Appendix F: Areas of Potential Future Research Needed to Support Hanford's Ecosytem Management Approach

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Appendix F briefly describes opportunities for potential areas of research.

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F Areas of Potential Future Research Needed to Support Hanford's Ecosystem Management Approach F.1

Because vast amounts of the Hanford Site have remained relatively undisturbed by direct human activities, the Site offers unique opportunities for research, especially in the areas of habitat use by wildlife, habitat restoration, and the dynamics of shrub-steppe and unimpounded riverine communities. An ecosystem management approach stresses the need to base management decisions on the best science available. Moreover, to implement adaptive management as a governing principle of ecosystem management, areas of uncertainty and gaps in knowledge should be identified. From this, a strategy can be outlined that, in concert with funding and staffing availability, identifies research areas whose resultant data can lead to improvements in management actions. Although theoretical or nonmanagement-driven research has its own merits, the research recommendations identified in BRMaP are needed for specific biological resource management needs.

Some examples of potential areas of research are:

- A comparison of habitat use by wildlife species between sagebrush habitat with cheatgrass as the predominant understory plant and sagebrush habitat with native bunchgrasses and forbs as the predominant understory. Does the presence of cheatgrass reduce wildlife usage over the long-term?

- A determination of the location, significance, and function of important plant, fish, and wildlife dispersal and movement corridors within Hanford and between Hanford and other areas.
- An evaluation of the effects of habitat fragmentation in a shrub-steppe ecosystem.
- An evaluation of spiny hopsage (*Grayia spinosa*) seedling recruitment requirements. (Spiny hopsage has shown little or no recruitment into the population since site activities began or earlier.)
- The continued refinement of vegetation association and habitat mapping on Hanford to support management objectives. This also could include the refinement of protected plant, fish, and wildlife species distribution maps.
- The development and testing of habitat suitability models for key Hanford species (especially those associated with predominantly native vegetation whether with shrubs or not) and the determination of vegetation patterns (e.g., density, diversity) of undisturbed shrub-steppe habitat to help define mitigation requirements and establish restoration goals.
- An evaluation and development of habitat improvement methods. Habitats with different levels of disturbance should be evaluated.
- Identification of critical habitat for sand roller and piute sculpin. This includes identifying those physical features, such as water depth and velocity, substrate characteristics, that may play a role in defining critical habitat.
- An evaluation of the impacts of environmental contaminants, especially chromium, on the viability of fall chinook salmon eggs and larvae within the inter-gravel spaces (hyporheic zone) of the Hanford Reach. Potential impacts to fall chinook salmon from localized impacts from Hanford groundwater and contaminant discharge to the river was recently assessed by Geist et al. (1994).[1] The authors concluded that additional characterization is required, particularly to determine conditions in the groundwater-surface water interface (pore water) where spawning takes place.[2]
- The continued inventory of Hanford's biological diversity with the goal of filling in the data gaps for poorly studied groups and locations (alpha diversity).
- An evaluation of the changes in species composition across different plant associations within shrub-steppe habitat (beta diversity). This information can help determine where management of the Hanford ecosystem must be focused in order to maintain the greatest diversity of native species and habitats on Hanford.

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[1] Geist, D. R., T. M. Poston, and D. D. Dauble. 1994. *Assessment of Potential Impacts of Major Groundwater Contaminants to Fall Chinook Salmon (Oncorhynchus tshawytscha) in the Hanford Reach, Columbia River*. PNL-9990, Pacific Northwest Laboratory, Richland, Washington.

[2] Hope, S. J., and R. A. Peterson. 1996. P*ore Water Chromium Concentrations at 100-H Reactor Area Adjacent to Fall Chinook Salmon Spawning Habitat of the Hanford Reach, Columbia River*. BHI-00345, Rev. 1, Bechtel Hanford Inc., Richland, Washington.