent plant cover was estimated for the site in general. The percent cover of plant shoots within a 0.5 meter by 1.0 meter plot frame (divided into 50 equal squares for convenience of estimating) was recorded. The plot frame was used to estimate plant cover representing two extreme conditions at each soil sampling location; i.e., areas with the greatest plant cover and areas of least plant cover. Photographs were taken of the plot frame in each position.

## 3.2 Field Records for Each Soil Sampling Location

Eleven onsite and nine offsite long-term soil sampling locations listed in locations manuals and used almost continuously use since 1971, or the year of establishment, were visited from late June to early July 1996. Transcribed field records for each location are summarized in the following sections. Field records included a general description of each site location, a general description of the site, a description of current land use, and a list of dominant plant species. A summary of the sampling history for each site is also provided. The EMA number of the location and the Global Positioning System (GPS) reading obtained at each site on September 16 and 17, 1996, are included as part of the field records. The GPS data are also tabulated separately in Appendix C.

The name used for each sampling site is that given in the first (1979) version of the locations manual. Names used in later versions of the locations manual and other documents (e.g., annual reports) are noted as a.k.a. The order in which the locations are listed is the order given in the original locations manual.

### 3.2.1 Onsite Sampling Locations

**1. Wahluke Slope No. 2 (a.k.a. Wahluke Slope)**

Grant County, EMA Location No. 6007
GPS: X Position = 565674; Y Position = 156293

Until publication of the 1991 locations manual, this site was listed as an onsite location. The site is located near the intersection of State Highway 24 and Mattawa Road just outside the northwestern boundary of the Hanford Site. The site is on private land adjacent to the Wahluke Slope air sampling station and is marked with an "Environmental Sampling Location" sign. The specific soil sampling site is in an open field approximately 50 feet south of the sign. The name Wahluke No. 1 was never used, but a location called Wahluke Slope Opposite 100-N was sampled from 1971 through 1974.

***General Site Description*** The sampling site is located within a sagebrush-hopsage/cheatgrass habitat near an irrigated field. The general topography is flat with micro-scale mounding creating ridges and swales. Large sagebrush plants are present with no evidence of recent wildfire. The soil is probably sandy loam. The soil surface shows a well developed crust of mosses and lichens.

***Current Land Use*** The site has been used for livestock grazing in the past, but it is currently idle. The land probably has never been plowed as evidenced by the presence of large shrubs and ridge and swale micro-topography. The present condition of the site is probably similar to that in 1971 when the site was established.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1971 through 1993, except 1991 and 1992. In 1971 and 1972, samples were also collected from the 1-2 inch layer of soil.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| | spiny hopsage (*Grayia spinosa*) |
| | green rabbitbrush (*Chrysothamnus viscidiflorus*) |
| Forbs: | Jim Hill's tumblemustard (*Sisymbrium altissimum*) |
| Grasses: | cheatgrass (*Bromus tectorum*) |
| | Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover (ridges): | 40% -- cheatgrass |
| | 20% -- Sandberg's bluegrass |
| | 40% -- exposed ground with moss and lichen crust |
| Least plant cover (swales): | 30% -- Sandberg's bluegrass |
| | 70% -- exposed ground with moss and lichen crust |
| | Trace amount of cheatgrass present |

## 2. Yakima Barricade

Benton County, EMA Location No. 6016
GPS: X Position = 559280; Y Position = 138657

The site is located adjacent (just north) of the Yakima Barricade entrance to the Hanford Site at the intersection of Hanford Highway Route 11A and State Highway 240. The site is marked with an "Environmental Sampling Location" sign. The specific soil sampling site is about 50 feet northeast of the air sampling station near the sign.

***General Site Description*** The site is located in a sagebrush-hopsage/cheatgrass habitat. The general topography is level with some micro-scale mounding associated with shrubs. The soil is probably loamy sand. There is no sign of recent wildfire, and the presence of many large shrubs indicates that the site has not burned after 1971. Small rodent diggings are present. The soil surface in open areas is partially crusted with mosses and lichens and shows some cracking.

***Current Land Use*** The site is idle and has not been used for agricultural production since the Hanford Site was established in the 1940s. The land probably has never been plowed because of the soil mounding associated with shrubs. The present condition of the site is probably similar to that in 1971 when sampling began.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1971 through 1993, except 1986, 1990, and 1992. In 1971 and 1972, samples were also collected from the 1-2 inch layer of soil.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| | spiny hopsage (*Grayia spinosa*) |
| Grasses: | cheatgrass (*Bromus tectorum*) |
| | bottlebrush squirreltail (*Sitanion hystrix*) |
| | Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 100% -- cheatgrass |
| Least plant cover: | 5% -- cheatgrass |
| | 30% -- exposed ground with moss and lichen crust |
| | 65% -- bare ground |

### 3. East of 200 West Area (a.k.a. E of 200-W Gate)

Benton County, EMA Location No. 6276
GPS: X Position = 568447; Y Position = 136137

The site is located across the road (Hanford Highway Route 3) and just north of the east entrance to the 200-West Area (old 200 West main gate). The site is marked with an "Environmental Sampling Location" sign. The specific soil sampling site is a few feet east of the sign.

***General Site Description*** The sampling site is located within a sagebrush/cheatgrass habitat. The general topography is flat. Mature sagebrush plants are present with no evidence of recent wildfire. The soil is probably sand. The soil surface in open areas is only slightly crusted with mosses and lichens.

