

Ecological Risk Assessment – Steps 3 and 4 Screening and Baseline Ecological Risk Assessment



In its 2000 session, the Wyoming Legislature created new opportunities, procedures, and standards for voluntary remediation of contaminated sites. These provisions, enacted as Articles 16, 17, and 18 of the Wyoming Environmental Quality Act and implemented by the Wyoming Department of Environmental Quality (DEQ), will govern future environmental cleanups in Wyoming.

This Fact Sheet describes the procedures required for Steps 3 and 4 in the Wyoming Voluntary Remediation Program (VRP) ecological risk assessment process. It supplements other Wyoming Department of Environmental Quality (DEQ) VRP Fact Sheets, including the following:

- Fact Sheet #8 *Site Characterization*
- Fact Sheet #11 *Risk Assessment*
- Fact Sheet #13 *Groundwater Cleanup Levels*
- Fact Sheet #14 *Ecological Risk Assessment—Steps 1 and 2 Ecological Exclusion and Scoping Assessments*

1. What are the steps in a VRP ecological risk assessment?

The DEQ ecological risk assessment process consists of four possible steps (Figure 1):

- Step 1: Ecological Exclusion Assessment
- Step 2: Ecological Scoping Assessment Checklist and Documentation
- Step 3: Ecological Screening Assessment
- Step 4: Baseline Ecological Risk Assessment

Steps 1 and 2 are addressed in Fact Sheet #14 *Ecological Risk Assessment—Steps 1 and 2 Ecological Exclusion and Scoping Assessments*. Steps 3 and 4 are the focus of this Fact Sheet. In Step 1, a site is evaluated through a simple Ecological Exclusion Assessment to screen out sites where ecological receptors are unlikely to be significantly exposed to site-related chemicals. For those sites that are not excluded from further ecological assessment during Step 1, Steps 2, 3, 4, or remedial action may be initiated depending on the ecological complexity and concerns at the site. Step 2 (Ecological Scoping Assessment) is intended to qualitatively determine whether the exposure of ecological receptors to site-related chemicals is likely and whether a site should undergo a more complex risk assessment or remediation. If important ecological receptors, exposure, or toxicity are shown to be negligible during Step 2, then further ecological assessment may not be necessary. Similar to Step 1, for sites that are not excluded from further ecological assessment during Step 2, additional ecological assessment (i.e., Steps 3 or 4) or remedial action may be initiated by the Volunteer depending on the ecological complexity and concerns at the site.

Step 3 involves a comparison of site-related chemical concentrations to contaminant concentrations that are considered to be safe for plants, invertebrates (insects, spiders, etc.), fish, and wildlife. Step 3 documentation provides a list of these ecological risk-based screening levels.

The Step 4 Baseline Ecological Risk Assessment involves calculating species-specific risk estimates using readily available exposure and toxicity information. Step 4 may also involve collecting additional site-specific exposure or toxicity information (e.g., field investigations) that may be submitted separately from, or incorporated into the Baseline Ecological Risk Assessment Report.

The actual procedures and technical details for Steps 3 and 4 are outlined in two VRP Technical Support Memoranda: 1) *Fact Sheet #19 – Technical Support Memo 3: Step 3 Ecological Screening Assessment*, and 2) *Fact Sheet #19 – Technical Support Memo 4: Step 4 Baseline Ecological Risk Assessment*.

In general, DEQ expects the equations presented in the Memoranda to be used when making risk assessment calculations and if used, do not need further discussion with DEQ. Volunteers, however, may propose other means of calculation to DEQ, and these will be considered on an individual basis.

The Wyoming VRP process follows the same basic framework as the U.S. Environmental Protection Agency (USEPA) ecological risk assessment guidance (USEPA 1992, 1997, 1998), but includes additional early screening procedures (Steps 1 and 2) and combines the eight USEPA steps within Steps 3 and 4. An underlying assumption and prerequisite for Steps 3 and 4 is that the type and distribution of contaminants at the site have been adequately characterized for ecological risk issues. The site characterization process is described in *Fact Sheet #8 Site Characterization*.

