

1 Nitrogen inputs are higher with greater water infiltration. Soil surface stability is related to cyanobacterial
2 biomass as well as total moss and lichen cover (Belnap et al. 2001). The lichen and mosses of the
3 Hanford Site were surveyed and evaluated by Link et al. (2000). They found 29 soil lichens in 19 genera
4 and 6 moss species in 4 genera. Twelve (41 percent) lichen species are of the crustose growth form (flat
5 and firmly attached to the substrate), eight (28 percent) are squamulose (having small, flat scales that do
6 not adhere tightly to substrate), seven (24 percent) are foliose (having leaf-like lobes, attached in the
7 center to substrate by clusters of rhizomes) and two (7 percent) are fruticose (plant-like growth attached at
8 one point).
9

10 **4.6.6 Biodiversity**

11
12 The Hanford Site is located within the Columbia Basin Ecoregion, an area that historically included
13 over 6 million ha (14.8 million acres) of steppe and shrub-steppe vegetation across most of central and
14 southeastern Washington State, as well as portions of north-central Oregon. The pre-settlement
15 vegetation consisted primarily of shrubs, perennial bunchgrasses, and a variety of forbs. An estimated
16 60 percent of shrub-steppe in Washington has been converted to agriculture or other uses. Much of what
17 remains is in small parcels, in shallow rocky soils, or has been degraded by historic land uses (mostly
18 livestock grazing) (TNC 1999).
19

20 The Hanford Site retains some of the largest remaining blocks of relatively undisturbed shrub-steppe
21 in the Columbia Basin Ecoregion. Hanford's importance as a refuge for the shrub-steppe ecosystem is
22 not solely size-related, however. The presence of a high diversity of physical features and examples of
23 rare, undeveloped deep and sandy soil has led to a corresponding diversity of plant and animal commu-
24 nities. Many places on the Hanford Site are relatively free of non-native species and are extensive enough
25 to retain characteristic populations of shrub-steppe plants and animals that are absent or scarce in other
26 areas. Because of its location, the Site provides important connectivity with other undeveloped portions
27 of the ecoregion.
28

29 **4.7 Cultural, Archaeological, and Historical Resources**

30
31 The Hanford vicinity is one of the most culturally rich resource areas in the western Columbia
32 Plateau. The site comprises a series of cultural landscapes containing the cumulative record of multiple
33 occupations by Native and non-Native Americans. These landscapes contain numerous well-preserved
34 archaeological sites representing prehistoric, ethnographic, and historic periods. Period resources include
35 sites with cultural materials that are thousands of years old, traditional cultural places, and buildings and
36 structures from the pre-Hanford, Manhattan Project, and Cold War eras. The National Historic
37 Preservation Act (16 USC 470), the Native American Graves Protection and Repatriation Act (25 USC
38 3001), the Archaeological Resources Protection Act, and the DOE American Indian Policy (DOE 2000b),
39 among other legislation and guidelines, require the identification and protection of areas and resources of
40 concern to the Native American community (see Sections 6.13 and 6.14).
41

4.7.1 Native American Cultural Resources and Archaeological Resources

Traditional Native American religion is manifest in the earth, the water, the sky, and all animate or inanimate beings that inhabit a given location. In prehistoric and early historic times, Native Americans of various tribal affiliations populated the Hanford Reach of the Columbia River. The Wanapum and the Chamnapum dwelt along the Columbia River from south of Richland upstream to Vantage (Relander 1956; Spier 1936). Some of their descendants (Wanapum) still live nearby at Priest Rapids; others live on the Yakama and Umatilla Reservations. Palus people, who lived on the lower Snake River, joined the Wanapum and Chamnapum to fish the Hanford Reach of the Columbia River and some inhabited the east bank of the river (Relander 1956; Trafzer and Scheuerman 1986). Many descendants of the Palus now live on the Colville Reservation. The Nez Perce, Yakama, Walla Walla, and Umatilla, and other Native American peoples also periodically visited to fish in the area. Traditional uses of the Hanford Site included fishing, hunting, and gathering roots and medicinal plants. The area was also used as a wintering ground. Descendants of these people retain traditional secular and religious ties to the region and many have knowledge of the ceremonies and life ways of their ancestral culture.