***Current Land Use*** The site is idle and has not been used for agricultural production since the Hanford Site was established. The land probably has never been plowed because it is only marginally suitable for dryland farming, and irrigation water was not available. The area may have been disturbed during construction activities at the 200-West Area. The present condition of the site is probably similar to that in 1975 when sampling began.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1975 through 1994, except 1992. As part of a special study, samples were collected in one-inch increments from the surface to a depth of 12 inches (Price 1991).

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| | green rabbitbrush (*Chrysothamnus viscidiflorus*) |
| Forbs: | Russian thistle (*Salsola kali*) |
| | Jim Hill's tumblemustard (*Sisymbrium altissimum*) |
| Grasses | cheatgrass (*Bromus tectorum*) |
| | Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 100% -- cheatgrass |
| | trace of Jim Hill's tumblemustard |
| Least plant cover: | 40% -- cheatgrass |
| | 5% -- Sandberg's bluegrass |

10% -- exposed ground with moss and lichen crust
45% -- bare ground

**4. 200 ENC (200 East, North Central)**

Benton County, EMA Location No. 6362
GPS: X Position = 573714; Y Position = 137817

The 200 ENC site is located about 200 feet north of the 200-East Area perimeter fence across from the intersection of 12th St. and Baltimore Ave. The 200 ENC air sampling station is located on the inside of the perimeter fence at the same intersection. The soil sampling site is marked with an "Environmental Sampling Location" sign. The specific sampling site is a few feet north of the sign.

***General Site Description*** The sampling site is located within a sagebrush/Sandberg bluegrass-cheatgrass habitat. The general topography is flat. Widely spaced sagebrush plants are present with no evidence of recent wildfire. The soil is probably loamy sand. Some of the soil surface in open areas is crusted with mosses and lichens.

***Current Land Use*** The site is idle and has not been used for agricultural production since the Hanford Site was established. The land probably has never been plowed because it is only marginally suitable for dryland farming, and irrigation water was not available. The area may have been disturbed during construction activities at the 200 East Area. The present condition of the site is probably similar to that in 1977 when the site was established.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1977 through 1994, except 1990 and 1992.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| Forbs: | Russian thistle (*Salsola kali*) |
| | Carey's balsamroot (*Balsamorhiza careyana*) |
| | yellow salsify (*Tragopogon dubius*) |
| Grasses: | cheatgrass (*Bromus tectorum*) |
| | Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 80% -- cheatgrass |
| | 20% -- Sandberg's bluegrass |

Least plant cover: 80% -- Sandberg's bluegrass
20% -- exposed ground with moss and lichen crust

**5. 200 ESE (200 East, Southeast; a.k.a. 200 East Hill, Control Plot #61, and 200 East Air Sampling Station)**

Benton County, EMA Location No. 6022
GPS: X Position = 576315; Y Position = 134592

The soil sampling site is located near the 200 ESE air sampling station at the top of the 200 East hill on Hanford Highway Route 4 South and about 0.5 mile east of the southeast corner of the 200-East Area. The soil collection site is marked with an "Environmental Sampling Location" sign. The specific soil sampling site is about 50 feet west of the sign and some 200 feet west of a cement block building near the current 200 ESE air sampling station.

***General Site Description*** The sampling site is located within a sagebrush/needle-and-thread grass-cheatgrass habitat. The general topography is rolling, consisting of stabilized sand dunes. Some sagebrush plants show scaring by recent wildfire. The soil is probably sand. Some of the soil surface is crusted with mosses and lichens in well vegetated areas, but most of the surface is bare soil in open areas.

***Current Land Use*** The site is currently idle but is near an abandoned army antiaircraft gun emplacement. The area may have been disturbed during construction and operation of the army encampment in the 1940s and 1950s. The site has not been used for agricultural production since the Hanford Site was established and probably has never been plowed because of the sandy nature of the soil and the lack of irrigation water. The present condition of the site is probably similar to that in the mid-1970s when routine soil sampling began.

***Sampling History*** The EMA number for this site was used to identify samples collected from the 0-1 inch layer of surface soil each year from 1971 through 1994, except 1990 and 1992. In 1971 and 1972, samples were also collected from the 1-2 inch layer of soil. In 1973, additional samples were collected from the 1-2 inch, 2-4 inch, 4-8 inch, and 8-12 inch layers of soil. However, as noted in Section 2.2.3 of this report, the original sampling site for this EMA number was located at the bottom of the 200 East hill, near a telephone line crossing over Highway 4 South, about 2.25 miles east of the PUREX plant stack. The sampling site apparently was moved to the present location in the mid-1970s.

***Predominant Plant Species Present***

Shrubs: big sagebrush (*Artemisia tridentata*)
green rabbitbrush (*Chrysothamnus viscidiflorus*)

| | |
|---|---|
| Forbs: | yarrow (*Achillea millefolium*)<br>turpentine springparsley (*Cymopteris terebinthinus*) |
| Grasses: | needle-and-thread grass (*Stipa comata*)<br>indian ricegrass (*Oryzopsis hymenoides*)<br>cheatgrass (*Bromus tectorum*)<br>Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 60% -- Sandberg's bluegrass<br>10% -- needle-and-thread grass<br>25% -- exposed ground with moss and lichen crust<br>5% -- bare ground |
| Least plant cover: | 20% -- needle-and-thread grass<br>80% -- bare ground |

**6. Hanford Townsite**

Benton County, EMA Location No. 6017
GPS: X Position = 584226; Y Position = 139807

The Hanford Townsite soil sampling site is located on the west side of Hanford Highway Route 2 North about 0.7 mile north of the intersection with Hanford Highway Route 11A. The soil collection site is marked with an "Environmental Sampling Location" sign about 80 yards west of Hanford Highway Route 2 North. The specific soil sampling site is within the general vicinity of the sign.

