5.0 Management of Biological Resource Impacts: Impact Assessment, Mitigation, and Restoration

5.0

Management of Biological Resource Impacts: Impact Assessment, Mitigation, and Restoration

This section describes the ecological compliance review process, addresses mitigation, especially as it relates to rectification/compensatory mitigation, and provides an overview of ecological restoration at Hanford. Guidance and requirements provided fulfill two of BRMaP's main purposes to: (1) anticipate and incorporate biological resource needs in a timely manner to minimize impacts to project cost and schedule and to biological resources, and (2) describe a process whereby consistent and effective recommendations and requirements for mitigation can be identified early in project planning to ensure adequate funding is allocated for mitigation, if necessary.

Compliance with requirements outlined in this section also shows, in part, compliance with DOE-RL biological resource management initiatives described in Section 2.2.1.

5.1 Impact Assessment

Although DOE-RL recognizes that biological impacts cannot always be eliminated, potential impacts must be considered during early phases of project development and their consequences incorporated in decision making.

Assessment of biological resource impacts are the focus of the ecological compliance review process. Impact assessment involves analyzing the impacts to biological resources of concern (Levels II through IV) that may be expected if a proposed action is implemented. This analysis is conducted well before implementation to enable enough time for the responsible program or project to evaluate and implement alternatives that would avoid or minimize impacts as much as possible, to plan for additional mitigation actions that may be necessary, to determine the need for ecological permits, and to obtain such permits, if necessary.

Impact management is accomplished in part by mitigation. Mitigation is a series of prioritized actions that, taken together, reduce or eliminate adverse project impacts to biological resources. The ecological compliance review process, as described in the *Ecological Compliance Assessment Management Plan* (DOE-RL 1995), also will identify the need for such mitigation actions.

5.1.1 Purpose and Goals

The ecological compliance review process assists DOE-RL in managing impacts to species and habitats of concern. Assistance is provided through collection and dissemination of information on project-specific impacts to biological resources, guidance provided to Site project managers toward making planning decisions, identification of mitigation requirements, and annual compilation of cumulative impacts to biological resources as a result of Hanford Site activities. The process provides a sound basis for evaluating biological impacts using appropriate environmental baseline data before initiating a proposed action.[1]

[1] Baseline data are of two types. Data collected via Hanford's compliance projects track resource status within expected impact zones (e.g., 100 Areas, 200 Areas, etc.). A second type of baseline data is collected via the Ecosystem Monitoring Project. This latter set of data serve to track the status of a particular resource within a broader context (i.e., within the entire Hanford ecosystem or, when data outside of Hanford are available, within the Columbia Basin Ecoregion). These data provide the relevant context for assessing cumulative impacts to biological resources of concern that also accounts for changes in resource status not directly attributable to DOE-RL activities. Section 6.0 addresses this second type of baseline data collection.

Goals of the ecological compliance review process are to:

- assess the potential for proposed projects, including maintenance activities, to adversely impact biological resources of concern, including migratory birds, using methods that ensure such resources are detected in potentially affected areas
- document the assessment and basis for the assessment for the requester and DOE-RL
- provide recommendations that will avoid, minimize, or otherwise mitigate adverse impacts
- retain the documentation in a format that can be reviewed by DOE-RL and used to support decisions to be made through the NEPA or CERCLA processes.

5.1.2 Legal and Policy Basis

Federal laws as well as other relevant and appropriate regulations (e.g., Washington State Department of Fish and Wildlife regulations) apply to ecological compliance on the Hanford Site. Applicable requirements for evaluating ecological resource impacts include the following federal laws:

- National Environmental Policy Act (NEPA)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- Endangered Species Act
- Bald and Golden Eagle Protection Act[2]
- Migratory Bird Treaty Act[3]
- Clean Water Act
- Fish and Wildlife Coordination Act
- Presidential Proclamation 7319 (Establishment of the Hanford Reach National Monument).

Regulations that implement these laws include those promulgated by regulatory agencies responsible for enforcement and DOE guidelines that define DOE responsibilities under NEPA (10 CFR 1021; see also 10 CFR 1022 for DOE's specific responsibilities in regard to compliance with floodplain/wetlands environmental review requirements). Additional guidance and requirements are defined in federal Executive Orders and DOE Orders. Detailed explanations of these requirements are provided in DOE-RL (1999).

Species protected by federal regulations are regularly identified and updated in the *Federal Register* and other agency publications. Species listed under the Endangered Species Act as threatened or endangered, or candidates for such listing, are published in 50 CFR Part 17, "Endangered and Threatened Species." Endangered species lists are also published by the U.S. Fish and Wildlife Service on the World Wide Web (www.usfws.gov/r9erdspp/endspp.html). Species protected under the Migratory Bird Treaty Act are listed by the USFWS under 50 CFR Part 10.13. Wetlands delineation and permitting procedures under the Clean Water Act are published by the U.S. Army Corps of Engineers at 33 CFR Parts 320-330.

Definitions of species and habitats protected or prioritized for management attention by Washington State laws, regulations, or guidance are published by the Washington State Department of Fish and Wildlife and Washington Department of Natural Resources. For current information, see www.wa/gov/wdfw (WDFW) and www.wa/gov/dnr (WDNR) and for priority habitats and species, www.wa/gov/wdfw/hab/phspage.htm.

Protection of species of concern and their habitats on the Hanford Site is central to the compliance process. Therefore, an up-to-date database will be maintained on Level II through IV resources known to occur on or use the Hanford Site that will be kept current with regard to changes in federal and state species protection laws, regulations, and listings (see Section 9.1).

5.1.3 Implementation

The implementation of the ecological compliance review process involves a number of considerations. This section discusses the aspects of implementation: methods used to conduct an ecological review,

[2] Although there are no specific impact assessment provisions, there are enforcement provisions in regard to the taking of individuals, etc., that could result in criminal penalties. Thus, DOE-RL feels it is prudent to assess potential impacts to biological resources covered under the provisions of this act.

[3] Ibid.

types of reports that can be generated, and extent of mitigation recommendations that can result.

5.1.3.1 Ecological Compliance Review Process: Methods

Impact assessment reviews will be conducted for projects with the potential for impacting the biological environment. A decision methodology for determining the need for an ecological compliance review is defined in DOE-RL (1995). Impacts to be considered include habitat alterations, disturbances that could affect species-specific behaviors (e.g., nest desertion) with resultant potential impacts on reproduction and/or survival, and toxicological effects from routine releases of potentially hazardous materials beyond those currently permitted (see Table 5.1).

Ecological compliance reviews will rely on field data specific to the site where the proposed action is to occur. To be reliable, field data must be obtained at the biologically appropriate times of year (i.e., the time period when the species of concern can be expected to be present and in an identifiable condition). Because Hanford projects cannot always determine their need for a review early enough in the biological cycle to enable the necessary field data to be collected, the compliance review process will use baseline biological surveys for areas where the majority of activities are expected to occur. These baseline surveys will be conducted at the biologically appropriate time of year. The baseline survey approach thus minimizes the likelihood of project delays due to project scheduling conflicting with the appropriate seasonal period at which to conduct surveys.

A determination of adverse impact will be based on whether: (1) biological resources of concern are present or use the area where the proposed action is to occur, and if so, (2) the proposed action would result in any of the effects described in Table 5.1. Use of an area is determined on the basis of the field survey as well as an assessment of foraging use by species of concern with relatively large home ranges, such as Swainson's hawks or bald eagles. As a working basis, direct impacts are assessed at the level of the individual; impacts to habitat are assessed at the level that would eliminate a pair's nesting/den/spawning area and/or foraging habitat or a local plant population.

Information on the sensitivity of various species to disturbance will be used in the assessment, as well as references to exclusion areas and sensitive periods that are identified for federally listed birds on the Hanford Site.

5.1.3.2 Ecological Compliance Review Process: Reports

Ecological review reporting will include letter reports documenting the review process, findings, and recommendations with regard to mitigation or contact points for permitting, as warranted. Report content will reflect the level of impact to the resources. Reviews for proposed actions that will

Table 5.1 Evaluation of Impacts to Biological Resources of Concern

Source of Impact	Treatment in Ecological Compliance Review
Direct mortality	Potential is defined as high for plants in the areas to be disturbed; low for mobile species
Habitat loss	Potential is evaluated on basis of species/habitat associations and foraging/home range radii
Nest/den/spawning area destruction	Potential is defined as high for nests/dens/redds found in the area
Disturbance during sensitive periods	Potential is defined as high within one home range radius or as defined by management plans/biological assessments
Exposure to toxic substances	Evaluated on a dose-response basis for releases above permitted quantities or rates

result in loss of Level III or IV habitat (losses of Level IV habitats/plant communities generally will not be allowed) will include quantitative descriptions of the habitat and recommendations for mitigation. Detailed descriptions of content are provided in DOE-RL (1995). Reports will be forwarded to the requester and the environmental compliance organizations of the contractor and DOE-RL.

5.1.3.3 Ecological Compliance Review Process: Mitigation Recommendations

Management of impacts to biological resources will be achieved using a hierarchy of mitigation actions identified through the review process and early interaction with project engineers and site development planners.

The hierarchy of mitigation ranges from impact avoidance, the preferred means, to compensatory mitigation (Table 5.2). Means to accomplish impact avoidance or minimization are identified through the ecological compliance review and project site selection processes before implementation of a proposed project. The need for a particular type of mitigation will be identified in the ecological compliance review reports for individual projects as needed in accordance with the *Biological Resources Mitigation Strategy* (DOE-RL 1996).

The review process will include, where appropriate, meeting with Hanford project staff to:

- provide information on potentially significant biological issues pertinent to the project
- assist in identifying alternatives to the proposed action that could minimize or avoid adverse biological consequences
- provide information on the location of important biological resources to assist, as necessary, in the site selection process for individual projects
- present information on Hanford policy in regard to mitigation, especially as that policy relates to when mitigation via rectification and or compensatory mitigation may be appropriate
- develop a common schedule for conducting an ecological compliance review that would minimize impacts to the proposed project's schedule.