The Hanford Reach and the greater Hanford Site, geographic centers for regional Native American religious belief, are central to the practice of Indian religion of the region, and many believe the creator made the first people here (DOI 1994). Indian religious leaders began their teachings here, including Smoholla, a prophet of Priest Rapids who brought the Washani religion to the Wanapum and others during the late nineteenth century. Native plant and animal foods, some of which can be found on the Hanford Site, are used in the ceremonies performed by tribal members. Certain landforms, especially Rattlesnake Mountain, Gable Mountain, Gable Butte, and various sites along and including the Columbia River, remain sacred to them. Aesthetic and scenic resources are discussed in Section 4.8.10. The Gable Mountain Block Survey conducted by tribal members in 2000, recorded important attributes that contribute to the significance of Gable Mountain to Native Americans (Poston et al. 2001). Native American traditional cultural places within the Hanford Site include, but are not limited to, a wide variety of places and landscapes: archaeological sites, cemeteries, trails and pathways, campsites and villages, fisheries, hunting grounds, plant-gathering areas, holy lands, landmarks, important places in Indian history and culture, places of persistence and resistance, and landscapes of the heart (Bard 1997). Traditional cultural places of importance to Native Americans are determined through methods that are mutually agreed upon by DOE and the Native American community.

Native Americans have lived in and around the present-day Hanford Site for thousands of years (Relander 1956; Spier 1936; Sturtevant and Walker 1998). When Euro-Americans arrived in the 1800s, peoples presently referred to as the Wanapum inhabited villages and fishing camps. Neighboring groups known today as the Yakama, Umatilla, Cayuse, Walla Walla, Palus, Nez Perce, and Middle Columbia Salish frequented the area to trade, gather resources, and conduct other activities. Many descendants of these tribes are affiliated with the Wanapum, Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, or the Confederated Tribes of the Colville Reservation, and they retain traditional, cultural, and religious ties to Hanford's places and resources. (See Section 6.14 for further information on the treaties associated with the Hanford Site). This record of Native American use and history is reflected in the archaeological sites and traditional cultural places that are located across the Hanford Site.

1 People have inhabited the Middle Columbia River region since the end of the glacial period. More
2 than 8000 years of prehistoric human activity in this largely arid environment have left extensive
3 archaeological deposits along the river shores (Chatters 1989; Leonhardy and Rice 1970). Well-watered
4 areas inland from the river also show evidence of concentrated human activity (Chatters 1982, 1989;
5 Daugherty 1952; Leonhardy and Rice 1970; Neitzel 2002a), and recent surveys have indicated extensive,
6 although dispersed, use of arid lowlands for hunting. Throughout most of the region, hydroelectric
7 development, agricultural activities, and domestic and industrial construction have destroyed or covered
8 the majority of these deposits. Amateur artifact collectors have had an immeasurable impact on what
9 remains at numerous sites. However, by virtue of their inclusion in the Hanford Site from which the
10 public is restricted, archaeological deposits found in the Hanford Reach of the Columbia River and on
11 adjacent plateaus and mountains largely have not been destroyed.

12
13 Archaeological sites and isolated finds totaling 439 associated with the prehistoric period have been
14 recorded on the site; of these, approximately 68 contain historic components as well. Prehistoric period
15 sites common to the Hanford Site include remains of numerous pit house villages, various types of open
16 campsites, spirit quest monuments (rock cairns), hunting camps, game drive complexes, and quarries in
17 nearby mountains and rocky bluffs (Rice 1968a, b; Neitzel 2002a); hunting/kill sites in lowland stabilized
18 dunes; and small temporary camps near perennial sources of water located away from the river
19 (Rice 1968b).

20
21 Many recorded sites were found during four archaeological reconnaissance projects conducted
22 between 1926 and 1968 (Krieger 1928; Rice 1968a,b). Much of this early archaeological survey and
23 reconnaissance activity concentrated on islands and on a strip of land about 400 m (1300 ft) wide on
24 either side of the river (Neitzel 2001). Reconnaissance of selected locations conducted through the mid-
25 1980s, as well as systematic archaeological surveys conducted from the middle 1980s through 1996,
26 added to the recorded site inventories, (Chatters 1989; Chatters and Cadoret 1990; Chatters and Gard
27 1992; Chatters et al. 1990, 1991, 1992; Last et al. 1994; Andrefsky et al. 1996).