***General Site Description*** The sampling site is located within a sagebrush/cheatgrass habitat. The general topography is gently undulating, but shows signs of being highly disturbed, probably during the time of major construction at Hanford and of housing for workers at Camp Hanford located just east of Hanford Highway Route 2 North. Before the Hanford Project, the general area was the site of the old town of Hanford and agricultural production. Mature sagebrush plants are present and do not show scaring by wildfire. The soil is probably loamy sand, but areas with surface gravel are present, probably spread from various kinds of historical construction activities. The development of a soil surface crust of mosses and lichens is mostly absent.

***Current Land Use*** The site is currently idle but obviously associated with historical activities at Camp Hanford. The area may have been used for farmland before 1942 because of the nearby location of abandoned irrigated fields. However, the present condition of the site is probably similar to that in 1971 when routine soil sampling began.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1971 through 1993, except 1974, 1986, 1990, and 1992. In 1971 and 1972, samples were also collected from the 1-2 inch layer of soil.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| Forbs: | yellow starthistle (*Centaurea solstitialis*)<br>Jim Hill's tumblemustard (*Sisymbrium altissimum*)<br>yellow salsify (*Tragopogon dubius*) |
| Grasses: | sand dropseed (*Sporobolus cryptandrus*)<br>cheatgrass (*Bromus tectorum*)<br>Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 80% -- cheatgrass<br>10% -- Sandberg's bluegrass<br>10% -- sand dropseed |
| Least plant cover: | 100% -- cheatgrass (short stems) |

**7. SE FFTF (Southeast of the Fast Flux Test Facility; a.k.a. Southeast Side of FFTF, SE Side of FFTF, and 400-S)**

Benton County, EMA Location No. 6277
GPS: X Position = 587939; Y Position = 122656

The soil sampling site southeast of FFTF is located near the southeast corner of the 400 Area and east of the 400 Area 30-meter-high meteorology tower. The site is marked with an "Environmental Sampling Location" sign about 100 feet south of the 400 Area perimeter road. The specific soil sampling site is within the general vicinity of the sign.

***General Site Description*** The general area of the sampling site is within a sagebrush/bitterbrush-cheatgrass habitat. The topography is rolling with stabilized sand dunes. The tops of the stabilized dunes tend to have blow-out areas with little or no vegetation. There are no large shrubs within the sampling site due to a wildfire that burned the area in the mid-1980s. The soil is probably sand. Some soil surface in vegetated areas is crusted with mosses and lichens.

***Current Land Use*** The site is currently idle and has not been used for agricultural production since the Hanford Site was established. The site has never been plowed because of the sandy nature of the

soil, the presence of sand dunes, and the absence of irrigation water. The present condition of the site is probably similar to that in 1975 except for fire damage to the vegetation and perhaps drifting sand near wind blow-out areas.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at SE FFTF site each year from 1975 through 1994, except 1976, 1987, 1990, and 1992. FFTF Control Plot 62 (a.k.a. FFTF CP 62; EMA No. 6015) was established to collect soil samples during the construction phase at the FFTF. Samples were collected from the 0-1 inch layer of surface soil from 1971 through 1974, and from the 1-2 inch layer in 1971 and 1972. FFTF Control Plot 62 was located between the current SE FFTF and NE FFTF sampling locations. Because of their proximity, results from samples collected at the three FFTF locations are considered equivalent. Results for FFTF Control Plot 62 are included in Appendix B.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | none present |
| Forbs: | hoary aster (*Machaeranthera canescens*) |
| | bur ragweed (*Ambrosia acanthicarpa*) |
| | jagged chickweed (*Holosteum umbellatum*) |
| | turpentine springparsley (*Cymopteris terebinthinus*) |
| | pale evening primrose (*Oenothera pallida*) |
| Grasses: | cheatgrass (*Bromus tectorum*) |
| | Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 85% -- cheatgrass |
| | 5% -- Sandberg's bluegrass |
| | 10% -- exposed ground with moss and lichen crust |
| Least plant cover: | 5% -- pale evening primrose |
| | 95% -- bare ground |

**8. NE FFTF (Northeast of the Fast Flux Test Facility; a.k.a. Northeast Side of FFTF, 0.5 mi NE FFTF, and 400-E)**

Benton County, EMA Location No. 6282
GPS: X Position = 587936; Y Position = 123337

The soil sampling site is located northeast of FFTF opposite the east fence of the 400 Area and several hundred yards northeast of the old visitors center building. The site is marked with an

"Environmental Sampling Location" sign and is near a 10-meter-high meteorology tower. The specific soil sampling site is the general area east of the sign.

***General Site Description*** The site is very similar to the SE FFTF site. The general area is a sagebrush/bitterbrush-cheatgrass habitat with rolling topography associated with stabilized sand dunes. The tops of the stabilized dunes tend to have blow-out areas with little or no vegetation. There are no living shrubs within the sampling area due to a wildfire that burned the area in the mid-1980s. Burned stumps of sagebrush, bitterbrush, and rabbitbrush are present. The soil is probably sand. Some of the soil surface in vegetated areas is crusted with mosses and lichens.

***Current Land Use*** The site is currently idle and has not been used for agricultural production since the Hanford Site was established. The site has never been plowed because of the sandy nature of the soil, the presence of sand dunes, and the absence of irrigation water. The present condition of the site is probably similar to that in 1975 when the site was established except for fire damage to the vegetation and perhaps wind-blown sand. The site is physically closer to the FFTF facility than the SE FFTF sampling location, but probably was not disturbed extensively by construction activities.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1975 through 1994, except 1986, 1990, and 1992. (See comments under Sampling History for SE FFTF regarding soil sampling at FFTF Control Plot 62, EMA No 6015.)

