

# Monitoring Resources for Fish and Wildlife Habitat Conservation Areas

## Voluntary Stewardship Program

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The Washington Department of Fish and Wildlife (WDFW) developed this monitoring resource guide to support counties participating in the [Voluntary Stewardship Program](#) (VSP). **The use and implementation of this resource is entirely voluntary.** The guide is designed to help counties develop a monitoring plan for protecting and enhancing [Fish and Wildlife Habitat Conservation Areas](#) (FWHCAs) on agricultural lands. FWHCAs are important to maintain healthy populations of species and their habitats, contribute to the state's biodiversity, and provide resiliency in the face of climate change. WDFW's [Priority Habitats and Species \(PHS\)](#) program provides science-based guidance for how to identify, designate, and protect FWHCAs, and serves as the foundation for this resource guide.

The PHS program includes the following resources:

- **PHS List:** identifies the species and habitat types that are priorities for management and conservation under the Growth Management Act, Shoreline Management Act, and other land use regulations and programs.
- **PHS Maps:** GIS spatial data on the known and modeled locations of priority habitats and species.
- **PHS Publications:** a collection of management recommendations to aid in habitat conservation and species recovery.

The information provided in the guide is intended to build upon the Washington State Conservation Commission's [VSP Monitoring Resource Library](#). WDFW's guide identifies the most common FWHCAs impacted by agriculture and does not include all PHS species and habitats. In addition, this guide is not inclusive of all critical area types. WDFW encourages counties to work with WDFW and other state agencies to identify and monitor critical areas. WDFW will update this guide as new data and resources are compiled for fish and wildlife species and their habitats.

WDFW regularly makes updates to the PHS database ([PHS on the Web](#)) as new information is collected on known locations of priority habitats and species in Washington State. To ensure counties have the most up-to-date information to support monitoring plans, WDFW recommends [requesting updated PHS data](#) every 6-12 months.

For assistance with integrating this information into your county monitoring plan, or with known distribution and management recommendations for PHS species and habitats not listed in this resource guide, please work with your local [WDFW Habitat Biologist](#).

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# Fish and Wildlife Habitat Conservation Areas

## Riparian Ecosystems

Lands that occur along the edges of rivers, lakes, and other waterbodies that encompass the active floodplain, riparian zone, and adjacent uplands. Riparian ecosystems provide important functions, including bank stability, shade, pollution removal, nutrients, and wood recruitment. Riparian ecosystems also support watershed processes, provide habitat for terrestrial and aquatic wildlife, and support climate resiliency. Riparian ecosystems occur in both forested and dryland ecoregions.

Monitoring Question	Benchmark	Indicators	Methods	Critical Area Functions	VSP Examples	Resources
Has there been a change in quantity of riparian habitat in the watershed?	Maintain riparian habitat	Change in acres of vegetative cover  Change in vegetation greenness  Change in acres enrolled in Farm Bill Programs	Change detection analysis  GIS spatial analysis	Aquatic and terrestrial habitat  Riparian Functions: shade, pollution removal, nutrients, wood recruitment, bank stability  Habitat Connectivity: animal movement, dispersal, and seasonal habitat use	HRCD: San Juan, Thurston, Skagit, Pacific  NAIP: Yakima, Chelan, Stevens, Spokane  Sentinel: Garfield, Walla Walla, Whitman  Farm Bill Programs: Walla Walla  MRLC: Douglas	<a href="#">Riparian Ecosystems, Volume 1: Science Synthesis</a>  <a href="#">Riparian Ecosystems, Volume 2: Management Recommendations</a>  <a href="#">High Resolution Change Detection (HRCD) - using NAIP imagery</a>  <a href="#">National Agricultural Imagery Program (NAIP)</a>  <a href="#">Cloud Based Monitoring Using Sentinel 2-Imagery</a>  <a href="#">Multi-Resolution Land Characteristics (MRLC) Consortium</a>
Has there been a change in quality of riparian habitat in the watershed?	Enhance riparian habitat	Acres of riparian restoration or invasive species management  Change in habitat cover, composition, or size  Change in habitat fragmentation  Change in vegetation greenness	GIS spatial analysis: compare acres lost to acres enhanced  Habitat Surveys: transect, percent cover plots, fixed radius plots  Track # of Best Management Practices (BMPs)	Riparian Functions: shade, pollution removal, nutrients, wood recruitment, bank stability	Chelan  Stevens  San Juan	<a href="#">RCO Salmon Recovery Portal</a>  <a href="#">Stream Habitat Restoration Guidelines   WDFW</a>  <a href="#">Integrated Streambank Protection Guidelines   WDFW</a>  <a href="#">White Paper - Ecological Issues in Floodplains and Riparian Corridors   WDFW</a>