28
29 During his reconnaissance of the Hanford Site in 1968, Rice (1968b) inspected portions of Gable
30 Mountain, Gable Butte, Snively Canyon, Rattlesnake Mountain, and Rattlesnake Springs. Rice also
31 inspected additional portions of Gable Mountain and part of Gable Butte in the late 1980s (Neitzel 2001).
32 Some reconnaissance of the Basalt Waste Isolation Project (BWIP) Reference Repository Location
33 (Neitzel 2001), a proposed land exchange in T. 22 N., R. 27 E., Section 33 (Neitzel 2001), and three
34 narrow transportation and utility corridors (Morgan 1981; Smith et al. 1977) was also conducted. Other
35 large-scale project areas completed in recent years include the 100 Areas from 1991 through 1993 and
36 1995 (Chatters et al. 1992; Wright 1993); McGee Ranch (Gard and Poet 1992); the Laser Interferometer
37 Gravitational Wave Observatory Project; the Environmental Restoration Disposal Facility; and the
38 Washington State University 600 Area Block Survey (Andrefsky et al. 1996). To date, approximately
39 12 percent of the Hanford Site has been surveyed for archaeological resources.

40 **4.7.2 Historic Archaeological Resources**

41
42
43 Two of the early Euro-Americans who passed near the Hanford Site were Lewis and Clark, who
44 traveled along the Columbia and Snake rivers during their 1803 to 1806 exploration of the Louisiana

1 Territory. The first European explorer to cross the Hanford Site was David Thompson, who traveled
2 along the Columbia River from Canada during his 1811 exploration of the Columbia River. Other
3 visitors included fur trappers, military units, and miners who traveled through the Hanford Site on their
4 way to lands up and down the Columbia River and across the Columbia Basin. It was not until the 1860s
5 that merchants set up stores, a freight depot, and the White Bluffs Ferry on the Hanford Reach. Chinese
6 miners soon began to work the gravel bars for gold. Cattle ranches were established in the 1880s, and
7 farmers soon followed. Agricultural development, irrigation districts, and roads soon dotted the
8 landscape, particularly in the eastern portion of the central Hanford Site. Several small thriving towns,
9 including Hanford, White Bluffs, Richland, and Ringold, grew up along the riverbanks in the early
10 twentieth century. Community accessibility to outside markets grew with the 1913 arrival of the Chicago,
11 Milwaukee, and St. Paul Railroad branch line (Priest Rapids-Hanford Line) from Beverly, Washington.
12 Ferries were established at Richland, Hanford, Wahluke, White Bluffs, and Richmond. The towns and
13 nearly all other structures were razed in the years after the U.S. government acquired the land for the
14 Hanford Engineer Works in 1943 (Chatters 1989; Neitzel 2002).

15
16 Since 1987, the Hanford Cultural Resources Laboratory (HCRL) has recorded 655 historic
17 archaeological sites associated with the pre-Hanford (Euro-American) era, the Manhattan Project, and
18 Cold War Era, including an assortment of farmsteads, corrals, dumps, and military sites. Of these,
19 56 sites contain prehistoric components as well. Archaeological resources from the pre-Hanford period
20 are scattered over the entire Hanford Site and include numerous areas of gold mining features along the
21 riverbanks of the Columbia and remains of homesteads, building foundations, agricultural equipment and
22 fields, ranches, and irrigation features. Properties from this period include the Hanford Irrigation Ditch;
23 former Hanford Townsite; Wahluke ferry landing; White Bluffs Townsite; Richmond ferry landing;
24 Arrowsmith Townsite; White Bluffs road; and the Chicago, Milwaukee, and St. Paul Railroad.

25
26 Areas of traditional cultural importance to pre-Hanford residents are also found on the Hanford Site.
27 These areas include places and structures that are important to descendants of pre-1943 settlers in the
28 former White Bluffs, Hanford, Allard, and Cold Creek areas.