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | none present |
| Forbs: | hoary aster (*Machaeranthera canescens*)<br>bur ragweed (*Ambrosia acanthicarpa*)<br>Russian thistle (*Salsola kali*) |
| Grasses: | cheatgrass (*Bromus tectorum*)<br>Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 70% -- Sandberg's bluegrass<br>5% -- cheatgrass<br>20% -- exposed ground with moss and lichen crust<br>5% -- bare ground |
| Least plant cover: | 20% -- mixture of cheatgrass, Sandberg's bluegrass, hoary aster, bur ragweed<br>80% -- bare ground |

**9. Wye Barricade**

Benton County, EMA Location No. 6016
GPS: X Position = 585106; Y Position = 128238

The site is located east of the Wye Barricade at the junction of Hanford Highway Route 4 South, Hanford Highway Route 2 South, and Hanford Highway Route 10. The soil sampling site, air sampling station, and 10-meter-high meteorology tower were moved to the present location from the west side of the highway in the late 1980s when the roads were relocated and the guard house replaced. The old and current sites are very similar in vegetation, topography, and historical use. The current soil sampling site is near a 10-meter-high meteorology tower and marked with an "Environmental Sampling Location" sign. The specific sampling site is within the general vicinity (south and east) of the sign.

***General Site Description*** The site is located in a bitterbrush-sagebrush/cheatgrass habitat. The general topography of the site is undulating with stabilized sand dunes. The soil at the sampling site is sand or loamy sand. No living shrubs are present, but there are charred remains from a wildfire that burned through the area in the mid-1980s. Ant hills are prominent. The soil surface is not crusted with mosses and lichens.

***Current Land Use*** The site is idle and has not been used for agricultural production since the Hanford Site was established. The land probably has never been plowed because of the sandy nature of the soil and the lack of irrigation water. The present condition of the site is probably similar to the original site established across the highway in 1971 except for the absence of shrubs due to wildfire.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site (i.e., EMA number) each year from 1971 through 1993, except 1974, 1975, 1976, 1986, 1990, and 1992. In 1971 and 1972 samples were also collected from the 1-2 inch layer of soil. As noted earlier, the sampling site was relocated from across the highway in the late 1980s, but the EMA number was retained.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | none present (charred stems of big sagebrush) |
| Forbs: | dune scurfpea (*Psoralea lancelolata*) |
| | jagged chickweed (*Holosteum umbellatum*) |
| | pale evening primrose (*Oenothera pallida*) |
| | bur ragweed (*Ambrosia acanthicarpa*) |
| | matted cryptantha (*Cryptantha circumscissa*) |
| | Russian thistle (*Salsola kali*) |

Grasses: cheatgrass (*Bromus tectorum*)
Sandberg's bluegrass (*Poa sandbergii*)

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

Greatest plant cover: 95% -- cheatgrass
5% -- Sandberg's bluegrass

Least plant cover: 5% -- cheatgrass and jagged chickweed
95% -- bare ground

**10. Prosser Barricade**

Benton County, EMA Location No. 6225
GPS: X Position = 583681; Y Position = 118275

The sampling site is located on the west side of Hanford Highway Route 10 across from the "Restricted Government Area" signboard and the air sampling station at the old Prosser Barricade where Route 10 exits the southern boundary of the Hanford Site to State Highway 240. The soil sampling site is located about 100 yards west of the highway and is marked with an "Environmental Sampling Location" sign. The specific sampling site is within the general vicinity (west) of the sign on a gentle east-facing slope.

***General Site Description*** The site is located in a bitterbrush-sagebrush/cheatgrass habitat. The general topography of the site is undulating with stabilized sand dunes. The soil at the sampling site is probably sand. No living shrubs are present, but charred remains of antelope bitterbrush indicate the general area was recently burned. Living gray rabbitbrush and young antelope bitterbrush shrubs are present in the vicinity. The exposed soil surface is crusted with mosses and lichens.

***Current Land Use*** The site is idle and has not been used for agricultural production since the Hanford Site was established. The land probably has never been plowed because of the sandy soil and the lack of irrigation water. The present condition of the site is probably similar to the original site established in 1974 except for the absence of shrubs due to a wildfire that occurred in the mid-1980s.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1974 through 1993, except 1976, 1987, 1990, 1991, and 1992.

***Predominant Plant Species Present***

Shrubs: snow buckwheat (*Eriogonum niveum*) (charred stems of antelope bitterbrush)

Forbs: Russian thistle (*Salsola kali*)

Grasses: cheatgrass (*Bromus tectorum*)
Sandberg's bluegrass (*Poa sandbergii*)

***Plant Cover Between Shrubs (0.5 m² Plot)***

Greatest plant cover: 50% -- cheatgrass
50% -- Sandberg's bluegrass

Least plant cover: 50% -- Sandberg's bluegrass
5% -- Russian thistle (seedlings)
45% -- exposed ground with moss and lichen crust

**11. ALE (Arid Land Ecology Reserve; a.k.a ALE Field Lab and East of Arid Land Ecology Lab)**

Benton County, EMA Location No. 6278
GPS: X Position = 574657; Y Position = 118316

The sampling site is located on the Fitzner/Eberhardt Arid Land Ecology Reserve near the intersection of the paved road, leading to the Emergency Relocation Center (ERC), and the ALE field laboratory buildings with the dirt 1200-foot road. The soil sampling site is located about 50 yards west of the intersection, and is marked with an "Environmental Sampling Location" sign. The specific sampling site is within the general vicinity south (slightly upslope) of the sign.