For bird species protected under the Migratory Bird Treaty Act, federal regulations require that a permit be obtained from the U.S. Fish and Wildlife Service before harming or collecting individuals, nests, or eggs. The ecological compliance review report will identify temporal or spatial alterations to proposed actions that would prevent the harming of regulated species. If such provisions cannot be implemented, the affected program or project should contact the Hanford Biological Resources Laboratory at PNNL for assistance with obtaining the necessary permit. The Laboratory also can be contacted for assistance with determining the specific applicability of the Migratory Bird Treaty Act's implementing regulations.

5.1.3.4 Ecological Compliance Review Process: Summary of Project Manager Recommended Actions

The box below outlines those actions that a project manager needs to take to be in compliance with ecological compliance review requirements. Figure 5.1 provides an overview of the ecological compliance review process.

Table 5.2 Hierarchy of Mitigation Actions for Biological Resource Impacts

Mitigation	Utilization Preference	Description of Mitigation Means
Avoid impact	1st	Alter proposed project (timing, location, or implementation) to avoid injury to biological resources of concern
Minimize impact	2nd	Alter proposed project to minimize injury to biological resources of concern
Rectify the impact	3rd	Replace at the project site the biological resources to be disturbed
Compensate for the impact	4th	Replace or relocate away from the project site the biological resources to be disturbed

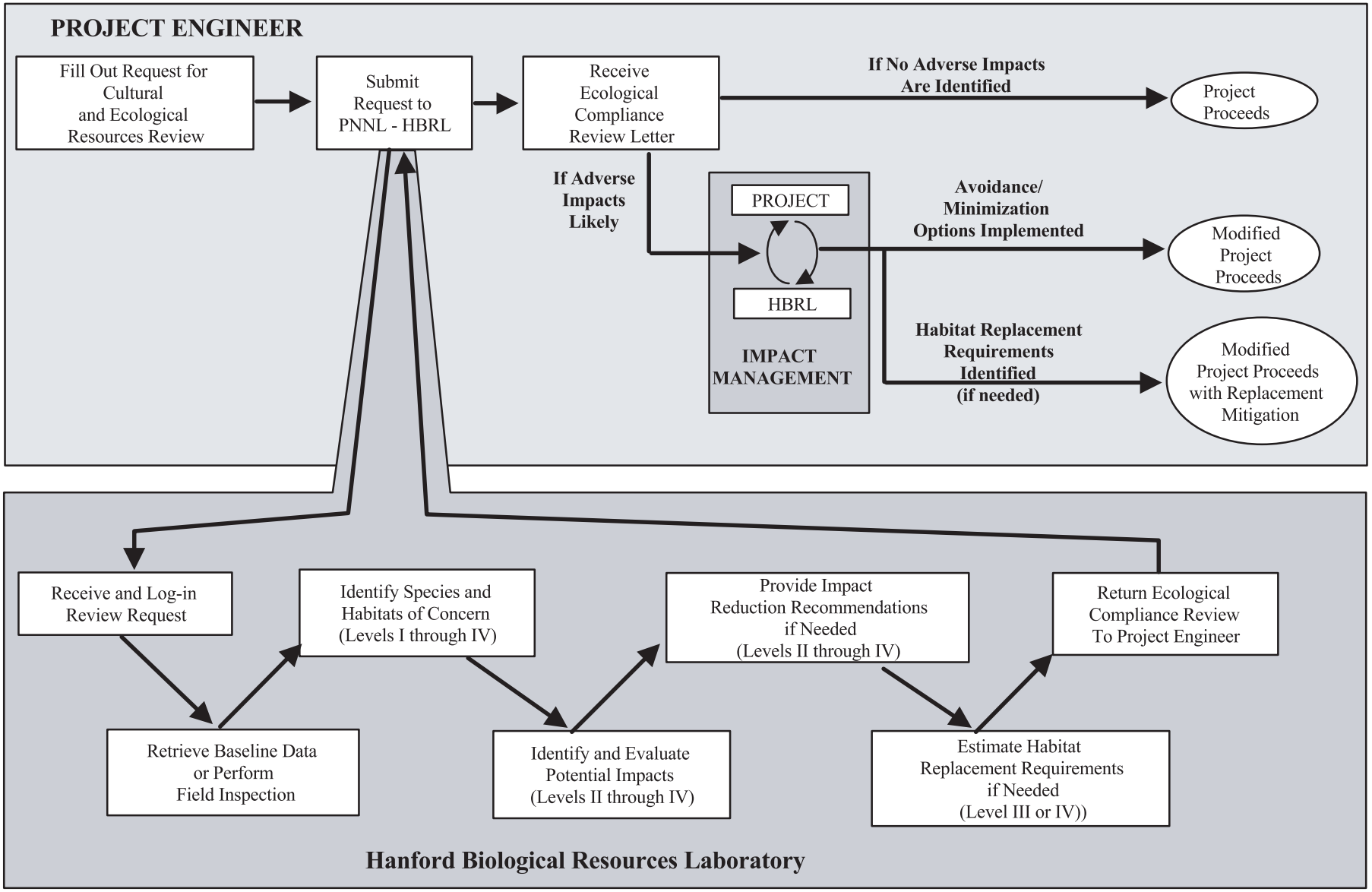

Figure 5.1 Ecological Compliance Review Process (PNNL = Pacific Northwest National Laboratory; HBRL = Hanford Biological Resources Laboratory)

5.1.4 Roles and Responsibilities

Consideration of impacts to biological and other natural resources in the early stages of project planning is the responsibility of the program or project leads. Early consideration of these impacts will ensure that the appropriate ecological reviews are completed and compliance costs minimized, enable appropriate mitigation planning, and avoid costly project delays. The request for an ecological review is the responsibility of the program or project leads as consistent with the relevant contractor procedures. Reviews should be obtained early on to assist in identifying possible project alternatives that incorporate resource values and avoid and/or minimize unnecessary impacts.

Ownership of the ecological compliance reviews is with the Office of Site Services at DOE-RL. Responsibility for conducting ecological compliance reviews is assigned to Pacific Northwest National Laboratory (via the Hanford Biological Resources Laboratory) and the Environmental Restoration Contractor. The Laboratory is responsible for conducting field baseline surveys for the primary activity areas as defined in the relevant Project Documentation Plan for DOE-RL. The Laboratory also is responsible for conducting reviews for non-environmental restoration contractor projects. The environmental restoration contractor, Natural Resources Section, is responsible for coordinating natural resource reviews for all proposed field activities within its contract scope.[5]

Implementing recommendations is the responsibility of the program or project leads in conjunction with the environmental compliance organization(s) of the relevant contractor, as necessary.

Oversight of implementation is the responsibility of the relevant contractor and DOE-RL compliance and program organization(s).

5.2 Mitigation

The basic tenet of biological resource mitigation at the Hanford Site is that projects should proceed through each stage of the mitigation hierarchy and only move to the next action level if all reasonable options for the previous level are exhausted. If careful consideration is given to avoiding and minimizing impacts before they occur, the need for the more expensive levels of mitigation (i.e., rectification and compensatory mitigation) can be greatly reduced or eliminated.

The *Biological Resources Mitigation Strategy* (DOE-RL 1996) and the *Ecological Compliance Assessment Management Plan* (DOE-RL 1995) provide Hanford Site project managers, planners and engineers, and resource managers with the concepts and information necessary to implement the requirements and guidance identified in this section for mitigation at the Hanford Site.

Ecological Compliance Review Process: Summary of Project Manager Recommended Actions

Step 1—Determine whether a proposed action requires an ecological compliance review. Consult DOE-RL (1995) for assistance in making this determination.

Step 2—If an ecological compliance review is needed, submit a request to the Hanford Biological Resources Laboratory at the Pacific Northwest National Laboratory if a non-CERCLA action; if a CERCLA action, contact the Environmental Restoration Contractor, Natural Resources Section.

Step 3—After receiving the ecological compliance review report, follow up on the report's recommendations:

- obtain any environmental permits that may be necessary
- plan, budget for, and implement, as necessary, any required or recommended mitigation actions. Contact the Hanford Biological Resources Laboratory if there are questions or to discuss options.

Step 4—Include the ecological compliance review report's findings in appropriate project documentation and act, as needed, on recommendations before proceeding with the proposed action.

[5] These responsibilities are coordinated in accordance with the letter from S. D. Liedle (BHI) to L. K. McClain (DOE-RL): "ERC Operating Procedures for Conducting Cultural and Natural Resource Reviews," March 9, 1995.

5.2.1 Purpose and Goals

Mitigation of adverse impacts to biological resources via rectification and/or compensatory mitigation is intended to ensure, to the extent practicable, no net loss of Level III and IV biological resources of concern on the Hanford Site (see Section 4.3 and Appendix D). In most cases, it is expected that adverse impacts can be avoided or minimized to the extent that additional mitigative actions are unnecessary. Some projects, however, may be of such a scale and/or have specific siting criteria that make complete avoidance and minimization impossible. In these cases, mitigation via onsite rectification and/or compensatory mitigation away from the project site would be recommended (see Section 4.3), absent any Irreversible and Irretrievable commitment of natural resources.

To facilitate a proper balance of DOE-RL's missions with its resource stewardship obligations, the mitigation requirements and guidance provided in the *Biological Resources Mitigation Strategy* (DOE-RL 1996) will meet the following objectives:

- ensure consistent and effective implementation of mitigation recommendations and requirements
- ensure that mitigation measures for biological resources meet the trust responsibilities of DOE-RL under both NEPA and CERCLA
- enable Hanford Site development and cleanup projects to anticipate and plan for mitigation needs via early identification of mitigation requirements
- provide guidance to Hanford personnel in implementing mitigation in a cost-effective and timely manner.