2. Why are these steps necessary?

DEQ recognizes that not all cleanup sites will present the same types of ecological issues. To accommodate the range of sites that will require consideration in the VRP, DEQ has developed the stepwise approach to ecological risk assessment. Under this approach, sites must first undergo a simple Ecological Exclusion Assessment (Step 1) designed to identify cleanup sites where ecological receptors are unlikely to be affected. If, after Step 1, a site requires further evaluation, it would then undergo an Ecological Scoping Assessment (Steps 2a and 2b), Ecological Screening Assessment (Step 3), a Baseline Ecological Risk Assessment (Step 4), **or** some sort of remedial action. Each subsequent step of the ecological risk assessment process is more complex than the previous step. In this manner, some sites may be excluded from the ecological risk assessment process during the early steps with relatively little effort, while complex sites may proceed from Step 1 directly to Step 4. The steps are also designed so that information gathered during earlier steps can be used to support and reduce the effort needed for subsequent steps. The risk assessment process is shown in Figure 1.

3. What is a Step 3 Ecological Screening Assessment?

Step 3 of the Wyoming VRP ecological risk assessment process is an ecological risk-based screening process to be implemented for those sites that do not qualify for an exclusion from further ecological risk assessment under Steps 1 or 2 (see Fact Sheet #14 *Ecological Risk Assessment—Steps 1 and 2 Ecological Exclusion and Scoping Assessments*). The screening is conducted by comparing site-related contaminant concentrations to concentrations that are considered to be protective of plants, invertebrates, fish, and wildlife (i.e., to ecological risk-based screening concentrations).

The Ecological Screening Assessment begins with the identification of contaminants of interest (COIs) (Step 3a), after which the Volunteer is free to immediately conduct a very simple screening using the maximum concentrations of the COIs in soil, surface water, and/or sediment (Step 3b: Medium-Specific Risk-Based Screening), or follow one or more of the successive refinement steps necessary to complete more detailed comparisons of site-related COI concentrations to risk-based concentrations established for ecological receptor groups such as terrestrial plants, terrestrial birds and mammals, fish, and aquatic birds and mammals (Steps 3c1 – 3c.2: Receptor Group-Specific Screening). Once the ecological risk-based screening procedures are complete, the results are documented (Step 3d).

At the conclusion of Step 3 there is a decision to be made by the Volunteer and DEQ as to whether the site may be excluded from further ecological assessment, requires additional site characterization, or whether a Baseline Ecological Risk Assessment (Step 4) or remedial action is appropriate. Figure 2 provides a summary of the Step 3 Ecological Screening Assessment process. Instructions for completing this step can be found in the VRP Technical Support Memo 3: *Step 3 Ecological Screening Assessment*, which is available from DEQ upon request or through the VRP website at: <http://deq.state.wy.us/volremedi/index.asp>.

4. What if I complete the Step 3 Ecological Screening Assessment and it shows that more evaluation is needed?

If the Step 3 Ecological Screening Assessment shows that more evaluation is needed, Volunteers will work with DEQ to design an approach to conducting Step 4 (Baseline Ecological Risk Assessment), determining Use Control Areas, or implementing remedial actions, as appropriate.

5. What is a Step 4 Baseline Ecological Risk Assessment?

The purpose of the Step 4 Baseline Ecological Risk Assessment is to estimate receptor-specific ecological risks and, if necessary, calculate site-specific ecological cleanup levels. Information gathered during Steps 1, 2, and 3 of the ecological risk assessment process is used to reduce the level of effort required for Step 4. Site-specific wetland delineation, critical habitat/species surveys, or other detailed field efforts may be required during Step 4, and the results of a rare, threatened, or endangered species search conducted in Step 1 (or afterward) must be incorporated into the assessment. DEQ has developed instructions for Step 4 in the VRP Technical Support Memo 4: *Step 4 Baseline Ecological Risk Assessment*, which is available from DEQ upon request or through the VRP website at: <http://deq.state.wy.us/volremedi/index.asp>.

6. What if I complete the Step 4 Baseline Ecological Risk Assessment and it shows that more evaluation is needed?

Step 4 is the last step in the ecological risk assessment process. If acceptable risks are predicted during the Step 4 Baseline Ecological Risk Assessment, remediation for the protection of the environment may be unnecessary. If unacceptable risks are predicted, then the Volunteer may proceed with refinements to the Step 4 risk estimation or may proceed to site remediation. Ecological risk management decisions should be made in consultation with DEQ because these decisions may impact the final remedies selected by DEQ through a remedy agreement.

7. What qualifications are necessary to complete Steps 3 and 4 of an Ecological Risk Assessment?

Completion of Step 3 or Step 4 requires a professional environmental contractor, ecologist, or biologist, who is familiar with site assessment and remediation methods, ecotoxicology, and ecological risk assessment principles and procedures, contaminant fate and transport processes, and current VRP rules and guidance documents. For information on hiring personnel with these skills you may contact DEQ at the numbers listed below.