***General Site Description*** The site is located in a sagebrush/bluebunch wheatgrass habitat. The general topography of the site is flat with a slight north-facing aspect. The soil at the sampling site is probably silt loam. No living shrubs are present on the sampling site because the area was recently burned, but a few young sagebrush plants are present nearby. The exposed soil surface is well crusted with mosses and lichens.

***Current Land Use*** The site is idle and has not been used for agricultural production since the Hanford Site was established except for stray cattle and possibly some sheep grazing. The ALE Reserve was established in the mid-1960s when sheep grazing was discontinued, and the entire ALE Reserve was fenced to exclude stray livestock. No livestock grazing has occurred since the soil sampling site was established in 1975. The land has never been plowed. The present condition of the site is probably similar to that in 1975 except for damage by wildfire in the mid-1980s.

***Sampling History*** Samples were collected from the 0-1 inch layer each year from 1975 through 1993, except 1986, 1990, 1991, and 1992. This general location was originally sampled from 1971 through 1974 at the ERC (EMA No. 6001) about 0.25 mile south of the current ALE sampling site. Samples were collected from the 0-1 inch layer of surface soil and also from the 1-2 inch layer in 1971 and 1972. Because of their proximity, results from samples collected at both locations are considered equivalent. Results for the ERC location are included in Appendix B.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | none present (except for charred stems of sagebrush) |
| Forbs: | velvet lupine (*Lupinus leucophyllus*)<br>Carey's balsamroot (*Balsamorhiza careyana*)<br>hoary aster (*Machaeranthera canescens*)<br>Cusick's sunflower (*Helianthus cusickii*)<br>yellow salsify (*Tragopogon dubius*)<br>slender hawksbeard (*Crepis atrabarba*)<br>Jim Hill's tumblemustard (*Sisymbrium altissimum*)<br>threadleaf fleabane (*Erigeron filifolius*) |
| Grasses: | bluebunch wheatgrass (*Agropyron spicatum* a.k.a. *Pseudoroegneria spicata*)<br>needle-and-thread grass (*Stipa comata*)<br>bottlebrush squirreltail (*Sitanion hystrix*)<br>cheatgrass (*Bromus tectorum*)<br>Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 75% -- cheatgrass<br>25% -- lupine |
| Least plant cover: | 30% -- needle-and-thread grass<br>25% -- Sandberg's bluegrass<br>15% -- lupine<br>15% -- salsify<br>5% -- cheatgrass<br>10% -- exposed ground with moss and lichen crust |

### 3.2.2 Offsite Sampling Locations

**1. Benton City**

Benton County, EMA Location No. 6000
GPS: X Position = 577989; Y Position = 111904

The site is located 4.8 miles southwest of State Highway 240 on Horn Road, State Highway 240. It is near the old southern boundary of the Hanford Site on the west side of Horn Road and north of Benton City. The soil sampling site is located on a ridge about 150 yards west of the highway and is marked with an "Environmental Sampling Location" sign. The specific sampling site is within the general vicinity of the sign.

***General Site Description*** The site is located in a sagebrush/bluegrass-cheatgrass habitat. The general topography of the site is an east-facing slope with knolls. The soil at the sampling site is probably silt loam. Some living sagebrush are present on the sampling site but the area shows signs of wildfire having occurred sometime in the past. Exposed soil surfaces are covered with a crust of mosses and lichens to the extent that soil erosion is not evident despite the rather steep topography.

***Current Land Use*** The site probably was located near or within the original Hanford Site boundary, but the area has been managed by Washington State Department of Game as a public hunting area since the early 1970s when the southern boundary of the Hanford Site was relocated. The area has not been used for significant cattle or sheep grazing since the soil sampling site was established. The land has never been plowed because of the steep terrain. The present condition of the site is probably similar to that present when sampling began except for damage from wildfire that probably occurred in the mid-1980s.

***Sampling History*** Samples identified with the EMA number for this location were collected from the 0-1 inch layer of surface soil each year from 1971 through 1993, except 1975, 1976, 1990, 1991, and 1992. In 1971 and 1972 samples were also collected from the 1-2 inch layer of soil. As noted in Section 2.2.3, the original sampling site for this location may have been at the PUD electrical distribution substation on the outskirts (north) of Benton City. It may have been relocated to the present site in the mid-1970s.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| Forbs: | hoary aster (*Machaeranthera canescens*)<br>Jim Hill's tumblemustard (*Sisymbrium altissimum*)<br>threadleaf fleabane (*Erigeron filifolius*) |
| Grasses: | cheatgrass (*Bromus tectorum*)<br>Sandberg's bluegrass (*Poa sandbergii*)<br>indian ricegrass (*Oryzopsis hymenoides*)<br>slender sixweeks fescue (*Festuca octoflora* a.k.a. *Vulpia octoflora*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 100% -- cheatgrass |
| Least plant cover: | 50% -- cheatgrass<br>10% -- slender sixweeks fescue<br>40% -- exposed ground with moss and lichen crust |

## 2. Sunnyside

Yakima County, EMA Location No. 6357
GPS: X Position = 542335; Y Position = 118579

The sampling site is located northeast of the town of Sunnyside on the east side of Hanford Road, Highway 241, two miles north of the intersection with Independence Road. The soil sampling site is located in an open field across the road (east) from the only farmhouse in the area. The site is on private property and not marked with an "Environmental Sampling Location" sign. The specific sampling site is several hundred feet east of the highway in an open field (across a fence) near an electric power pole.