5.2.2 Legal and Policy Basis

Much of the legal and policy basis for biological resource management in general also is relevant directly to mitigation. Federal acts, regulations, and Executive Orders have specific provisions concerning mitigation including the following:

- National Environmental Policy Act
- Comprehensive Environmental Response, Compensation, and Liability Act[6]
- Endangered Species Act[7]
- Clean Water Act
- Fish and Wildlife Coordination Act
- Mineral Leasing Act of 1920
- Executive Order 11988 - Floodplain Management
- Executive Order 11990 - Protection of Wetlands.

The strategy for biological resource mitigation on the Hanford Site is strongly based on both Washington State and federal mitigation policies. These include:

- U.S. Fish and Wildlife Service Mitigation Policy (46 FR 7644)
- Washington Department of Fish and Wildlife Mitigation Policies (Policies 3000 and 3001).

5.2.3 Implementation

The implementation of the mitigation process at Hanford involves a number of considerations. The following sections address the overall mitigation process and its relationship to remediation/restoration, identification of what constitutes mitigable resources at Hanford, mitigation thresholds for specific types of biological resources, and mitigation ratios, replacement units, and areas. It also summarizes the mitigation process as it affects Hanford Site project managers.

5.2.3.1 Overall Mitigation Process and Its Relationship to Waste Site Remediation and Restoration

Application of the mitigation hierarchy on the Hanford Site includes several prioritized actions (or

[6] CERCLA identifies no specific provisions for mitigation; however, its natural resource damage provisions may provide a strong incentive to consider mitigation when appropriate.

[7] Mitigation under the Endangered Species Act is separate from the mitigation that is addressed in 46 FR 7644, U.S. Fish and Wildlife Service Mitigation Policy.

steps) and decision points. The overall decision tree, as well as what documents can be consulted for specific information, are indicated in Figure 5.2. Table 5.2 describes the components of the mitigation hierarchy.

Mitigation planning starts with determining the need for an ecological compliance review (DOE-RL 1995 and Section 5.1). In general, projects that require an ecological compliance review are those that are conducted outdoors, especially those that also require an excavation permit, or inside abandoned buildings that may contain biological species of concern, such as bats. This encompasses a wide range of projects—from maintenance work on the outside of buildings to large-scale land development for new facilities. The majority of projects reviewed have been determined to have no adverse impacts on any biological resources of concern and have therefore proceeded without delay and without additional mitigative actions. Of those remaining projects, most were able to proceed with only minor adjustments, such as

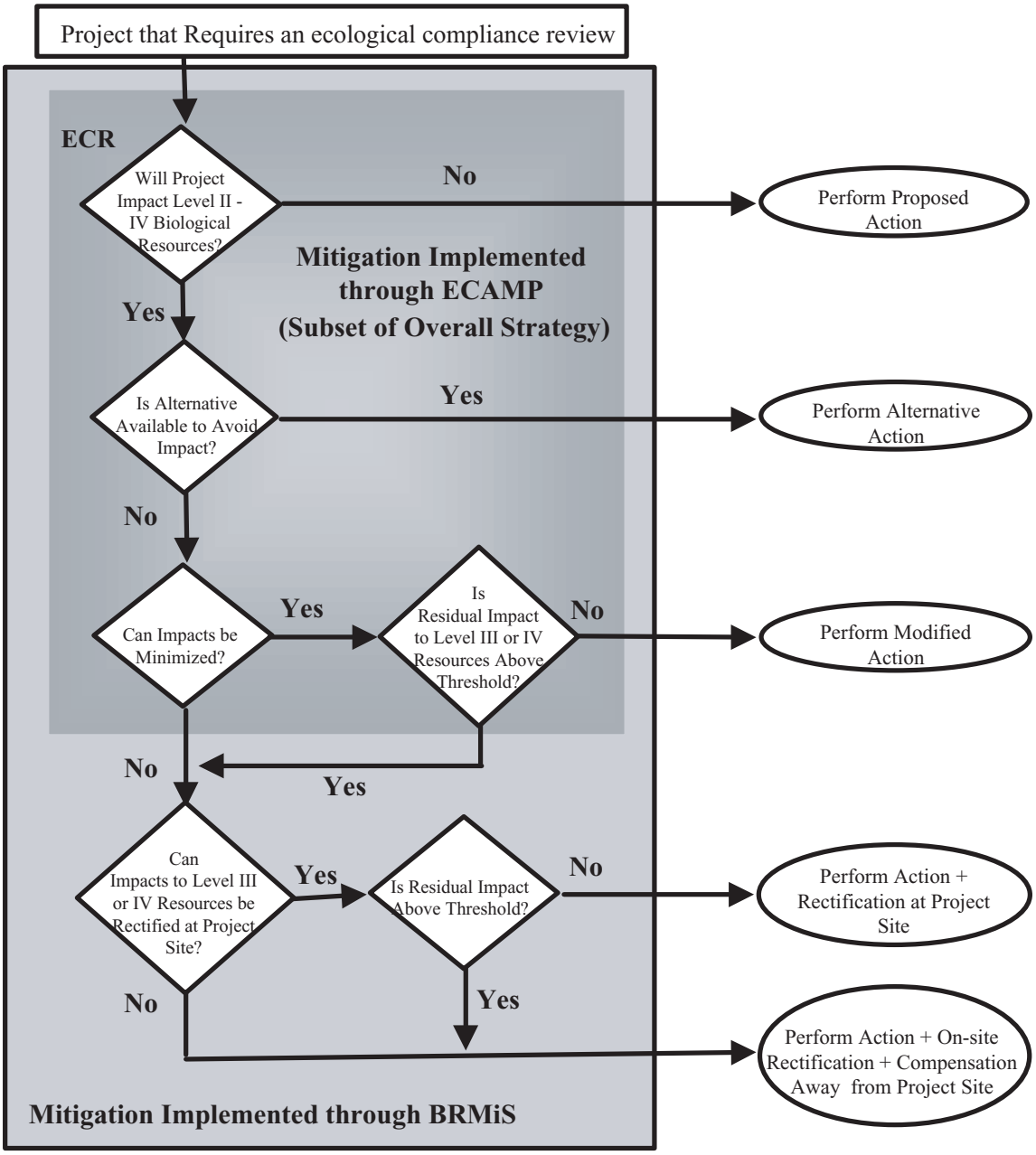

Figure 5.2 Mitigation Decision Tree and Relationship of Reference Documentation (ECR = Ecological Compliance Review; ECAMP = Ecological Compliance Assessment Management Plan; BRMiS = Biological Resources Mitigation Strategy)

moving the site a small distance or timing the action to avoid impacts to nesting migratory birds.

If a significant adverse impact remains after the avoidance and minimization steps, then the amount of rectification or compensatory mitigation required of a project will be determined using habitat evaluation procedures or equivalent method as described in of the *Biological Resources Mitigation Strategy* (DOE-RL 1996). A number of projects may trigger some form of onsite rectification, not only to replace the resources lost as a result of the project but also to prevent further resource degradation to the surrounding habitat, such as soil erosion or the introduction of non-native plant species. Compensatory mitigation is recommended if a significant amount of adverse impact remains after onsite rectification. For example, the land area covered by a new facility can not be rectified on site. Rectification or compensatory mitigation is applicable only to the unavoidable loss of existing resources of concern.

Restoration and stabilization are options encouraged for use at past-practice waste sites (restoration and stabilization also can be used at non-contaminated, human-impacted areas; see Section 5.3). Although implementing such options may be of benefit to Hanford's biological resources, they do not constitute mitigation for Level III or IV habitat losses. Restoration here refers to the actions taken to create habitat value at a past-practice waste site subsequent to the completion of remediation. Alternatively, if the intended use of a site is not as plant, fish, and/or wildlife habitat, the site may simply be stabilized or converted to other uses. Restoration and stabilization will often include the placement of some type of vegetative cover over a remediated/decommissioned site (see Section 7.2). The type of vegetation and the habitat or community created, if applicable, will conform with a pre-determined land-use objective for the site and might not resemble the surrounding communities or the pre-disturbance native habitat. Thus, the scope of the action taken depends on the site's land-use objective. If the objective is restoration, then the action will entail recreating a native plant community. If the objective is stabilization, then simply planting a soil-stabilizing cover crop may be the only action necessary.

For a CERCLA-related action, a remediation project may often be expected to perform restoration, but might not be required to conduct replacement mitigation (via rectification and/or compensatory mitigation) unless a resource of concern is lost during the remediation process. Figure 5.3 provides an aid to understanding the difference between mitigation and restoration as it applies to a CERCLA remedial action. Additional guidance is provided on CERCLA-related restoration in Section 5.3.

5.2.3.2 Identification of Mitigable Resources

Distribution of Hanford Site Mitigable Resources by Level of Concern—Not all biological resources are

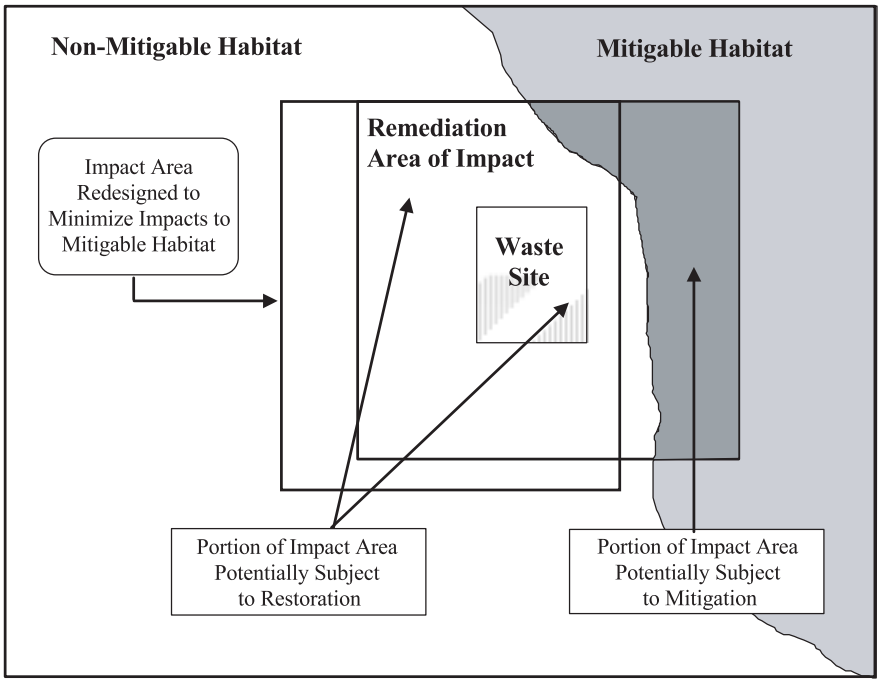

Figure 5.3 Relationship of Mitigation to Restoration in Regard to a CERCLA-Related Remedial Action

considered mitigable resources at Hanford. All biological resources categorized within Levels II - IV should be considered for mitigation via avoidance and minimization; however, only Level III and IV resources must be considered for mitigation via rectification and compensatory mitigation. The determination of what constitutes appropriate mitigation takes place during the ecological compliance review process.

