6 Management Plan

6.1.1 Introduction

Emphasis in this management plan is placed on selected focal habitats and fish and wildlife species described in the inventory and assessment. Management goals, objectives, and strategies will aide subbasin planners and state salmon recovery personnel in the conservation and restoration of important habitat and focal species. It is impractical to address goals for future conditions within the subbasin without consideration of existing conditions; not all impacts are reversible. It is clear from the inventory and assessment that reliable quantification of most subbasin level impacts is lacking; however, many anthropogenic changes have occurred and will continue to occur in the future and impact the focal habitats: riparian wetlands, shrub-steppe, herbaceous wetland habitats, Columbia River, and small tributaries. Recommendations are made within this presumptive framework.

While all habitats are important, focal habitats were selected in part because they are disproportionately vulnerable to anthropogenic impacts, and likely have received the greatest degree of existing impacts within the subbasin. In particular, the majority of shrub-steppe and herbaceous and riparian wetlands habitats fall within the low or no protection status categories. Some of the identified impacts are, for all practical purposes, irreversible (conversion to urban and residential development, primary transportation systems); others are already being mitigated through ongoing management (e.g., USFS adjustments to grazing management).

The management plan is made up of six components: 1) the vision for the subbasin; 2) the working hypothesis; 3) subbasin goals, objectives, and strategies; 4) monitoring, evaluation, and adaptive management; 5) comprehensive plans; and 6) research. Since the biological objectives are linked to the working hypotheses, we have inserted them here also for better clarity.

One of the primary interests of this subbasin plan is to identify management actions that promote compliance of the ESA and the CWA. None of the recommended management strategies are intended nor envisioned to compromise or violate any federal, state, or local laws or regulations. Rather, the management strategies are intended to provide local solutions that will enhance the intent and benefit of these laws and regulations. This subbasin plan complies with the intent of the ESA and the CWA primarily through the Mid Columbia HCP, FERC license mitigation programs, and other local fish and wildlife efforts in a region wide context.

6.1.2 Vision for the Subbasin

Natural habitats exist with sufficient quantity, quality, and linkages to perpetuate existing native fish and wildlife populations into the foreseeable future. Where sufficient habitat exists, through a combination of protection and restoration, extirpated fish and wildlife species are restored within the subbasin.

6.1.3 Working Hypothesis

The working hypotheses for focal habitat types are based on the factors that affect/limit focal habitats (the term, “factors that affect habitat” is synonymous with “limiting factors” for fish and wildlife species). Ecoregion and subbasin level working hypotheses are statements that assist subbasin planners and their communities to clearly articulate a program aimed at addressing the most pressing needs in a given area. The hypothesis is based on the limiting factors described in

the Assessment and defines the relationship between limiting factors and the goals, objectives and strategies in the Managent Plan. These relationships are tested through implementation, followed by monitoring and evaluation. Ultimately, adaptive management is used to respond to the outcomes of these "tests" of "working hypotheses." Hypotheses for subbasin focal habitat types are summarized below.

6.1.4 Subbasin Recovery Goals, Objectives, and Strategies

Biological Objectives

Biological objectives describe physical and biological changes within the subbasin needed to achieve the vision and address factors affecting focal habitats. Biological objectives for all Ecoregion subbasins are habitat based and describe priority areas and environmental conditions needed to achieve functional focal habitat types. Where possible, biological objectives are empirically measurable and based on an explicit scientific rationale (the working hypothesis). Biological objectives are:

- Consistent with subbasin-level visions and strategies
- Developed from a group of potential objectives based on the subbasin assessment and resulting working hypotheses
- Realistic and attainable within the subbasin
- Consistent with legal rights and obligations of fish and wildlife agencies and tribes with jurisdiction over fish and wildlife in the subbasin, and agreed upon by co-managers in the subbasin
- Complementary to programs of tribal, state and federal land or water quality management agencies in the subbasin
- Quantitative and have measurable outcomes where practical

Strategies

Strategies are sets of actions to accomplish the biological objectives. In developing strategies, planners took into account not only the desired outcomes, but also the physical and biological realities expressed in the working hypothesis. Strategies are not projects but instead are the guidance for the development of projects as part of the implementation plan.