30 **4.7.3 Historic Built Environment**

31
32 A number of buildings associated with the pre-Hanford Site era have been documented. They include
33 the Hanford Irrigation and Power Company pumping plant at Coyote Rapids, the high school and the
34 electrical substation at the Hanford Townsite, First Bank of White Bluffs, Bruggemann's fruit warehouse,
35 and the blacksmith cabin at the East White Bluffs ferry landing.

36
37 Historic built resources documented from the Manhattan Project and Cold War eras include buildings
38 and structures found in the 100, 200, 300, 400, 600, 700, and former 1100 and 3000 Areas. The most
39 important of these are the plutonium production and test reactors, chemical separation and plutonium
40 finishing buildings, and fuel fabrication/manufacturing facilities. The first reactors, 100-B, 100-D, and
41 100-F, were constructed during the Manhattan Project. Plutonium for the first atomic explosion and the
42 bomb that destroyed Nagasaki was produced at the Hanford Site. Additional reactors and processing
43 facilities were constructed after World War II during the Cold War period. All reactor containment

1 buildings still stand, although many ancillary structures have been removed, and the C, D, DR, F, and
2 H reactors have been considerably modified.

3 Historic contexts were completed for the Manhattan Project and Cold War eras as part of a National
4 Register Multiple Property Documentation Form prepared for the Hanford Site to assist with the
5 evaluation of National Register of Historic Places (National Register) eligibility of buildings and
6 structures sitewide (Bard 1997). Additionally, historical narratives and individual building documenta-
7 tions have been compiled in the *History of the Plutonium Production Facilities at the Hanford Site*
8 *Historic District, 1943-1990*, published in 2002 (DOE-RL 2002). At the site, 528 Manhattan Project and
9 Cold War Era buildings/structures and complexes have been determined to be eligible for the National
10 Register as contributing properties within the designated Hanford Site Manhattan Project and Cold
11 War Era Historic District. Of that number, 190 were recommended for individual documentation
12 (DOE-RL 1998).

13

14 **4.7.4 200 Areas**

15

16 Much of the 200 East and West Areas has been disturbed by construction of facilities associated with
17 the chemical separations process as part of the Manhattan Project and Cold War Era. Other facilities have
18 been constructed as part of ongoing cleanup efforts for the Hanford Site. Comprehensive efforts were
19 made in 1986 and 1989 to inventory the undisturbed portions of the 200 East and West Areas for cultural
20 resources. The 1989 survey was “an intensive pedestrian survey of all undisturbed portions of the
21 200 East Area and a stratified random survey [of the undisturbed portions] of the 200 West Area”
22 (Chatters and Cadoret 1990). No cultural resources are known to exist within currently active borrow
23 areas (DOE 2001).

24

25 The 1989 survey located two historic-archaeological sites (can and glass scatters), four isolated
26 historic artifacts, one isolated cryptocrystalline flake, and an extensive linear feature (that is, the White
27 Bluffs Road). These were the only materials older than 50 years discovered during the field survey. The
28 most significant archaeological resource located in the 200 Areas is the extensive linear feature known as
29 the White Bluffs Road, a portion of which passes diagonally southwest to northeast through the 200 West
30 Area. This road, in its entirety, was determined eligible for listing in the National Register. Within the
31 200 West Area, two intact segments of the road are considered contributing elements: 1) the southwest
32 segment from the perimeter fence to approximately 19th Street at Dayton Avenue, and 2) the extreme
33 northeast segment above T Plant Complex to the perimeter fence. A 100-m (328-ft) easement has been
34 created to protect these segments of the road from uncontrolled disturbance. The remaining portions of
35 the road within the 200 West Area have been determined to be non-contributing. Such non-contributing
36 segments of the White Bluffs Road are those that do not add to the historic significance of the road, but
37 retain evidence of its contiguous bearing. Originally used as a Native American trail, it played a role
38 in Euro-American immigration, development, agriculture, and Hanford Site operations. In 1996, an
39 inventory was completed of the remainder of the undisturbed ground; an area totaling 2.2 km² (0.85 mi²).
40 Although six isolated finds and two historic debris scatters were located, none were considered to be
41 eligible for the National Register. A survey of the White Bluffs Road in 2000 recorded an additional
42 54 historic isolated finds and 2 prehistoric isolated finds, as well as six can dump features (Neitzel
43 2002a).