Because the available options for mitigating Level IV resources are limited, and may be costly, the preferred management strategy for these resources at Hanford is one of protection against impacts. Generally, Hanford Site Level IV resources are not in the vicinity of planned development areas or past-practice waste sites (one potential exception are bald eagle primary night roost or potential nest site locations). Thus, it is unlikely that Level IV resources will be impacted, and therefore require mitigation, by Hanford Site activities.

Some level III resources, however, are located in areas that may in the future be developed or, if a waste site, require remediation. The presence of Level III resources does not preclude a development or cleanup action; however, impacts to Level III resources from such actions should be mitigated (i.e., using rectification and/or compensatory mitigation if necessary) when such impacts exceed a specified impact threshold. Level III resource areas can be evaluated at the landscape scale as to their on-the-ground potential for mitigation via rectification and/or compensatory mitigation and in so doing aid project managers in making planning decisions.

Five data layers contribute to the composite map of Level III resources; three of these (plant species of concern, ferruginous hawk nest, and bald eagle perch and secondary night roost locations[8]) are based on annually updated biological resource monitoring information. Thus, the locations where these resources are depicted have a high mitigation potential (i.e., projects that plan to work in these areas can reasonably expect to encounter these resources and to have to mitigate any adverse impacts their actions may cause).

The other two data layers—habitats of concern (exclusive of the early-successional habitats such as abandoned old fields) and the Hanford Reach 100-year floodplain—are based to a lesser extent on actual ground surveys, depending on location, and more on either aerial photographs or modeling. The accuracy of these techniques in depicting spatial features is highly dependent on the uniformity of the feature and the scale of resolution being mapped. An on-the-ground assessment is vital for those areas in which the mapping data could be limited in its accuracy.

Level II resource areas are limited to early-successional habitats (Figure 4.3). Impacts to these areas will generally not require mitigation via rectification and/or compensatory mitigation (impacts still should be avoided or minimized to the extent practical). In contrast to Level III and IV resource areas—within which for project planning purposes it is conservatively assumed that the level designations are accurate and mitigation will be necessary unless verified otherwise on-the-ground—within Level II resource areas the lack of accurate understory data and disturbance history leads to an opposite conclusion: mitigation via rectification and/or compensatory mitigation will not be necessary unless on-the-ground biological surveys indicate the presence of resources that qualify as either Level III or IV.

Although Section 5.2.3.3 mostly provides threshold criteria for determining when an assumed Level III resource area may not qualify as Level III, the threshold criteria for Level II resource areas in Section 5.2.3.3 can be used identify when early-successional habitat areas qualify as either Level III or IV resources.

When looked at in combination, there are some spatial overlaps in the resource data provided in Figures 4.3, 4.4, and 4.6. Although Level II and III resource areas are mostly complementary (i.e., no overlap), Level IV resources are in many cases mapped as a subset of Level III resources (e.g., element occurrences represent the highest quality examples of some of the habitat of concern cover classes; see Appendix D). Figure 4.7 is a composite map of the Level II-IV resources of concern. Because a particular biological resource is associated with only one level of management concern (see Section 4.3), a specific location on the Hanford Site is classified at the highest level of concern for which it qualifies (with Level IV the highest level). It is important to realize that there are inherent accuracy limitations in data used to develop

[8] Bald eagle primary night roost and attempted nest site locations are considered Level IV resources.

Figure 4.7 and to restrict its application primarily to landscape-level land-use planning. Although Figure 4.7 may be useful to project managers at the landscape scale for planning projects to avoid costly mitigation, actual mitigation requirements must be determined only by on-the-ground surveys obtained during the ecological compliance review process.

The use of Figure 4.7 to evaluate a project's mitigation potential is only one piece of information that project managers should consider in determining whether their particular project may result in a mitigable impact. Each type of Level III resource also has an associated impact threshold that determines whether mitigation will be needed. Thresholds are addressed in Section 5.2.3.3. The next section provides guidance to project managers on how to prioritize between certain types of mitigable biological resources to ensure that the project alternative is identified that results in the least impact to biological resources of concern and minimizes the need for costly mitigation.

Prioritizing Between Mitigable Shrub-Steppe Resources—The Hanford habitats of concern map (Appendix D) shows all shrub-steppe community types and successional stages that are considered important from the standpoint of impact mitigation. At the first level of mitigation planning, these communities (along with the Columbia River 100-year floodplain) should be protected from significant impact to minimize the potential that mitigation via rectification and/or compensatory mitigation would be necessary. A composite view of these resource areas, in which the resources are assigned to different levels of management concern (Figure 4.7), indicates, however, that mitigation cost saving can be achieved by avoiding impacts during the site selection process.

The steps outlined in the following discussion are designed to assist project managers in sorting through different siting options for projects. Careful planning can help avoid and/or minimize impacts to biological resources of concern and reduce or eliminate mitigation costs.

Because the mitigation options for Level IV resources are more restrictive than for Level III resources, the highest mitigation planning priority is assigned to Level IV resources. Thus, the first two steps in planning mitigation priorities are:

- Step 1—Avoid impacts to Level IV resource areas (as indicated on the composite resource maps in Section 4.3.4) at all times.
- Step 2—Avoid impacts to Level III resource areas (as indicated on the composite resource maps in Section 4.3.4) as much as possible.

Within portions of the Hanford Site covered by late-successional plant communities, a mix of shrub types and understory conditions exist that affect any particular location's habitat value. To better assess the quality (condition) of the late-successional communities, and by so doing identify those areas for which significant adverse impacts should be mitigated, a habitat association model is used that relates the condition of the habitat to its suitability for usage by a shrub-steppe obligate species.

The species used is the sage sparrow, a Washington State candidate species. The model does not derive a linear or other relationship between continuous measures of habitat quality or usage. The model output indicates whether a particular locale is suitable for sage sparrows. Full details on the model development are provided in Appendix D. Although the model was derived specifically for big sagebrush-dominated plant communities, the model conditions—adjusted for other appropriate native shrub species (see Section 5.2.3.3 and Appendix D)—will be used to define Level III, late-successional shrub-steppe habitat during ecological compliance reviews.

An estimate of the extent of this habitat on Hanford relative to other Level III resource areas is presented in Figure 4.5. Because this estimate is based on the sage sparrow association model, it represents only big sagebrush-dominated areas. Moreover, actual usage by sage sparrows of the estimated suitable area may depend on landscape effects not examined by the model. Because fragmentation of this habitat may adversely affect sage sparrow usage (as well as other shrub-steppe species) of otherwise suitable areas, any unavoidable project impacts should be directed away from the largest patches of remaining late-successional shrub-steppe. Thus, the next step in the mitigation planning priority is:

- Step 3—Preferentially avoid impacts to large blocks of late-successional shrub-steppe habitat over impacts to smaller blocks; preferentially avoid impacts to areas of late-successional shrub-steppe habitat that are near other Level IV or III resource areas over impacts to areas that are not near such resources (as indicated on the composite resource maps in Section 4.3.4).

Although preservation of a mosaic of different successional stages of shrub-steppe on Hanford is

vital for maintaining the full diversity of shrub-steppe-dependent species, the late-successional stages are of most concern because recent past wildfires have removed significant portions of similar habitat and they are at risk because of the potential for land conversion on the central plateau of Hanford. The DOE-RL recognizes both the importance of late-successional shrub-steppe habitat to the Columbia Basin Ecoregion and the role Hanford plays as a refugium for this habitat.[9] Thus, a final prioritization for mitigation planning purposes is appropriate that distinguishes late-successional communities from earlier successional stages.

- Step 4—Preferentially avoid impacts to all areas of late-successional shrub-steppe habitat over impacts to areas of early-successional shrub-steppe habitat (as indicated on the composite resource maps in Section 4.3.4).

Because early-successional shrub-steppe habitat is considered a Level II resource unless it can be demonstrated otherwise (see Section 5.2.3.3), impacts to these areas—though they should be avoided or at least minimized—do not qualify for mitigation via rectification and/or compensatory mitigation. Thus, in comparison with other shrub-steppe resources, they have the lowest priority for impact avoidance.

The application of a landscape-scale approach to prioritizing between mitigable shrub-steppe resources is best applied to broad scale land-use planning as achieved by the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)* (DOE 1999). Even if the Land Use Plan "zones" a particular area containing biological resources of concern as available for development (but with constraints), the site selection process for a particular project should consider the planning priorities outlined above and avoid as much impact and potential mitigation cost as possible.

5.2.3.3 Mitigation Thresholds

Even after following the mitigation hierarchy and the guidance in Section 5.2.3.2 to the extent possible, a project may still have significant residual impacts on Level III or IV resources. Therefore, once it is determined that a proposed action might adversely impact a potentially mitigable resource, it is then necessary to determine whether the impact will be significant and require mitigation via rectification and/or compensatory mitigation.