8. How can I get more information?

To learn about VRP sites that may exist in your community, obtain copies of other VRP Fact Sheets/guidance documents, get answers to your questions, or volunteer for the program, contact DEQ at (307) 777-7752 or through the VRP website at: <http://deq.state.wy.us/volremedi/index.asp>.

The VRP website includes all of the Fact Sheets and other guidance documents for the VRP. This website is updated frequently and includes the latest information about DEQ's progress in developing guidance, policy, and other supporting documents for the VRP.

9. References:

EPA 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*. Interim Final. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 540-R-97-006. Available at: <http://www.epa.gov/oswer/riskassessment/ecorisk/ecorisk.htm>

EPA 1998. *Guidelines for Ecological Risk Assessment*. Final. Risk Assessment Forum, Washington D.C. U.S. Environmental Protection Agency. EPA/630/R-95/002F. April. Available at: <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460>

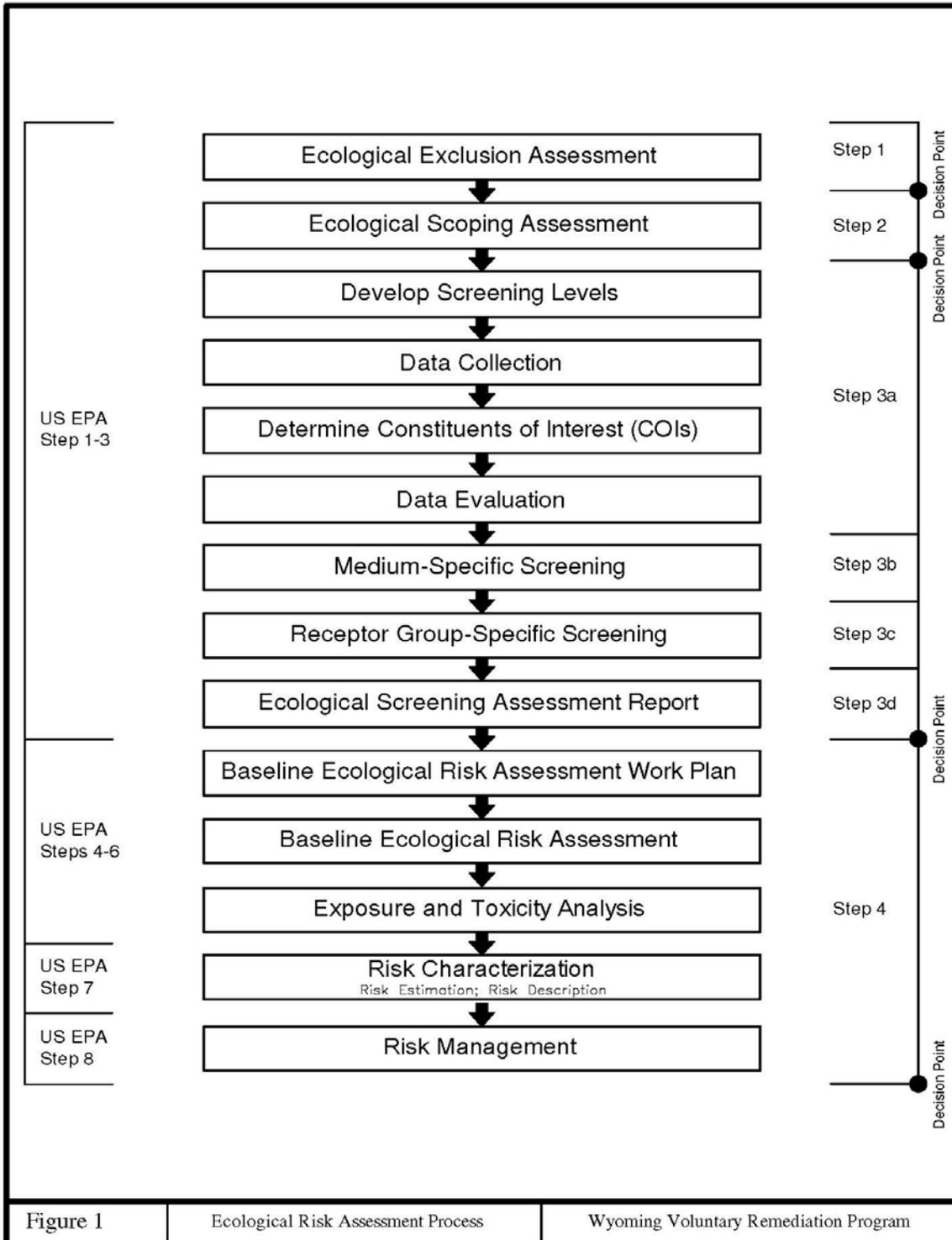


Figure 1

Ecological Risk Assessment Process

Wyoming Voluntary Remediation Program

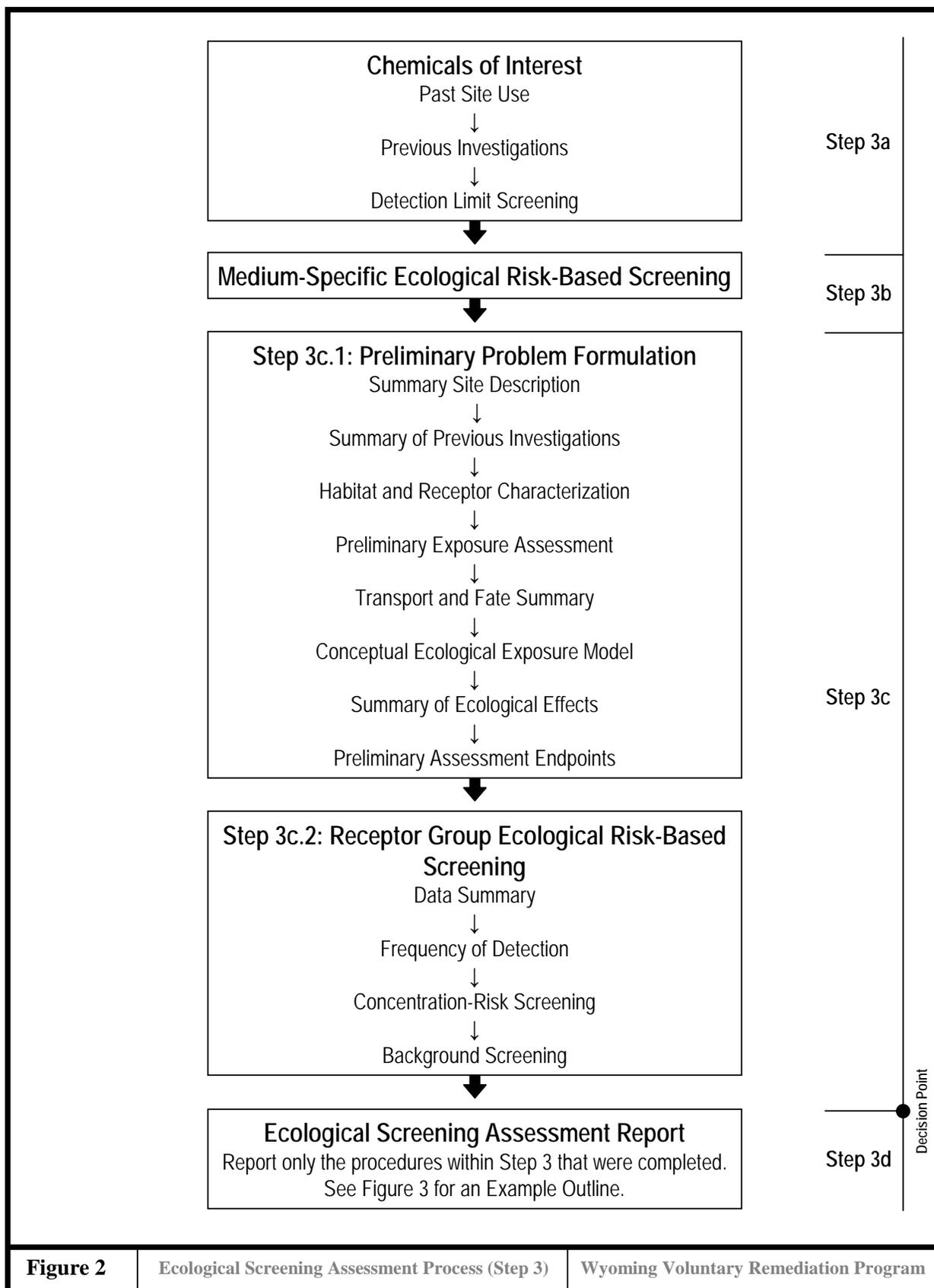


Figure 2

Ecological Screening Assessment Process (Step 3)

Wyoming Voluntary Remediation Program