***General Site Description*** The site is located in a sagebrush/bluebunch wheatgrass-cheatgrass habitat. The general topography of the site is flat with a gentle south-facing slope. The soil at the sampling site is probably silt loam. No living sagebrush is present on the sampling site, but it does occur nearby. Exposed soil surface is crusted with mosses and lichens.

***Current Land Use*** The area is lightly grazed as evidenced by a few weathered cow chips. However, the site is not overgrazed because of the presence of a soil crust on most exposed soil surfaces. The site probably has been used for livestock grazing since it was established in 1977. The land probably has never been plowed because of the lack of irrigation water and a marginal climate for dryland grain production. The present condition of the site is probably similar to that in 1977 when the site was established.

***Sampling History*** The Sunnyside sampling location was established in 1977 and has been sampled each year through 1993. Samples were collected from the 0-1 inch layer of surface soil. As part of a special study in 1988, samples were collected in 1-inch increments from the surface to a depth of 12 inches (Price 1991).

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | none present |
| Forbs: | hoary aster (*Machaeranthera canescens*)<br>jagged chickweed (*Holosteum umbellatum*)<br>longleaf phlox (*Phlox longifolia*) |
| Grasses: | bluebunch wheatgrass (*Agropyron spicatum* a.k.a. *Pseudoroegneria spicata*)<br>cheatgrass (*Bromus tectorum*)<br>Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 90% -- cheatgrass<br>10% -- jagged chickweed |
| Least plant cover: | 60% -- bluebunch wheatgrass<br>15% -- Sandberg's bluegrass<br>5% -- jagged chickweed<br>10% -- exposed ground with moss and lichen crust<br>10% -- bare ground |

**3. Harris Farm (a.k.a. Riverview-Harris Farm)**

Franklin County, EMA Location No. 6361
GPS: X Position = 596658; Y Position = 104928

The location was established in 1977 a few hundred yards west of the out-buildings at the Harris Farm on the north side of Court Street near the intersection with Road 100 in the Riverview district of Pasco. The location was changed from Riverview - Control Plot 55 to coincide with samples of produce, meat, and milk obtained from the Harris Farm. The current soil sampling site is in an open field near the Columbia River and irrigated farming on private property. The site is not marked with an "Environmental Sampling Location" sign. The specific sampling site is within the general area west of a dirt road that runs along a row of trees that is part of the Harris Farm.

***General Site Description*** The site is located in a bitterbrush-sagebrush/cheatgrass habitat although neither antelope bitterbrush nor big sagebrush are present at the specific sampling site; these shrubs do occur nearby. The general topography of the site is undulating with medium-sized, stabilized sand dunes present. The soil at the sampling site is probably sand. A small amount of the exposed soil surface is crusted with mosses and lichens.

***Current Land Use*** This open field is currently idle but was grazed sometime in the past. The site has not been grazed extensively in recent time because of the slight development of a moss and lichen crust on the soil surface especially beneath the canopy of rabbitbrush shrubs. The land probably has never been plowed because the sand dunes would have been leveled. The present condition of the site is probably similar to that in 1977 when the site was established.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at the Harris Farm site each year from 1977 through 1994, except 1990. A sampling site known as Riverview - Control Plot 55 was established in 1971 at the intersection of Taylor Flats Road and Road 68 in Pasco, Washington, several miles northeast of the Harris Farm. The Riverview - Control Plot 55 site was sampled from 1971 through 1974, but is not considered supplementary or equivalent to the Harris Farm site because of the distance separating the two sites.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | gray rabbitbrush (*Chrysothamnus nauseosus*)<br>green rabbitbrush (*Chrysothamnus viscidiflorus*) |
| Forbs: | dune scurfpea (*Psoralea lanceolata*)<br>jagged chickweed (*Holosteum umbellatum*)<br>pale eveningprimrose (*Oenothera pallida*)<br>Winged dock (*Rumex venosus*) |
| Grasses: | cheatgrass (*Bromus tectorum*)<br>Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 90% -- cheatgrass<br>5% -- jagged chickweed<br>5% -- exposed bare ground |
| Least plant cover: | 10% -- green rabbitbrush<br>5% -- cheatgrass<br>5% -- pale eveningprimrose<br>75% -- bare ground<br>5% -- exposed ground with moss and lichen crust |

**4. Byers Landing**

Franklin County, EMA Location No. 6011
GPS: X Position = 596616; Y Position = 114789

The sampling site is located adjacent to an irrigated field about 0.6 mile east of County Road 68 near the Byers Landing air sampling station. The soil sampling site is located on private property in an open field about 0.1 mile beyond (east) of the Byers Landing air sampling station. The site is on the east side of the second dirt road that makes a sharp left turn (north) away from the Esquatzel Waste Way (irrigation water return canal). The site is not marked with an "Environmental Sampling Location" sign. The specific sampling site is near an electric power pole about 100 feet north of the sharp left turn and about 100 feet east of the dirt road. The site was moved about 0.1 mile east of the original sampling location in 1992, which is now under cultivation.

***General Site Description*** The site is located in a sagebrush/cheatgrass habitat. The general topography of the site is undulating, and the soil is probably sand or loamy sand. Some exposed soil surface is crusted with mosses and lichens. Irrigated fields and canals are nearby.