In the sections that follow, mitigation thresholds are provided for each type of mitigable resource. A threshold is an allowable amount of impact above which the impact is considered significant and should be mitigated. It is defined here as the amount of habitat value reduction or potential species population impact that will trigger rectification and/or compensatory mitigation. Mitigation thresholds address only human-induced impacts and not natural events. Depending on the type of resource being considered, a threshold determination may need to take into account the on-the-ground condition (or quality) of the resource, its location relative to other biological resources of concern, and the amount (e.g., area or population) of the resource that will be impacted.

The impact thresholds discussed below do not address those impacts (e.g., human proximity or human-caused noises) and their mitigation associated with disturbing the perching, roosting, or nesting behavior of bald eagles or nesting behavior of ferruginous hawks. These considerations are addressed in Section 7.4.8.

Level IV Biological Resources—Any impact to a Level IV resource is considered potentially significant. Therefore, the threshold value for Level IV resources is any reduction in area or loss in ecological function of a habitat-based resource or loss or reduction in use of a fall chinook salmon spawning area (i.e., redds) or documented bald eagle primary night roost or attempted nest site locations. Level IV resources at Hanford must be protected against impacts.

Riparian Habitat/Wetlands/100-Year Floodplain—Any impact to a riparian habitat or to a qualifying jurisdictional wetland resource or to key biological resource values within the Hanford Reach 100-year floodplain is considered potentially significant. Therefore, the threshold value for riparian habitat/wetland/floodplain resources is any reduction in area or loss in ecological function. To qualify for consideration, riparian habitats must either be

[9] Letter from J. E. Rasmussen to The Hanford Natural Resource Trustees, dated May 22, 1995. Cumulative Impacts on the Mature Shrub-Steppe Habitat of the Central Plateau (200 Area and Vicinity) of the Hanford Site.

composed of predominantly native vegetation, provide habitat for Level III or IV species, or serve to protect the ecological functioning of adjoining wetland or deepwater resources. To qualify as a jursidictional wetland, the wetland must meet the appropriate criteria specified in the 1987 U.S. Army Corp of Engineers' wetlands identification manual (ACOE 1987); see Appendix D for additional information.

Late-Successional Shrub-Steppe—Ideally, it would be beneficial to be able to calculate habitat value on a scale that reflects some measure of relative value. Scaled habitat value models, such as Habitat Suitability Index (HSI) models, currently are not available for habitats at the Hanford Site. Until such models are developed, and at least for large, native shrub-dominated communities (i.e., big sagebrush, bitterbrush, and spiny hopsage), the variables and thresholds used in the sage sparrow habitat association model will be used in conjunction with geographically based area threshold values as an interim mitigation threshold for late-successional shrub-steppe.

The determination of whether a mitigation threshold may be exceeded by a given project is made during the ecological compliance review process and will be based on the on-the-ground, field-verified condition of the habitat and the amount of area to be impacted. Thus, two different thresholds must be exceeded before a project will incur a mitigation commitment to rectify and/or compensate for the impact, as appropriate: one threshold addresses habitat quality and the second the amount of area impacted based on geographic location.

To exceed the habitat quality threshold, the habitat variables at the site of the impact must meet three sage sparrow model conditions:

- at least 10% cover of big sagebrush
- mean big sagebrush height of at least 0.5 m
- no more than 25% ground cover by cheatgrass.

See Appendix D for details on model development. As pointed out in Section 5.2.3.2, the use of model conditions (i.e., shrub cover and height) for determining appropriate mitigation thresholds will be extended to other late-successional shrub-steppe habitats containing bitterbrush or spiny hopsage. These shrubs often are present at Hanford as pure stands or as part of a mixed shrub community along with big sagebrush. Therefore, the cover and height conditions apply to pure stands of each of these shrubs or to mixed communities in which each shrub type can contribute to the cover and height characteristics of a particular area. Finally, for marginal habitat areas (i.e., those areas that qualitatively are difficult to judge as to whether or not they meet the model conditions), field crews conducting the ecological compliance review will use sighting information for biological species of concern (e.g., sage sparrows) as further confirmation of an area's capability to exceed the habitat quality threshold.

To exceed the area threshold, the project must impact areas greater than those identified in Table 5.3. The area threshold values in Table 5.3 are based on the estimated home range size of the sage sparrow and the land-use and disturbance patterns currently

Table 5.3 Mitigation Area Thresholds for Late-Successional Shrub-Steppe Habitat Areas

Level of Impact	Geographic Area on Hanford			
	600 Area (ha)	200 West Expansion Area; 200 Area Corridor (ha)	200 East: south portion; 200 West: northeast corner (ha)	All other sites within 200, 300 and 400 Area fences, 100 Area perimeter roads, and 1100 Area industrial sites (ha)
Individual site	0.5	1	5	No mitigation of habitat loss required other than avoidance and minimization
Project cumulative	2.5	5	10	

present on the Hanford Site. The home range size for the sage sparrow is conservatively estimated to be 0.5 ha (about 1.24 acres) of late-successional sagebrush-steppe (see Appendix D for the derivation of this value). Different mitigation area threshold levels are set for different geographic areas on the Hanford Site. The area thresholds also apply to late-successional habitats containing bitterbrush or spiny hopsage. The different area threshold levels reflect current land use (industrial versus open space) surrounding the patches of late-successional, shrub-steppe habitat found within these areas, the size of the patches of habitat, and the connectivity of the patches to similar habitat.

Because the shrub-steppe patches within the 600 Area are generally surrounded by open space (i.e., undeveloped land with some habitat value), are often of large size, and tend to be connected to like patches, the 600 Area contains shrub-steppe habitat patches of the highest wildlife usage value. Therefore, this area is assigned the lowest threshold values. The big sagebrush-dominated portions of the 600 Area that are potentially affected by these guidelines are those portions identified as potential sage sparrow habitat areas in Figure 4.5. The 200 West expansion area and 200 Area corridor are assigned intermediate threshold values because, though they are in proximity to developed areas, they still represent significant blocks of suitable habitat. For the 200 Areas, including the 200 Area corridor (i.e., the 200 Area Plateau), potentially mitigable habitat affected by these guidelines, as well as the mitigation area threshold regions, are depicted in Figure 5.4.

Table 5.3 also provides both single site and project-cumulative mitigation threshold levels. This is because a single portion of a project (such as one well site) may have minimal impact and be below the threshold level, but the cumulative impact of an entire project (for instance 20 well sites) may be detrimental. These thresholds are an attempt to balance the effects of habitat fragmentation that could result from numerous small disturbances with the realization that each individual disturbance may have minimal impact.

Early-Successional Shrub-Steppe—To be considered suitable habitat to require mitigation via rectification and/or compensatory mitigation, a habitat must qualify as a Level III or IV resource area. This section provides criteria that can be used to determine whether early-successional shrub-steppe habitat areas qualify as either Level III or IV resources. Qualification will depend on both the quality of the habitat at the site of the proposed action and its geographical location. Early-successional shrub-steppe habitat areas are assumed to represent Level II resources (see Sections 4.3.3 and 5.2.3.2) unless it can be demonstrated otherwise during ecological compliance review field surveys.

An early-successional shrub-steppe habitat area will qualify as a Level IV resource provided its constituent plant community type(s) are of such a condition, rarity, size, and location that they will be accepted as terrestrial element occurrences by the Washington State Natural Heritage Program. Evaluations should be conducted in accordance with Natural Heritage Program criteria. All currently identified element occurrences on Hanford have been verified for acceptance by the Natural Heritage Program (see Appendix D). Thus, new areas proposed to qualify as an element occurrence—whether currently identified as a Level II area or otherwise—should be reviewed by the Natural Heritage Program for acceptability.

An early-successional shrub-steppe habitat area will qualify as a Level III resource provided it meets the following conditions:

- Cheatgrass ground cover is no more than 25%, and cheatgrass constitutes no more than 25% of total herbaceous (i.e., forbs and grasses) cover.
- Total herbaceous species composition is dominated (i.e., greater than 75%) by native species both in regard to herbaceous cover and species diversity.
- If appropriate to the soil conditions, a microbiotic crust is present.
- The soil shows no indication of repeated disturbances that have reduced its ability to support a native plant community and associated wildlife. Indications of recent fire is not in itself sufficient to make a determination that soil function has been impacted.
- If native shrub species are reinvading the area, the dominant species are not species of rabbitbrush.
- The stem density of the large, native shrubs (i.e., big sagebrush, bitterbrush, and/or spiny hopsage) that are present can be projected to result in a cover of at least 10% when the shrubs reach maturity.
- The area of habitat that meets the above quality conditions must have a patch size of at least

Figure 5.4 Mitigation Area Threshold Regions and Mitigable Habitat on the 200 Area Plateau

0.5 ha (about 1.24 acres) and must be located in proximity to other Level III or IV resource areas.

(Soil and herbaceous understory conditions, as well as patch size and proximity requirements are mandatory; however, shrub conditions are conditional based on the stage of succession of the area under consideration.)

Rare Plant Populations (Level III or IV)—Any impact to a rare plant population is considered potentially significant. Therefore, the threshold value for a rare plant population is any reduction in the size of the population.

Bald Eagle Perch and Secondary Night Roost Locations—Potential impacts could be CERCLA-related or non-CERCLA related. The U.S. Fish and Wildlife Service concurred through informal consultation pursuant to Section 7(a)(2) of the Endangered Species Act that U.S. Department of Energy activities that are carried out consistent with the *Hanford Site Bald Eagle Site Management Plan* (Fitzner and Weiss 1994) are "not likely to adversely affect" the bald eagle. The bald eagle management plan addresses only CERCLA-related site characterization and remedial activities. Provided it is consistent with the bald eagle management plan, DOE-RL can set guidance in regard to mitigation thresholds for bald eagle habitat. The following guidance is provided for CERCLA-related impacts:

- Any impact to a bald eagle perch and secondary night roost location that is within 1/4 mile of the average high water mark on either side of the Columbia River and that reduces its capability to function as perch or roost habitat is considered potentially significant. Therefore, the threshold value for bald eagle perch and secondary night roost locations within the 1/4 mile corridor is any loss of function as a potential perch or night roost location.
- Impacts to bald eagle perch and secondary night roost locations that are outside the 1/4 mile river corridor do not require mitigation beyond avoidance and minimization.