Terrestrial/Wildlife

Shrubsteppe

Goal: Provide sufficient quantity and quality shrubsteppe habitat to support the diversity of wildlife as represented by sustainable focal species populations. Emphasis should be placed on managing sagebrush-dominated shrubsteppe and steppe/grassland-dominated shrubsteppe toward conditions identified in the Recommended Future Conditions in the Assessment section of this document.

Habitat Objective 1: Determine the necessary amount, quality, and juxtaposition of shrubsteppe by the year 2008

Strategy:

- Select and implement methodology, alternative to IBIS or GAP, to accurately characterize shrubsteppe habitat quantity and quality in the UMM Subbasin

Habitat Objective 2: Based on findings of Objective 1, identify and provide biological and other conservation measures to sustain focal species populations and habitats by 2010

Strategies:

- Use federal, state, tribal, and local government programs, such as USDA "Farm Bill" programs, to conserve shrubsteppe habitat
- Achieve permanent protection of shrubsteppe through acquisition, conservation easement, cooperative agreements, etc.
- Emphasize conservation of large blocks and connectivity of high quality shrubsteppe habitat
- Promote local planning and zoning to maintain or enhance large blocks of habitat

Habitat Objective 3: Maintain and/or enhance habitat function (i.e., focal habitat attributes) by improving agricultural practices, fire management, weed control, livestock grazing practices, and road management on existing shrubsteppe

Strategies:

- Promote and support implementation of the Foster Creek Habitat Conservation Plan (currently in development)
- Implement habitat stewardship projects with private landowners
- Develop fire management protocols (e.g., protection and prescribed burning) to produce desired shrubsteppe habitat conditions
- Implement existing plans (e.g., Wenatchee National Forest plan, Bureau of Land Management Spokane Resource Management Plan, Chelan County Watershed Mgt Plan, WDFW Wildlife Area Management Plans, Colville Tribes Integrated Resource Management Plan)
- Develop and implement a coordinated, cross-jurisdictional comprehensive weed control management plan (e.g., Moses Coulee Cooperative Weed Management Area)
- Develop and implement a coordinated, cross-jurisdictional road management plan

Biological Objective 1: Determine population status of sage thrasher by 2008

Strategies:

- Select survey protocol and measure abundance of focal species
- Select survey protocol and measure diversity and richness of species assemblages within shrubsteppe

Biological Objective 2: Within the framework of the sage thrasher population status determination and existing sharp-tailed grouse and sage grouse population determinations, inventory other shrubsteppe obligate populations to test assumption of the umbrella species concept for conservation of other shrubsteppe obligates

Strategy:

- Implement federal, state, and tribal management plans, other conservation plans, or recovery plans to conserve the focal species

Biological Objective 3: Maintain and enhance pygmy rabbit populations consistent with state and federal management and recovery plans

Strategy:

- Implement federal, state, and tribal management plans, other conservation plans, or recovery plans to conserve the focal species

Eastside (Interior) Riparian Wetlands

Goal: Provide sufficient quantity and quality riparian wetlands to support the diversity of wildlife as represented by sustainable focal species populations. Emphasis should be placed on managing riparian wetland habitats toward conditions identified in Recommended Future Conditions in the Assessment section of this document

Habitat Objective 1: Determine the necessary amount, quality, and connectivity of riparian wetlands by the year 2008

Strategy:

- Select and implement methodology, alternative to IBIS or GAP, to accurately characterize riparian wetlands habitats in the UMM Subbasin

Habitat Objective 2: Based on findings of Habitat Objective 1, provide biological and social conservation measures to sustain focal species populations and habitats by 2010

Strategies:

- Use federal, state, tribal, and local government programs, to conserve, enhance, and/or restore riparian wetlands habitat
- Achieve permanent protection of riparian wetlands through acquisition, conservation easement, cooperative agreements, etc.
- Emphasize conservation connectivity of high quality riparian wetlands habitat
- Promote local planning and zoning to maintain or enhance riparian wetlands habitat

Habitat Objective 3: Maintain and/or enhance habitat function (i.e., focal habitat attributes) by improving silviculture, agricultural practices, fire management, weed control, livestock grazing practices, and road construction and maintenance on and adjacent to existing riparian wetlands

Strategies:

- Promote and support implementation of the Foster Creek Habitat Conservation Plan (currently in development)
- Implement habitat stewardship projects with private landowners
- Implement existing plans (e.g., Wenatchee National Forest plan, Bureau of Land Management Spokane Resource Management Plan, Chelan County Watershed Mgt Plan, WDFW Wildlife Area Management Plans, Colville Tribes Integrated Resource Management Plan)
- Develop and implement a coordinated, cross-jurisdictional comprehensive weed control management plan (e.g., Moses Coulee Cooperative Weed Management Area)
- Develop and implement a coordinated, cross-jurisdictional road management plan