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Monitoring Question	Benchmark	Indicators	Methods	Critical Area Functions	VSP Examples	Resources
Has there been a change in riparian functions at a project site?	Enhance riparian habitat	Change in vegetative cover, composition, or size  Change in channel or bank condition  Change in water quality  Change in aquatic or terrestrial habitat	Habitat assessment: Stream Visual Assessment Protocol (SVAP2)  Habitat surveys: transect, percent cover plots, fixed radius plots  Photo point monitoring	Riparian Functions: shade, pollution removal, nutrients, wood recruitment, bank stability	San Juan  Chelan  Asotin	<a href="#">Vegetation monitoring manual   Snohomish County</a>  <a href="#">NRCS Stream Visual Assessment Protocol Version 2 (SVAP2) Handbook</a>  <a href="#">Stream Function Assessment Method (SFAM)</a>
Has there been a change in stream shading?	Maintain riparian habitat	Percent of stream channel in shade	GIS spatial analysis	Stream shading	Chelan	Chelan Riparian Prioritization Map (contact VSP Coordinator to learn more)
What percentage of the watershed is providing full riparian function?	Enhance riparian habitat	Percent of riparian habitat that approaches SPTH at 200-years	GIS spatial analysis	Aquatic and terrestrial habitat  Riparian Functions  Habitat Connectivity	None currently	<a href="#">WDFW SPTH-200 Riparian Spatial Data (downloads)</a>  <a href="#">Site-Potential Tree Height mapping tool</a>



## Salmonids & Other Priority Aquatic Species

Salmonids -- which includes salmon, trout, and steelhead -- and other aquatic species including freshwater mussels and lamprey, depend on clean water, in-stream habitat complexity, and functioning riparian areas to support their life history needs. Agricultural lands are often located along floodplains, and their land-use activities can have direct and indirect impacts on aquatic life.

Monitoring Question	Benchmark	Indicators	Methods	Critical Area Functions	VSP Examples	Resources
Has there been a reduction in the number of fish passage barriers?	Enhance fish habitat	# Fish barriers removed  Linear distance of habitat made accessible to fish	Track # of barriers	In-stream habitat  Spawning and rearing habitat access	Walla Walla  Garfield  Okanogan  Yakima  Thurston	<a href="#">WDFW Fish Passage Web App</a>  <a href="#">WDFW Fish Passage Manual and Training Videos</a>
Has there been a change in the number of fish screens used for irrigation?	Enhance fish habitat	# Fish screens	Track # of fish screens in operation	In-stream habitat  Fish survival	Walla Walla	<a href="#">WDFW Fish Screening and Irrigation Diversions</a>
Has there been a change in water quantity?	Maintain stream habitat	Instream flow levels  Acre/feet water savings from BMPs  Acre/ft water rights in trust	Monitor change over time	In-stream habitat  Usable habitat for fish and aquatic species	Garfield  Lincoln  Benton	<a href="#">Ecology: Measuring and Calculating Stream Discharge</a>  <a href="#">Ecology Stream Flow Monitoring</a>
Has there been a change in water quality?	Maintain stream habitat	Temperature  Dissolved oxygen  Bacteria  Turbidity  pH  Nitrogen and phosphorus loading  Macroinvertebrate species composition	Ecology 303(d) listings  Routine water sampling  Benthic Index of Biotic Integrity (B-IBI) survey	In-stream habitat  Usable habitat for fish and aquatic species	Spokane  Whitman  Douglas  Kittitas  Garfield  Grant  Okanogan  Mason	<a href="#">Puget Sound Stream Benthos - statewide map of B-IBI scores</a>  <a href="#">Ecology Freshwater Quality Index</a>  <a href="#">Ecology: Collection, Processing, and Analysis of Stream Samples</a>  <a href="#">Ecology Statewide River and Stream ambient Water Quality Monitoring QAPP</a>  <a href="#">Ecology Recommendations for Precision Measurement Quality Objectives for Water Quality Parameters</a>