Non-CERCLA related actions that will potentially impact bald eagle perch and secondary night roost locations may require concurrence from the U.S. Fish and Wildlife Service that the actions are not likely to adversely impact bald eagles before the action can take place. Additionally, concurrence may depend on appropriate mitigation.

Ferruginous Hawk Historic Nest Locations—Any impact to a historic ferruginous hawk nest substrate (e.g., tree, transmission tower) that makes it unusable as a nest substrate is considered potentially significant. Therefore, the threshold value for a historic ferruginous hawk nest location is a removal of the nest substrate or reduction in physical dimension of the nest substrate that will result in the abandonment of that nesting location. See Section 7.4.8 for additional details.

Administrative Areas—Some areas of the Hanford Site have administrative designations that are associated with a biological resource protection element (see Section 7.4). To the extent that resources of concern are located within these areas, it is appropriate for Hanford Site program/project managers to consider the threshold values provided in the preceding sections as minimum standards for when mitigation via rectification and/or compensatory mitigation should be accomplished. Thus, the stated purpose of an area is an additional factor that should be considered when evaluating the need for appropriate mitigation.

5.2.3.4 Mitigation Ratios

Definition—A mitigation (or replacement) ratio can be defined as the ratio of the area over which mitigation measures are applied to the area receiving adverse impacts. The calculation of an appropriate ratio (and any adjustments made to the ratio because of time delays in accomplishing mitigation) ensures that the lost habitat value, and not simply the lost acreage, is replaced.

General Principles of Ratio Determination—Because habitat losses that may trigger compensatory mitigation are replaced based on habitat value, the replacement of lost habitat is not necessarily hectare for hectare. The difference in habitat value between the impact site and the habitat improvement area determines, in part, the appropriate mitigation ratio; however, what may be more of a determining factor is actually how much value can be added to an area by habitat improvements. Mitigation credit generally is granted only for the habitat value created by the habitat improvement and not for the previously existing value at the habitat improvement site.[10]

[10] There is an exception. Mitigation credit can be granted when it involves the preservation of high-quality, at-risk, habitat (not necessarily accomplished on a hectare-for-hectare basis).

Other factors may need to be considered in calculating an appropriate ratio. For example, if mitigation is implemented after project construction, or if replacement of habitat value takes a long time, then the mitigation ratio may need to account for additional habitat value (over and above replacement value) equal to the loss through time. Additionally, the mitigation ratio may need to be increased for a project that fragments habitat, as well as directly removes habitat, to account for the loss of value due to fragmentation. To avoid the consequences of these adjustments to the mitigation ratio, projects should minimize the time between impact and compensatory mitigation (best addressed through mitigation banking; see Section 5.2.3.6) and avoid project siting decisions that fragment Level III or IV resources.

A mitigation ratio can be based on the feasibility of how much habitat value can be added to an area. Other approaches also have been used for calculating a mitigation ratio. A ratio can be based on known or expected failure rates for mitigation. This approach is, in part, how wetland mitigation ratios have been determined. Additionally, ratios can attempt to account for the inability to ever replace the full ecological function of what has been lost. In this instance, a ratio can be proposed that is arbitrary and severe.

Current Guidance—The following mitigation ratio guidelines apply:

- For Level III plant species of concern the ratio is 1:1 (individual plants).
- For riparian or jurisdictional wetland habitats the ratio is 2:1 based on area in accordance Washington Department of Ecology requirements (Castelle et al. 1992a).
- For shrub-steppe habitats identified as Level III resources of concern, the following ratios are provided:

    1. For mitigation accomplished via rectification (i.e., the entire lost habitat value is to be replaced at the site of impact), the ratio is 1:1 based on area. No additional compensatory mitigation is needed.
    2. For mitigation accomplished via compensatory mitigation [i.e., the lost habitat value cannot begin to be replaced at the site of impact during the first two full planting seasons available following the actual impact and thus must be replaced away from the site of impact (e.g., if spring is the appropriate planting season, then revegetation should commence before the end of the second spring following the impact)], the guidance value for the ratio is 3:1 based on area.
    3. For significant impacts to mitigable habitat within the northeast corner of 200 West Area or the southern portion of 200 East Area (see Figure 5.4), a minimum mitigation ratio of 1:1 based on area applies regardless of whether mitigation is accomplished via rectification or compensatory mitigation. Because the surrounding areas include disturbed industrial sites, the preferred kind of mitigation may be compensatory regardless of whether or not the impact can be rectified onsite.
    4. For significant impacts to mitigable early-successional habitat that is mitigated using the replacement unit for late-successional sagebrush-steppe (i.e., out-of-kind mitigation; see Section 5.2.3.5), a mitigation ratio of 1:1 based on area applies regardless of whether mitigation is accomplished via rectification or compensatory mitigation.

For projects that involve a mix of rectification and compensatory mitigation (i.e., some portion of the impact site will remain impacted for periods greater than two full planting seasons), the 3:1 ratio, when otherwise applicable, applies only to that area that cannot be rectified. Mitigation ratios are not provided for Level IV resources as these resources should be protected against impacts. Should impacts to a Level IV resource be unavoidable, the ratio that may be applied can be expected to exceed that for Level III resources. The *Biological Resources Mitigation Strategy* (DOE-RL 1996) provides additional detail on mitigation ratios and their application.

Basis for the Shrub-Steppe Habitat Interim Compensatory Mitigation Ratio of 3:1 and Development and Use of Alternative Ratios—The shrub-steppe habitat mitigation ratio is interim in that, ultimately, it should be based on accurately known failure rates for improving habitat and quantitative evaluations of habitat value at the impact site and the habitat improvement site (which in turn are dependent on the development of Habitat Suitability Index models or equivalent that currently are unavailable). The interim ratio is based on an expected amount of increased habitat value that reasonably can be

achieved at any particular habitat improvement site (i.e., about 33%). If based on failure rates, the 3:1 ratio also is reasonable based on previous, but limited, habitat improvement experience at Hanford. As experience is gained in habitat improvement methods, a ratio based on failure rates can be expected to improve somewhat (i.e., be less conservative) over time. The interim ratio also is consistent with guidance provided by Washington Department of Fish and Wildlife and U.S. Fish and Wildlife Service for the New Tanks Project.

Because the mitigation ratios identified above are provided to Hanford Site program/project managers as guidance, the use of other ratios is possible. The advantages of implementing the guidance are that the ratio values have been used before, have some technical backing, or in certain applications have gained the approval of some stakeholders. Thus, programs and projects are free to pursue development and use of alternative mitigation ratios; however, they must ensure the ratios are technically based and are subject to tribal and stakeholder review and, if necessary, concurrence (i.e., a mitigation ratio should not be arbitrarily determined and used).

5.2.3.5 Replacement Units

The use of a mitigation ratio implies that a certain level of habitat improvement is necessary on a per area basis to replace lost habitat value. To provide an appropriate basis for determining how much habitat improvement is needed, the concept of a replacement unit is used. A replacement unit is the amount of habitat improvement, per resource type and per unit area, that is necessary to achieve the mitigation goal. For example, for a mitigation ratio of 2:1 and a replacement unit defined on a per hectare basis, if 10 ha are impacted then 20 replacement units of mitigation will be necessary. The quantification of the replacement unit depends on the resource impacted (i.e., the replacement unit for wetlands will be different from that for late-successional sagebrush-steppe with respect to the type and amount of vegetation seeded/planted and any physical amendments made to a site).

The *Biological Resources Mitigation Strategy* (DOE-RL 1996) will be the source of specific definitions of replacement units by resource type. Initial emphasis will be on a replacement unit definition for late-successional sagebrush-steppe. Appropriate replacement unit definitions for other mitigable habitats will be developed on an as-needed basis. Each replacement unit definition will focus on replacing those attributes of native species composition, habitat structure, and ecological function that existed at the impact site in a cost-effective manner and will emphasize natural processes to aid replacement whenever appropriate. For example, the replacement unit for late-successional sagebrush-steppe should be defined so that habitat improvement actions result, within a reasonable timeframe, in achieving at least a 10% cover of big sagebrush (i.e., the threshold value for this variable in the sage sparrow habitat association model).

Replacement unit definitions will need to account for the likelihood of survivability of planted or seeded vegetation in determining how the mitigation goal will be achieved. The *Biological Resources Mitigation Strategy* (DOE-RL 1996) also will indicate for each replacement unit when corrective action would be necessary in response to excessive habitat improvement failures that will preclude the mitigation goal from being achieved. Finally, use of replacement units should be flexible. For example, if achieving the mitigation goal relies on out-of-kind mitigation, it may then be permissible, for example, to use the late-successional sagebrush-steppe habitat replacement unit as the mitigation goal for rectifying and/or compensating impacts to early-successional habitats.

In summary, by defining a replacement unit, and by providing guidance on what can be considered successful mitigation, the uncertainty of what constitutes adequate mitigation is removed.

5.2.3.6 Mitigation Areas

General—Mitigation areas are (1) onsite—impact rectified at the site of the impact by replacing the lost habitat value through habitat improvement—and (2) offsite—impact compensated away from the site of the impact through habitat improvement.[11] An offsite compensatory mitigation area must include locations where habitat improvements can occur adjacent to native habitat areas.

[11] Offsite as used in this section refers to an area away from the project site but still on the Hanford Site. Compensatory mitigation also can be accomplished by acquisition of suitable habitat that meets the mitigation goal. In this case, the mitigation area is located off the Hanford Site.

The latter provide the relevant ecological context that enables the habitat improvements to effectively replace lost habitat value. The *Biological Resources Mitigation Strategy* (DOE-RL 1996) outlines the specific technical criteria that must be considered when siting a mitigation area. The siting of a mitigation area also must be consistent with Hanford's land-use planning goals and constraints. Once established, mitigation areas that have been designated as part of a commitment in a Mitigation Action Plan, Record of Decision, or as part of a proposed NEPA action are considered either a Level III (onsite mitigation or rectification areas) or Level IV (compensatory mitigation areas) resource area. Management of these areas is discussed further in Section 7.4.4.