Biological Objective 1: Determine population status of beaver, willow flycatcher, Lewis' woodpecker by 2008

Strategies:

- Select survey protocol and measure abundance of focal species
- Select survey protocol and measure diversity and richness of species assemblages within riparian wetland habitats

Biological Objective 2: Within the framework of the focal species population status determinations, inventory other riparian wetlands obligate populations to test assumption of the umbrella species concept for conservation of other riparian wetlands obligates

Strategy:

- Implement federal, state, tribal management, other conservation plans, or recovery plans to conserve the focal species

Biological Objective 3: Based on findings of Biological Objective 1 and Habitat Objective 2, maintain and enhance beaver populations where appropriate and consistent with state/tribal management objectives

Strategies:

- Protect, and where necessary restore, habitat to support beaver
- Reintroduce beaver into suitable habitat where natural recolonization may not occur
- Through state harvest restrictions, protect beaver populations at a level sufficient to allow natural and reintroduced beaver populations to perpetuate at levels that will meet Habitat Objective 2

Herbaceous Wetlands

Goal: Provide sufficient quantity and quality herbaceous wetlands to support the diversity of wildlife as represented by sustainable focal species populations. Emphasis should be placed on

managing herbaceous wetland habitats toward conditions identified in the Recommended Future Conditions in the Assessment section of this document

Habitat Objective 1: Determine the necessary amount, quality, and connectivity of herbaceous wetlands by the year 2008

Strategy:

- Select and implement methodology, alternative to IBIS or GAP, to accurately characterize riparian wetlands habitats in the UMM Subbasin

Habitat Objective 2: Based on findings of Habitat Objective 1, provide biological and social conservation measures to sustain focal species populations and habitats by 2010

Strategies:

- Use federal, state, tribal, and local government programs, to conserve herbaceous wetlands habitat
- Achieve permanent protection of riparian wetlands through acquisition, conservation easement, cooperative agreements, etc.
- Emphasize conservation connectivity of high quality herbaceous wetland habitat
- Promote local planning and zoning to maintain or enhance herbaceous wetland habitat

Habitat Objective 3: Maintain and/or enhance habitat function (i.e., focal habitat attributes) by improving silviculture, agricultural practices, fire management, weed control, livestock grazing practices, and road construction and maintenance on and adjacent to existing herbaceous wetlands

Strategies:

- Promote and support implementation of the Foster Creek Habitat Conservation Plan (currently in development)
- Implement habitat stewardship projects with private landowners
- Implement existing plans (e.g., Wenatchee National Forest plan, Bureau of Land Management Spokane Resource Management Plan, Chelan County Watershed Mgt Plan, WDFW Wildlife Area Management Plans, Colville Tribes Integrated Resource Management Plan)
- Develop and implement a coordinated, cross-jurisdictional comprehensive weed control management plan (e.g., Moses Coulee Cooperative Weed Management Area)
- Develop and implement a coordinated, cross-jurisdictional road management plan

Biological Objective 1: Determine population status of red-winged blackbird in the UMM by 2008

Strategies:

- Select survey protocol and measure abundance of focal species

- Select survey protocol and measure diversity and richness of species assemblages within riparian wetland habitats

Biological Objective 2: Within the framework of the focal species population status determinations, inventory other herbaceous wetland obligate populations to test assumption of the umbrella species concept for conservation of other herbaceous wetland obligates.

Strategy:

- Implement federal, state, and tribal management and recovery plans

Aquatic/Fish

Columbia River

Goal: Use NPCC fish and wildlife mitigation programs to compliment the implementation of the Mid Columbia HCP, FERC license mitigation programs, and other local fish and wildlife efforts in a region wide context

Biological Objective 1: Ensure the long-term persistence of self-sustaining, complex interacting groups (or multiple local populations that may have overlapping spawning and rearing areas) of bull trout distribution across the species' native range, so that the species can eventually be delisted

Strategies:

- Maintain and enhance current distribution of bull trout within the UMM of the Columbia River
- Maintain stable or increasing trends in abundance of bull trout
- Restore and maintain suitable habitat conditions for overwintering, foraging, and migration for bull trout