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Monitoring Question	Benchmark	Indicators	Methods	Critical Area Functions	VSP Examples	Resources
Has there been a change to in-stream habitat complexity?	Enhance fish habitat	# Runs, riffles, and pools  # Large woody debris  # Beaver dam analogs / post assisted log structures  Linear feet of side channel habitat restored	Instream habitat assessment: Stream Visual Assessment Protocol (SVAP2)  Track # of BMPs  Photo point monitoring  Watershed assessment: Intensively Monitored Watersheds	In-stream habitat  Usable habitat for fish and aquatic species  Spawning and rearing habitat access	Garfield  Asotin  Okanogan	<a href="#">WDFW Stream Habitat Restoration Guidelines, 2012</a>  <a href="#">Inventory and Monitoring of Salmon Habitat in the Pacific Northwest   WDFW</a>  <a href="#">Evaluating Watershed Response to Land Management and Restoration Actions: Intensively Monitored Watersheds (IMW) 2005 Progress Report   WDFW</a>
Has there been a change in the condition of floodplains?	Protect frequently flooded areas	Acres of impervious surface  Acres of riparian habitat  Acres of floodplain converted to ag  # Livestock exclusions	GIS spatial Analysis  Track # of BMPs	In-stream habitat  Spawning and rearing habitat access  Floodwater storage and attenuation  Pollution assimilation	Thurston  Benton  Asotin	Refer to riparian section.



## Shrubsteppe Ecosystems

Non-forested arid ecosystem consisting of native grasses, forbs, and shrubs such as sagebrush. Shrubsteppe occurs in various stages of succession and habitat quality due to fire, drought, invasive species, and land use impacts. Several statewide priority species are strongly associated with shrubsteppe, and a few are shrubsteppe obligates. The protection and restoration of large, healthy, and contiguous networks of shrubsteppe habitat provides the greatest ecosystem function. WDFW’s PHS map for shrubsteppe and eastside steppe identifies where these priority habitats are likely present.

Monitoring Question	Benchmark	Indicators	Methods	Critical Area Functions	VSP Examples	Resources
Has there been a change in the quantity of shrubsteppe habitat?	Protect shrubsteppe habitat	Change in acres of vegetative cover or greenness  Acres of rangeland conversion  Change in acres of bare ground	GIS spatial analysis	Habitat quantity  Wildlife food, cover, nesting, breeding, and migratory habitat	Yakima  Douglas  Benton  Franklin  Chelan	<a href="#">WDFW PHS Shrubsteppe and Eastside Steppe Map</a>  <a href="#">Washington Shrubsteppe Restoration and Resiliency Initiative Spatial Data</a>  <a href="#">Cloud Based Monitoring Using Sentinel 2-Imagery</a>  <a href="#">Multi-Resolution Land Characteristics (MRLC)</a>
Has there been a change in the quality of shrubsteppe habitat?	Enhance shrubsteppe habitat	Acres invasive species management  Acres of restoration  Acres of native plantings  Change in vegetative cover, composition, or size	GIS spatial analysis  Habitat surveys: transect survey, percent cover plots, line-point transect  Habitat assessment: Ecological Integrity Assessment  Photo point monitoring  Track # of BMPs	Habitat quality  Wildlife food, cover, nesting, breeding, and migratory habitat	Douglas  Yakima	<a href="#">Management Recommendations for Washington's Priority Habitats: Shrubsteppe (Ecological Integrity Assessment: Appendix 9)   WDFW</a>  <a href="#">Washington Shrubsteppe Restoration &amp; Resiliency Initiative Spatial Data</a>  <a href="#">Rangeland Analysis Platform</a>  <a href="#">USDA Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems</a>  Grazing Guidance and Grazing Management Tools   WDFW (request for access)