***Current Land Use*** This field is currently idle but undoubtedly has been used for limited grazing. However, the site has not been grazed extensively in recent times because of the absence of manure and the presence of a moss and lichen crust on some of the soil surface. The land has not been plowed since the site was established because of the presence of large sagebrush plants. The present condition of the site is probably similar to that in 1971 at the original sampling site.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at the Byers Landing location each year from 1971 through 1994, except 1975. In 1971 and 1972 samples were also collected from the 1-2 inch layer of soil. As noted above, the original sampling site for this location was across the road from the Byers Landing air sampling station about 0.1 mile west of the current site. Samples collected from either site are considered equivalent.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| | green rabbitbrush (*Chrysothamnus viscidiflorus*) |
| Forbs: | Jim Hill's tumblemustard (*Sisymbrium altissimum*) |
| | tarweed-fiddleneck (*Amsinckia lycopsoides*) |
| | indian wheat (*Plantago patagonica*) |
| | Carey's balsamroot (*Balsamorhiza careyana*) |
| | prickley pear cactus (*Opuntia spp.*) |
| Grasses: | cheatgrass (*Bromus tectorum*) |
| | indian ricegrass (*Oryzopsis hymenoides*) |
| | Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 100% -- cheatgrass |
| Least plant cover: | 20% -- cheatgrass |
| | 75% -- bare ground |
| | 5% -- exposed ground with moss and lichen crust |

**5. Sagemoor (a.k.a. Sagemore Farm)**

Franklin County, EMA Location No. 6358
GPS: X Position = 596524; Y Position = 116256

The sampling site is located in a small field among irrigated orchards and vineyards just off of County Road 68 across from the main entrance to Sagemoor Farms. The soil sampling site is located on private property in a fenced field several hundred feet south of County Road 68. The site is not

marked with an "Environmental Sampling Location" sign. The specific sampling site is about 100 feet past a wire gate across a dirt road that follows a row of Lombardy poplar trees forming a windbreak adjacent to an apple orchard.

***General Site Description*** The site is located in a sagebrush/cheatgrass habitat. The general topography of the site is west sloping, and the soil is probably sand. The field is highly disturbed from recent livestock grazing. The exposed soil surface is not crusted with mosses and lichens.

***Current Land Use*** This field is currently in an over-grazed condition from use by cattle and horses. The soil surface is trampled, and much fresh manure is present. The land has not been plowed since 1977 as evidenced by the presence of large sagebrush shrubs. The present condition of the site compared to 1977 is unknown. The field probably has always been used for livestock grazing, but may be used more intensively now than in the past.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1977 through 1994.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| | gray rabbitbrush (*Chrysothamnus nauseosus*) |
| Forbs: | Russian thistle (*Salsola kali*) |
| | yarrow (*Achillea millefolium*) |
| | puncture vine (*Tribulus terrestris*) |
| Grasses: | cheatgrass (*Bromus tectorum*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 90% -- cheatgrass |
| | 10% -- bare ground |
| Least plant cover: | 95% -- trampled bare ground |
| | 3% -- Russian thistle (immature plants) |
| | 2% -- puncture vine |

**6. Fir Road (a.k.a. W end of Fir Road)**

Franklin County, EMA Location No. 6360
GPS: X Position = 595986; Y Position = 124268

The sampling site is located in an open field among irrigated vineyards near the west end of Fir Road. The soil sampling site is located on private property on the south side of the road in the vicinity of the Fir Road air sampling station. The site is not marked with an "Environmental Sampling Location" sign. The specific sampling site is about 100 feet south of the air sampling station.

***General Site Description*** The site is located in a sagebrush/cheatgrass habitat on a west-facing slope overlooking the Columbia River. The soil is probably loamy sand. The field has not been used for grazing for many years because of the presence of a well-developed crust of mosses and lichens on a stable soil surface. However, cheatgrass is prevalent indicating severe disturbance at some time in the past.

***Current Land Use*** This field is currently idle. The land probably has never been plowed because of the presence of large-sagebrush plants. The land is suitable for a vineyard or orchard. The present condition of the site is probably similar to that in 1977 when the site was established for soil sampling.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1977 through 1993, except 1990, 1991, and 1992.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| | green rabbitbrush (*Chrysothamnus viscidiflorus*) |
| Forbs: | slender hawksbeard (*Crepis atrabarba*) |
| | yarrow (*Achillea millefolium*) |
| | snow buckwheat (*Eriogonum niveum*) |
| Grasses: | cheatgrass (*Bromus tectorum*) |
| | Sandberg's bluegrass (*Poa sandbergii*) |
| | needle-and-thread grass (*Stipa comata*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

Greatest plant cover: 100% -- cheatgrass

| | |
|---|---|
| Least plant cover | 80% -- Sandberg's bluegrass<br>20% -- exposed ground with moss and lichen crust |

**7. Taylor Flats No. 2**

Franklin County, EMA Location No. 6421
GPS: X Position = 595595; Y Position = 120949

This soil sampling site is now part of a private residence. The dirt entrance road, as shown in the locations manuals, was recently developed into a driveway leading to a house. The original soil sampling site was located at the base of the hillside about 0.2 mile east of the river road extension of Fir Road, but the location is uncertain because the general area is currently well used. The site was not marked with an "Environmental Sampling Location" sign. The entrance road is about 2.1 miles south of the end of Fir Road, but was originally described as 2.6 miles north of the end of the pavement on the river road extension of County Road 68 (at Sagemoor Farms). Landslides blocked the river road extension of Road 68 in 1983.

If sampling is resumed at this location, the specific sampling site should be moved to a similar field about 0.1 mile north. This site is located on private property east and upslope from the river road extension of Fir Road. The sampling site is near the top of a steep driveway, which is about 2 miles south of the end of Fir Road (hence, 0.1 mile north of the dirt road to the original site). The specific sampling site should be located about 200 yards south and upslope of the house at the top of a driveway. The GPS data given above are for this proposed sampling site.