Biological Objective 2: Reduce threats to the long-term persistence of bull trout populations and their habitat, ensuring the security of multiple interacting groups of bull trout, and providing habitat and access to conditions that allow for the expression of various life history forms

Strategies:

- Reduce impacts from residential and recreational development

Biological Objective 3: Improve current knowledge base on bull trout throughout the Upper Middle Mainstem of the Columbia River Watershed

Strategies:

- Complete a bull trout fish use study in the Upper Middle Mainstem of the Columbia River
- Complete a life history study throughout the Upper Middle Mainstem of the Columbia River

Biological Objective 4: Reduce threats to the long-term persistence of populations and their habitat, ensuring the security of multiple interacting groups of white sturgeon, and providing habitat and access to conditions that allow for the expression of various life history forms

Strategies:

- Determine the location and degree of spawning throughout the Columbia River from Wanapum Dam to Chief Joesph Dam
- Determine effects of passage through the hydroelectric projects and how the project areas may be modify to facilitate more success
- Determine the degree of predation by native and non-native species on larval sturgeon
- Determine how flows affect existing spawning habitat and rearing success

Biological Objective 5: Improve current knowledge base on white sturgeon throughout the Upper Middle Mainstem of the Columbia River Watershed

Strategies:

- Complete a life history study throughout the Upper Middle Mainstem of the Columbia River
- Determine the effects of a supplementation progam on thecurrent population

Biological Objective 6: Reduce threats to the long-term persistence of populations and their habitat, ensuring the security of multiple interacting groups of Pacific lamprey, and providing habitat and access to conditions that allow for the expression of various life history forms

Strategies:

- Determine effects of passage through the hydroelectric projects and how the project areas may be modify to facilitate more success
- Determine migration periods of Pacific lamprey through the system and in to the tributaries
- Determine effects of hydro-electirc project on all life stages

Biological Objective 7: Improve current knowledge base on Pacific lamprey throughout the Upper Middle Mainstem of the Columbia River Watershed

Strategies:

- Complete a life history study throughout the Upper Middle Mainstem of the Columbia River
- Improve enumeration of lamprey at the hydro-electric projects
- Conduct adult telemetry studies to determine population distribution

Small Tributary Assessment

To accommodate the numerous small streams within the UMM Subbasin, the goals, objectives, and strategies have been set-up in table format and grouped alphabetically by tributary (Table 49 - Table 64). Each listed objective includes a description of the task, rationale, outcome, and uncertainty of the project.

Brushy Creek

Table 49 Management plan recommendations for Brushy Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Determine existing and potential fish use of watershed	Full stream investigation (survey) using the biological strategy protocols (PNAMP 2004)	Very little information exists on watershed	This will determine whether further funds for protection or restoration for fish resources is warranted This will also assist with wildlife habitat assessment as related to riparian areas	Funding and low prioritization in a region-wide context

Colockum Creek

Table 50 Management plan recommendations for Colockum Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Improve water flows	Work with existing water rights holders to conserve water or acquire rights	Goal to restore year-round flows	This would surely increase fish productivity; Maybe some can be convinced to sell their water rights thus allowing a minimum flow for fish in Reach 2	Highly unlikely that all landowners would sell their water rights
Eliminate obstructions to adult steelhead and Chinook migration	Locate and remove obstructions to fish migration	Allow access to spawning steelhead and salmon	Increase of habitat and likely the population	Landowner cooperation is unknown
Reduce the input of fine sediments	Change land use practices in the upper watershed	Reduce silt input will allow the creek substrate to eventually flush out some of silt currently present thus increase productivity of the creek	Increase in ground cover and controlled overland flow	This would require a change in agricultural practices That may or may not be acceptable to the public

Foster Creek

Table 51 Management plan recommendations for Foster Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Restore Riparian Vegetation	Plant and nurture native vegetation along stream banks after channel work to reduce erosion and head-cutting	This would provide the shade and organic materials needed for a viable aquatic ecosystem	This would require cooperation with the landowners coupled with conservation programs This will also assist with wildlife habitat enhancement of riparian areas	Very likely if project funding can be secured, local landowner interest is high