1 Although other areas of undisturbed land in the 200 East and 200 West Areas have been surveyed as
2 part of cultural resource reviews of proposed projects, no new significant cultural resources have been
3 located. Reviews include the 1989 permit application for the LLBGs (218-E-10, 218-E-12B, 218-W-3A,
4 218-W-3AE, 218-W-4B, 218-W-4C, 218-W-5, 218-W-6) (Hanford Cultural Resources Case [HCRC]
5 # 89-200-008; see Table K.1). Previous borrowing and burying activities at the grounds had extensively
6 disturbed the majority of the LLBGs. However, portions of 218-E-12B, 218-W-5 and 218-W-6 were
7 undisturbed. These areas were surveyed and reviewed by the HCRL in the summer of 1988 as part of
8 HCRC# 88-200-038 (see Table K.1) and clearance for the project was granted. The ETF location was
9 reviewed for the presence or absence of cultural resources in 1990 (HCRC# 89-200-023; see Table K.1).
10 The WRAP Facility location was reviewed in 1993 (HCRC# 93-200-074; see Table K.2) and the CWC
11 was reviewed in 1995 (HCRC# 95-200-104; see Table K.1). No significant resources were identified.
12 Over the past 15 years, 50 cultural resource reviews were conducted on the LLBGs for grouting, geologic
13 testing, subsidence repair and maintenance, removal of contaminated soils, retrieval of vented drums,
14 culvert installation, drilling to install high-integrity containers, and trench construction.

15
16 Chemical separations facilities (processing plants and their ancillary and support services) were
17 located in the 200 Areas. Irradiated fuel elements were dissolved and desired materials such as plutonium
18 were separated out. Historic property inventory forms have been completed for 72 buildings and
19 structures in the 200 Area. Of that number, 58 have been determined to be eligible for the National
20 Register as contributing properties within the Historic District recommended for mitigation.
21 Included are the 234-5Z Plutonium Finishing Plant, 236-Z Plutonium Reclamation Facility, 242-Z
22 Water Treatment Facility, 231-Z Plutonium Metallurgical Laboratory, 225-B Encapsulation Building,
23 221-T Canyon (T Plant) Building, 202-A Purex Building, 222-S Redox Plant, 212-N Lag Storage
24 Facility, 282-E Pumphouse and Reservoir Building, 283-E Water Filtration Plant, and 284-W Power
25 House and Steam Plant. The 232-Z Waste Incinerator Facility and the 233-S Plutonium Concentration
26 Building, determined eligible for the National Register, have been documented to Historic American
27 Engineering Record (HAER) standards (DOE-RL 1998).

28
29 Completed in December 1944, T Plant (221-T) was the world's first large-scale plutonium (chemical)
30 separation facility. T Plant, like the other chemical separation buildings at Hanford, is a massive,
31 concrete, canyon-like structure measuring 800 feet long, 65 feet wide, and 80 feet high. Because of its
32 role as the primary chemical separations plant at the Hanford Site from 1944 until the opening of the
33 REDOX Plant in 1952, T Plant was found to be eligible for inclusion in the National Register as a
34 contributing property within the Historic District and recommended for individual documentation
35 (mitigation). Mitigation of T Plant has been completed and consisted of a HAER documentation of the
36 facility and a walkthrough/assessment of the building contents. DOE entered into the Programmatic
37 Agreement for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment
38 on the Hanford Site (DOE-RL 1996) with the Advisory Council on Historic Preservation and the
39 Washington State Historic Preservation Office. One stipulation of the agreement requires DOE to
40 undertake an assessment of the contents of the historic buildings and structures prior to any deactivation,
41 decommissioning, or decontamination activities. The purpose of these assessments is to locate any
42 artifacts that may have interpretive and or educational value as exhibits within local, state, or national
43 museums. Industrial artifacts at T Plant and other historic facilities in the 200 Area were identified and
44 tagged for future exhibit purposes.