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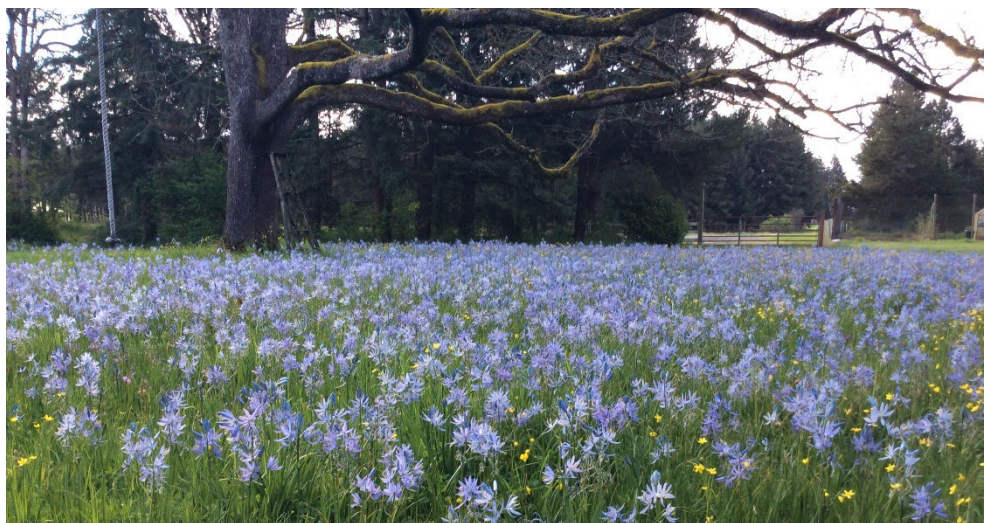
Monitoring Question	Benchmark	Indicators	Methods	Critical Area Function	VSP Examples	Resources
Has there been a change in the connectivity of shrubsteppe habitat?	Protect shrubsteppe habitat	Acres of vegetative cover retained in core areas	GIS spatial analysis	Habitat quantity  Wildlife food, cover, nesting, breeding, and migratory habitat	Benton  Franklin  Yakima	<a href="#">WDFW PHS Biodiversity Areas and Corridors Map User Guide</a>  <a href="#">Washington Shrubsteppe Restoration and Resiliency Initiative Spatial Data</a>  <a href="#">Arid Lands Initiative Map</a>
Has there been a population level change in a shrubsteppe indicator species?	Protect shrubsteppe species	Species population trends	Wildlife surveys	Species recovery, biodiversity, and ecosystem health	Douglas - sage grouse  Okanogan - sharptailed grouse  Walla Walla - ferruginous hawk  Benton - sagebrush sparrow	<a href="#">WDFW Periodic Status Reviews and Progress Reports</a>  Local Audubon Chapter Bird Surveys



## Oak Woodland Ecosystems

Oregon white oak is Washington's only native oak. Although limited and declining, oaks and their associated floras comprise distinct woodland ecosystems. The various plant communities and stand age mixtures within oak forests provide valuable habitat that contributes to wildlife diversity statewide. In conjunction with other forest types, oak woodlands provide a mix of feeding, resting, roosting, and breeding habitat for many wildlife species. Oaks' slow growth rate means it is difficult to replace or mitigate the loss of habitat function when mature oaks are cut.