Offsite mitigation areas can be established as either compensatory mitigation areas (post-impact mitigation) for individual projects or as a mitigation bank (generally, pre-impact mitigation). Depending on how far DOE-RL implements the concept of a mitigation bank, the bank area can be operated either as a specific location where habitat improvements are made in advance to offset anticipated, future multiple-project-impacts or as a common compensatory mitigation area that future projects can continue to use without the need for new siting decisions. In the absence of a mitigation bank, the selection of a project-specific compensatory mitigation area must be determined for each individual project.

The Special Case of Mitigation Banking—The long-term goal of the mitigation strategy is that most compensatory mitigation will be accomplished via participation in a mitigation bank. Under a true mitigation banking concept, habitat improvement actions are taken before impacts occur in anticipation that unavoidable future losses will need to be compensated.

Although a true mitigation bank would be the most desirable approach to compensatory mitigation at Hanford, the degree to which compensatory mitigation is coordinated sitewide can range from a project-by-project approach (no coordination) to complete coordination with pre-emptive habitat value replacement (true bank). Thus, there are intermediate options to a true bank should that level of coordination be unattainable. Four different levels of coordination can be identified:

1. Each project (or program) identifies its own compensatory mitigation areas, plans and implements its own habitat improvements, and maintains responsibility for maintenance and monitoring of the mitigation areas.
2. One or more common mitigation areas are identified, but each project continues to plan and implement habitat improvements within that area and is responsible for the continued monitoring and maintenance of its portion of the mitigation area.
3. A pseudo-mitigation bank is created that uses one or more common mitigation areas. The habitat improvements are coordinated by the bank managers using standardized implementing procedures, and the maintenance and monitoring of the mitigation areas are the responsibility of the bank managers. Under a pseudo-bank concept, credits are created (e.g., through habitat improvement) as a response to project needs; however, most likely, such credits are created after the losses already have occurred.
4. A true mitigation bank is created. This is essentially the same as a pseudo-bank, except that credits are created in anticipation of future project needs and before the project-induced losses occur.

Use of a common mitigation area will save time and money because siting decisions need to be made only once. Use of a banking system saves additional money because individual projects will not be required to engineer the habitat improvements or set up individual sub-contracts to accomplish the improvements. Under a bank system, each project would simply pay into a common pool operated by the bank managers (tentatively Office of Site Services) who would then coordinate the habitat improvements for all projects. Use of a true mitigation bank would ultimately be the most cost effective, but it would require that non-project-specific "seed money" be identified and appropriated to create the initial bank credits before they are needed by projects.

The advantages of mitigation banking include:

- better overall coordination of Hanford Site mitigation
- elimination of the learning curve on a project-by-project basis
- reduction of the time required for preparation of NEPA documents

- reduced cost because of the economy of scale
- improved consistency in mitigation practices
- elimination of extended project durations required to complete mitigation and monitoring
- enabling projects to adequately budget for mitigation
- ensuring mitigation will be performed by experienced personnel.

The two key concepts of the mitigation bank are:

- Impacts of a similar nature are treated in a similar but comprehensive manner
- Mitigation efforts are begun (and objectives are met, if possible) before the impact occurs.[12]

Under these concepts, projects may begin mitigation efforts (pay into the bank) before any disturbance to the resource takes place. When a balance accrues in the bank, the project may take credit for the mitigation when the impact occurs (withdraw from the bank). Although pre-payment is preferred, projects would be allowed to pay into the bank at any time.

Mitigation banking provides a means both to minimize the risk to resource health and survival posed by future projects and to perform the habitat improvement and monitoring in a manner that takes advantage of economies of scale. Mitigation banking is a concept that has been well developed for addressing wetlands impacts (e.g., Castelle et al. 1992b), but has been less well-defined for impacts in other areas, although it is recognized as a potential component of mitigation by both the U.S. Fish and Wildlife Service (46 FR 7644, USFWS 1988) and the Washington State Department of Fish and Wildlife (Policy 3000, October 1992).

The *Biological Resources Mitigation Strategy* (DOE-RL 1996) describes the following components of a mitigation bank system:

- bank objectives and currency
- bank site(s), including necessary site protection and controls
- a policy for bank operation, including payments, construction, use of credits and debits, and bank management responsibilities
- funds and schedule for monitoring, remedial actions, and reporting on bank operations.

5.2.3.7 Mitigation: Summary of Project Manager Recommended Actions

The mitigation associated with a proposed action can be determined in a number of ways. For a project that is tied to a specific location, the ecological compliance review report will contain mitigation recommendations that the project manager should consider. By being tied to a specific location, however, much of the flexibility associated with the mitigation hierarchy of actions is not available.

For projects that include a site-selection component as part of the proposed action, there is more flexibility available to use the mitigation process. This can help reduce the amount of impact to biological resources of concern and the associated mitigation cost by first following the mitigation hierarchy and second by using mitigation requirements as part of the trade-off analysis for choosing between alternative locations and actions.

The steps listed in the box on page 5.21 outline actions a project manager needs to take to be in compliance with mitigation requirements. The steps can aid avoiding unnecessary adverse impacts to biological resources of concern (and thereby reducing the amount of costly mitigation) and determining what additional mitigation may be necessary for a proposed action when adverse impacts are unavoidable.

5.2.4 Roles and Responsibilities

Effective implementation of the mitigation strategy requires that the roles and responsibilities be well defined for DOE-RL and each of the contractors. The roles and responsibilities for each of these organizations or groups are described in the *Biological Resources Mitigation Strategy* (DOE-RL 1996). The overall relationships are depicted in Figure 5.5.

5.3 Restoration

As discussed in Section 5.2.3.1, restoration can be distinguished from mitigation by the nature of the

[12] Beginning mitigation before the impact occurs may act to reduce the required mitigation ratio. The calculation of lost habitat value is partly time-dependent. If mitigation is delayed, the amount of habitat value needed to be replaced may increase.

Mitigation: Summary of Project Manager Recommended Actions

Step 1—If site selection has yet to be determined or can be modified for a proposed action, use the composite biological resource level of concern maps in Chapter 4.0 to determine where constraints for siting may exist (for the 200 Areas, use Figure 5.4).

Step 2—As applicable, follow to the extent practicable the mitigation planning priority guidance outlined in Section 5.2.3.2 for avoiding adverse impacts to the highest valued shrub-steppe resources.

Step 3—For the site selected, determine whether a mitigation threshold has been exceeded based on the kinds of resources potentially impacted in accordance with Section 5.2.3.3. When it becomes necessary to formally document this determination, the documentation will be provided to the project manager via the ecological compliance review report. The project manager may desire, however, to make his/her own preliminary determination.

Step 4—If a mitigation threshold has been exceeded, determine the applicable mitigation ratio (Section 5.2.3.4) and replacement unit (Section 5.2.3.5) for the kind(s) of resource(s) impacted. Determine the overall mitigation requirement for this proposed site/action. As for Step 3, final mitigation requirements will be documented in the ecological compliance review report. The Hanford Biological Resources Laboratory can be contacted for assistance with any of the preceding determinations.

Step 5—If alternative site locations and/or actions are being compared, repeat any of the necessary steps above for each location/action.

Step 6—If compensatory mitigation is required, work with the Hanford Biological Resources Laboratory to identify potential mitigation areas. The Laboratory will assist in determining whether a common mitigation area already exists and is available or whether a new mitigation area must be selected to mitigate for the proposed action (Section 5.2.3.6).

Step 7—Define the mitigation goal for the project. Plan, budget for, and implement, as necessary, any recommended mitigation actions.

Step 8—Plan to monitor the success of any mitigation action conducted and be prepared to correct any failures.

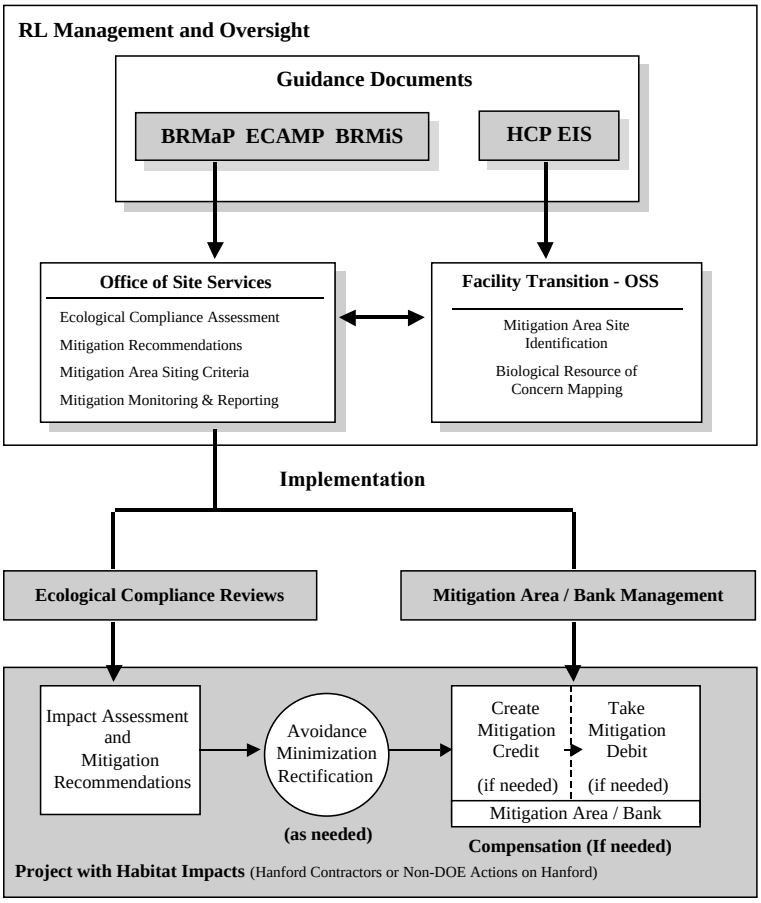

Figure 5.5 Organizational Structure and Flow for Implementation of Biological Resource Mitigation (BRMaP = Biological Resources Management Plan; BRMiS = Biological Resources Mitigation Strategy; ECAMP = Ecological Compliance Assessment Management Plan; HCP EIS = Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement; OSS = Office of Site Safety)

impacts to biological resources they each address. Mitigation addresses those impacts to existing resources that will occur as a result of a proposed action. In contrast, restoration addresses human-caused impacts that may have occurred in the past (e.g., at a past-practice waste site). Although this example may be restoration's chief application at Hanford, the concept also can be applied more generally: for example, the site of a decommissioned, but previously non-contaminated building, also is a candidate for restoration. Finally, restoration also can be considered at scales larger than an individual waste site or building.