***General Description of the Proposed Site*** The proposed site is located in an abandoned field within a sagebrush/cheatgrass habitat on a west facing slope overlooking the Columbia River. The soil is probably loamy sand. The field has been used for livestock grazing in the past and probably was plowed sometime before 1978. There is only a slight development of a crust of mosses and lichens on the soil surface. Sagebrush bushes are present in the general area but not on the sampling site. A few wild alfalfa plants are growing nearby.

***Current Land Use at the Proposed Site*** This field is currently idle, but the area is suitable for irrigated agriculture and may be developed before long. Land nearby (north and east) currently is being prepared for either a vineyard or an orchard. The present condition of this site is probably similar to that present at the original site when it was established for soil sampling in 1978.

***Sampling History at the Original Site*** Samples were collected from the 0-1 inch layer of surface soil at the original site each year from 1978 through 1993, except 1991 and 1992.

***Predominant Plant Species Present at the Propose Site***

| | |
|---|---|
| Shrubs: | none present |
| Forbs: | yellow salsify (*Tragopogon dubius*)<br>prickly lettuce (*Lactuca serriola*)<br>alfalfa (*Medicago sativa*) |
| Grasses: | cheatgrass (*Bromus tectorum*)<br>Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 100% -- cheatgrass |
| Least plant cover | 90% -- cheatgrass<br>8% -- Sandberg's bluegrass<br>2% -- exposed ground with moss and lichen crust |

**8. Ringold (Ringold Area)**

Franklin County, EMA Location No. 6009
GPS: X Position = 595847; Y Position = 129571

The site is located south of the Ringold fish hatchery in a field on the east side of the river road near the gateway sign to Ringold Ranch. The soil sampling site is located on private property and is not marked with an "Environmental Sampling Location" sign. The specific sampling site is located about 50 feet east of the unpaved river road.

***General Site Description*** The site is located on idle benchland at the base of a steep bluff across the road from an orchard. Groundwater seepage from irrigation at the top of the bluff is collected in a ditch at the base of the bluff and along the east edge of the sampling area. The ditch is vegetated with peachleaf willow, Russian olive, cattail, and Canadian thistle. The site has been used for stump and brush disposal but is mostly a sagebrush/cheatgrass habitat. The soil is probably loamy sand. The general area probably has been grazed sometime in the past before the orchard was developed, but currently it is too small to be used for grazing. Alfalfa plants are present, but the seeds could have been spread by birds from an adjacent field or the entire area could have been an alfalfa field before the dirt road was established. It is doubtful that the field has been plowed recently because of the presence of large sagebrush bushes. There is a slight crust of mosses and lichens on the soil surface.

***Current Land Use*** This field is currently idle and not suitable (too small) for agricultural development. The present condition of the site is probably similar to that in 1971 when the site was established for soil sampling except perhaps for the presence of groundwater seepage from on top of the bluff.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1971 through 1994, except 1974. Samples were also collected from the 1-2 inch layer of soil in 1971 and 1972.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| | gray rabbitbrush (*Chrysothamnus nauseosus*) |
| Forbs: | alfalfa (*Medicago sativa*) |
| | yellow salsify (*Tragopogon dubius*) |
| | snow buckwheat (*Eriogonum niveum*) |
| | Cusick's sunflower (*Helianthus cusickii*) |
| | Carey's balsamroot (*Balsamorhiza careyana*) |
| Grasses: | cheatgrass (*Bromus tectorum*) |
| | Sandberg's bluegrass (*Poa sandbergii*) |
| | wheatgrass (*Agropyron spp.*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 95% -- cheatgrass |
| | 5% -- Sandberg's bluegrass |
| Least plant cover: | 85% -- cheatgrass |
| | 5% -- Sandberg's bluegrass |
| | 10% -- exposed ground with some moss and lichen crust |

**9. Berg Ranch**

Franklin County, EMA Location No. 6421
GPS: X Position = 588293; Y Position = 156850

The sampling site is located in a field north of State Highway 24 and off the Hanford Site (near the eastern boundary). The soil sampling site is located on private property outside of a fenced exclusion area where the Berg Ranch air sampling station was located. The site is marked with an "Environmental Sampling Location" sign, and the specific sampling site is located about 50 yards west of the sign.

***General Site Description*** The site is located on grazing land within a sagebrush/cheatgrass habitat and on a gentle south-facing slope. The soil is probably loamy sand. The field has been used extensively for grazing. The land apparently has never been plowed. Any developing crust of mosses and lichens on the soil surface is mostly destroyed by grazing animals. Large and broken-down sagebrush bushes are present and the soil surface is trampled.

***Current Land Use*** This field is currently in use for cattle grazing, as noted by the presence of fresh manure, and is in an overgrazed condition. Because of extensive animal disturbance, the present condition of the soil surface may not be the same as it was in 1971 when the sampling site was established.

***Sampling History*** Samples were collected from the 0-1 inch layer of surface soil at this site each year from 1971 through 1993, except 1991 and 1992. In 1971 and 1972 samples were also collected from the 1-2 inch layer of soil.

***Predominant Plant Species Present***

| | |
|---|---|
| Shrubs: | big sagebrush (*Artemisia tridentata*) |
| Forbs: | none present |
| Grasses: | cheatgrass (*Bromus tectorum*)<br>Sandberg's bluegrass (*Poa sandbergii*) |

***Plant Cover Between Shrubs (0.5 $m^2$ Plot)***

| | |
|---|---|
| Greatest plant cover: | 50% -- Sandberg's bluegrass<br>50% -- bare ground |
| Least plant cover: | 99% -- exposed ground with manure piles<br>1% -- Sandberg's bluegrass |