Monitoring Question	Benchmark	Indicators	Methods	Critical Area Function	VSP Examples	Resources
Has there been a change in the quantity of oak trees?	Protect oak habitat	# Trees lost  Change in acres of oak canopy cover	GIS spatial analysis  WDFW's mapping protocol for oak woodlands	Wildlife habitat, cover, nesting, and food sources  Function vary based on the age and size of oak trees	None currently	<a href="#">WDFW PHS Management Recommendations: Oregon White Oak Woodlands</a>  <a href="#">WDFW PHS Best Management Practices for Mitigating Impacts to Oregon White Oak Priority Habitat</a>
Has there been a change in the quality of oak habitat?	Enhance oak habitat	Acres of conservation easements  Acres of oak enhancements  Acres of native oak plantings  Acres of invasive species management	Track # BMPs  Photo point monitoring  WDFW's functional assessment protocol for oak woodlands	Wildlife habitat, cover, nesting, and food sources  Function vary based on the age and size of oak trees	None currently	<a href="#">WDFW PHS Best Management Practices for Mitigating Impacts to Oregon White Oak Priority Habitat</a>  <a href="#">Oak Habitat Metric Rapid Assessment Tool</a>





## Biodiversity Areas & Corridors

Lands with comparatively rich and abundant wildlife that are connected to allow wildlife to move between core habitat areas and enhance resiliency in the face of climate change. The WDFW PHS Biodiversity Areas and Corridors (BAC) map identifies large areas of intact native habitat and habitat corridors connecting those areas. Protecting intact native habitat and minimizing fences, roads, or development are high priorities for these areas. With wildlife-friendly management, low intensity land uses, like dryland agriculture, can support animal movement between native habitats.

Monitoring Question	Benchmark	Indicators	Methods	Critical Area Function	VSP Examples	Resources
Are biodiversity areas and corridors protected at the watershed-scale?	Protect habitat	Acres of habitat retained in core areas  Acres of low intensity agriculture retained in core areas  Acres of conservation easements	GIS spatial analysis	Animal movement, dispersal, breeding, genetic exchange, and seasonal habitat use  Population resiliency	Benton  Franklin	<a href="#">WDFW PHS Managing for Biodiversity in Developing Areas</a>  <a href="#">WDFW Biodiversity Areas and Corridors Map for the Columbia Plateau</a>  <a href="#">Arid Lands Initiative Map</a>  <a href="#">Washington Shrubsteppe Restoration and Resiliency Initiative Spatial Data</a>
Have biodiversity areas and corridors been enhanced through land use practices?	Enhance habitat	Acres of habitat restoration  Linear feet of wildlife friendly fencing or related BMPs  Acres of lands enrolled in CRP or other Farm Bill Programs	Track # of BMPs	Animal movement, dispersal, breeding, genetic exchange, and seasonal habitat use  Population resiliency	None currently	Same as above



## Other Species/Habitats of Local Significance

WDFW’s PHS Program includes a broad list of species and habitats that are priorities for management and conservation. We recommend working with your local [WDFW Habitat Biologist](#) to determine if other Priority Species and Priority Habitats are relevant for monitoring in your VSP Work Plan.

Monitoring Question	Benchmark	Indicators	Methods	Critical Area Function	VSP Examples	Resources
Are agricultural activities impacting Priority Species?  How are wildlife using ag land?	Protect fish and wildlife	Acres of wildlife habitat in areas of ag intersect  Installment of wildlife structures  Acres of habitat enhancement  Population demographics	Track landcover impacts to PHS datapoints and polygons  Field assessments and wildlife surveys  Track # of BMPs  Photo point monitoring	Habitat quantity  Wildlife cover, nesting, and breeding habitat  Pollination, seed dispersal, nutrient cycling, pest control, creation of beneficial nest sites or structures	Walla Walla - ferruginous hawks  Douglas - sage grouse  Whitman, Adams, Yakima - PHS polygons  Franklin - game cameras  Chelan – complimentary wildlife	<a href="#">Xerces: Pollinator Habitat Assessment Form and Guide Farms and Agricultural Landscapes</a>  <a href="#">WDFW Management Recommendations for Washington's Priority Habitats and Species</a>  <a href="#">WDFW PHS on the Web</a>