This section provides an overview of what restoration entails at Hanford. As will be discussed below, there are a number of constraints that preclude specifying specific requirements for restoration. What can be provided at this point are some guiding principles and the beginning outlines of a Hanford Site restoration strategy.

5.3.1 Purpose and Goals

The narrow purpose of restoration is to create some amount of habitat value at a site (e.g., past-practice waste site, industrial area, road, etc.) at which at the time of remediation, decommissioning, or end of use little or no value exists. A broader purpose of restoration is to replace habitat value and ecological function over a broad geographic area to account for accumulated losses of value and function attributable to human-induced impacts.

The general goal of restoration is to establish, through the use of habitat improvement methods and the aid of natural processes, the necessary species composition, structural components, and ecological processes at a site such that it can support native plants, fish, and/or wildlife.

The specific restoration goal depends, in part, on what future use is planned for the site and, if the land-use goal is to create habitat value for the benefit of plants, fish, and wildlife, in part, on the kind of habitat that is desired (i.e., it may not be necessary or prudent to attempt to establish the same kind of habitat that existed at the site before the initial human-induced disturbance). In those cases in which the land-use goal is not to create habitat value at a particular site subsequent to remediation, decommissioning, or end of use, the site may simply be stabilized (e.g., for dust control purposes) or it may be converted to other uses (e.g., putting in a new building, a parking lot, etc.).

5.3.2 Legal and Policy Basis

Restoration already has occurred at Hanford. Most recently, this involved revegetating some sites associated with the Basalt Waste Isolation Project. Today, however, there is little legal basis for determining when restoration may be appropriate for the types of activities conducted at Hanford. For example, for terrestrial waste site cleanup scenarios in which site remediation occurs under CERCLA, there is little specific guidance provided, let alone legal requirements that address restoration of habitat lost incidental to the release of hazardous substances and conducted subsequent to remediation.

No specific, broadly applicable policy exists at Hanford for waste site restoration or any other form of restoration; however, in March 1996, DOE-RL became a signatory to a Memorandum of Agreement in which the agency agreed to participate in the Hanford Natural Resource Trustee Council.[13] One objective of the Trustee Council is: "To integrate, to the extent practicable, natural resource restoration into remedial actions taken at the Hanford Site..." A second objective encouraged: "...the development and implementation of sitewide natural resource planning which supports mitigation, restoration, and management goals, and encompasses good stewardship practices." Any future policy in regard to restoration will reflect DOE-RL's participation as a Natural Resource Trustee.

5.3.3 Implementation

General Principles—Although restoration and mitigation have been distinguished by the types of impacts they address, they share a commonality when their actions are directed at replacing lost habitat value. Moreover, instead of just considering restoration in the narrow sense of what occurs at an individual site subsequent to remediation, decommissioning, or end of use, restoration also can

[13] Signatories to the Hanford Natural Resource Trustee Council Memorandum of Agreement are the U.S. Department of Energy (Richland Operations Office), U.S. Department of Interior, Nez Perce Tribe, State of Oregon, Confederated Tribes of the Umatilla Indian Reservation, state of Washington, and the Confederated Tribes and Bands of the Yakama Nation.

be viewed from a broader, sitewide perspective. Given that Hanford is in the midst of a large-scale remedial effort, decisions will need to be made about which lands will be restored and which will not subsequent to remediation. This decision process can be aided if it is understood that the success of restoration is better judged at ecological scales and not necessarily at the scale of an individual waste site. Therefore, restoration can be more successful if it is fully integrated with a Hanford sitewide mitigation strategy. This is especially true in those instances in which restoration efforts (i.e., the creation of habitat value) are better served if they are performed other than at the remediated waste site.

Restoration planning decisions should be made in concert with sitewide land-use planning decisions. Thus, restoration should be accomplished with a broad vision in mind. What should the entire site look like for the foreseeable future? Where are the best places to restore, or where should restoration otherwise occur when a particular remedial/decommissioning site cannot be successfully restored or its intended land use is not to provide habitat for plant, fish, or wildlife populations? Thus, whenever possible, restoration should be planned based on a landscape perspective of sitewide restoration needs rather than just on an individual remedial or decommissioning site basis.

Because restoration involves creation of habitat value, it can use the same technical approaches as have been outlined in Section 5.2 for mitigation via habitat improvement (e.g., the use of replacement units insofar as the concept helps guide how much habitat improvement effort may be needed to achieve the restoration goal). Further technical guidance (i.e., specifically in regard to revegetation) is provided in Section 7.2 and the *Biological Resources Mitigation Strategy* (DOE-RL 1996). Finally, as is the case for designated onsite mitigation or rectification areas, areas that have been restored as part of a commitment in a Mitigation Action Plan or Record of Decision should be regarded as Level III biological resources of concern (see Section 7.4.5 and Table 7.1).

Restoration in a CERCLA Context—Ultimately, a restoration strategy, insofar as it will be driven by CERCLA-related needs, will probably reflect the consensus viewpoint of members of the Hanford Natural Resource Trustee Council. Because of this likelihood, it would be inappropriate to unilaterally outline here the specifics of a restoration strategy. As a starting point, however, it may be helpful to identify a few considerations in regard to CERCLA-related restoration. These are:

- Restoration agreements can be either negotiated waste site by waste site or at larger scales. For reasons provided previously, at least from an ecological perspective, the latter approach is preferred.
- Restoration agreements, especially if they cover a broad geographic area, may necessitate a comprehensive (perhaps sitewide) restoration plan.
- An agreement on restoration that arises out of a cooperative relationship between DOE-RL and the other Hanford Natural Resource Trustees is preferable to one that is dictated via a formal Natural Resource Damage Assessment process.
- Implementation of a landscape-scale restoration effort does not, and perhaps should not, wait until all waste site remediations are complete.
- To facilitate an early agreement on the scope of restoration, it may not be necessary to tie the need for restoration directly to the effects of contaminant exposure.

Non-CERCLA Related Restoration Actions—Restoration in a non CERCLA-related context will not necessarily be subject to Hanford Natural Resource Trustee Council purview, though at its discretion DOE-RL can invite non-DOE Trustee input. With no specific impetus for restoration, it is important that restoration decisions are based on intended land use and are, in general, in concert with other sitewide initiatives (i.e., mitigation and CERCLA-related restoration). Thus, the considerations for non-CERCLA related restoration are as follow:

- Unless some formal commitment has been made through mechanisms such as a NEPA document in which it is identified that following the useful life of a project site conditions will be restored, restoration is otherwise discretionary.
- When restoration will take place, then its goal should be to replace habitat value commensurate with the site's location and other resource management initiatives (e.g., perhaps a management objective is to enhance the status of a particular resource at Hanford).

- If the intended land use for an area is not to function as plant, fish, and/or wildlife habitat, then site stabilization or conversion to other uses should be pursued, as appropriate.

Toward a Hanford Site Restoration Strategy—A prerequisite for the development and implementation of a Hanford Site restoration strategy is a comprehensive, long-term vision of the Hanford Site and its public uses. Implicit in this vision is that, for the foreseeable future, there will be a considerable federal presence at Hanford. To be successful, a sitewide restoration strategy must enable DOE-RL to pursue those missions society deems appropriate and must have the backing of local tribes and stakeholders.

A Hanford Site restoration strategy should encompass the following considerations:

- The strategy should be developed and implemented in conjunction with comprehensive land-use planning for the Hanford Site and be consistent with a future vision of the Site (DOE 1999). Thus, constraints on restoration planning, such as areas intended to remain industrial for the foreseeable future, should be acknowledged.
- The strategy should be developed and implemented in accordance with the principles of ecosystem management as outlined in other sections of this document. Thus, restoration planning should consider ecological boundaries as well as administrative and consider restoration needs within the context of the surrounding ecoregion.
- The strategy should be developed and implemented in concert with Hanford's sitewide mitigation strategy. Common areas for conducting habitat improvement should be considered and concepts such as banking should be investigated for their mutual applicability and overall benefit to resource management.
- The strategy should be developed and implemented with the meaningful participation of local tribes and stakeholders.

Restoration: Summary of Project Manager Recommended Actions—For CERCLA project managers, individual restoration actions, at least in the short-term, will be a result of coordination between DOE-RL and the other members of the Hanford Natural Resource Trustee Council. For non-CERCLA project managers, restoration will more than likely remain discretionary. The lack of a restoration requirement, however, does not preclude a project from having to at least stabilize a site based on other requirements (e.g., dust suppression).

5.3.4 Roles and Responsibilities

The performance of restoration actions is the responsibility of the relevant DOE-RL program or project lead in conjunction with the relevant contractor, as necessary. For CERCLA-related projects, the environmental restoration contractor is responsible for all restoration actions. Until a sitewide restoration strategy is in place, there is no overall oversight responsibility for restoration.

5.4 Tribes and Stakeholders

Several Tribes and stakeholders have both concerns for and interests in the impact management of, mitigation of impacts to, and restoration of Hanford's biological resources. These include the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and the Wanapum people, USFWS, WDFW, and Washington Department of Natural Resources.