Objective	Task	Rationale	Outcome	Uncertainty
Restore natural channel condition and diversity	Continue implementation of erosion control structures and stream bank restoration	Restore natural habitat conditions needed by resident species	This would require cooperation with the landowners coupled with conservation programs	Very likely if project funding can be secured, local landowner interest is high
Augment surface water flows	Implement groundwater storage projects	Additional groundwater supplies supplement surface water flows	Assessment of project potential has occurred under ESHB 2514, implementation is dependent on funding	Very likely if project funding can be secured, local landowner interest is high
Reduce the input of fine sediments	Implement agricultural best management practices in the upper watershed and other soil conservation programs	Reduce silt input will allow the creek substrate to eventually flush out some of silt currently present thus increase productivity of the creek	This would require cooperation with the landowners coupled with landonwers coupled with conservation programs	Vey likely if project funding can be secured, local landowner interest is high

Johnson Creek

Table 52 Management plan recommendations for Johnson Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Determine existing and potential fish use of watershed	Full stream investigation (survey) using the biological strategy protocols (PNAMP 2004)	Very little information exists on watershed	This will determine whether further funds for protection or restoration for fish resources is warranted	Funding and low prioritization in a region-wide context
Restore Riparian Vegetation	Plant and nurture native vegetation along stream banks	This would provide the shade and organic materials needed for a viable aquatic ecosystem	Unknown This would require gaining the landowners cooperation, conservation easements or purchasing the land out right This will also assist with wildlife enhancement habitat of riparian areas	Landowner cooperation is unknown
Restore natural Channel condition and diversity	This would require planning and implementation by a fluvial geo-morphologist	Restore natural habitat conditions needed by salmon and steelhead	Unknown This would require gaining the landowners cooperation, conservation easements or purchasing the land out right	Landowner cooperation is unknown
Reduce the input of fine sediments	Change land use practices in the upper watershed	Reduce silt input will allow the stream substrate to eventually flush out some of silt currently present thus increase productivity of the stream	Unknown This would require gaining the landowners cooperation, conservation easements or purchasing the land out right	Landowner cooperation is unknown

Moses Coulee (Douglas and McCarteney Creeks)

Table 53 Management plan recommendations for Moses Coulee, WA.

Objective	Task	Rational	Outcome	Uncertainty
Restore Riparian Vegetation	Plant and nurture native vegetation along stream banks after channel work to reduce erosion and head-cutting	This would provide the shade and organic materials needed for a viable aquatic ecosystem	This would require cooperation with the landowners coupled with conservation programs This will also assist with wildlife enhancement habitat of riparian areas	Very likely if project funding can be secured, local landowner interest is high
Restore natural channel condition and diversity	Continue implementation of erosion control structures and stream bank restoration	Restore natural habitat conditions needed by resident species	This would require cooperation with the landowners coupled with conservation programs	Very likely if project funding can be secured, local landowner interest is high
Augment surface water flows	Implement groundwater storage projects	Additional groundwater supplies supplement surface water flows	Assessment of project potential has occurred under ESHB 2514, implementation is dependent on funding	Very likely if project funding can be secured, local landowner interest is high
Reduce the input of fine sediments	Implement agricultural best management practices in the upper watershed and other soil conservation programs	Reduce silt input will allow the stream substrate to eventually flush out some of silt currently present thus increase productivity of the stream	This would require cooperation with the landowners coupled with conservation programs	Very likely if project funding can be secured, local landowner interest is high

Quilomene Creek

Table 54 Management plan recommendations for Quilomene Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Determine existing and potential fish use of watershed	Full stream investigation (survey) using the biological strategy protocols (PNAMP 2004)	Very little information exists on watershed	This will determine whether further funds for protection or restoration for fish resources is warranted This will also assist with wildlife habitat assessment as related to riparian areas	Funding and low prioritization in a region-wide context

Rock Island Creek

Table 55 Management plan recommendations for Rock Island Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Restore Riparian Vegetation	Plant and nurture native vegetation along stream banks to reduce erosion and enhance wildlife habitat	This would provide the shade and organic materials needed for a viable aquatic ecosystem	This would require cooperation with the landowners coupled with conservation programs This will also assist with wildlife habitat enhancement of riparian areas	Likely if project funding can be secured, and cooperation with local landowners

Sand Canyon Creek

Table 56 Management plan recommendations for Sand Canyon Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Restore Riparian Vegetation	Plant and nurture native vegetation along stream banks to reduce erosion and enhance wildlife habitat	This would provide the shade and organic materials needed for a viable aquatic ecosystem	This would require cooperation with the landowners coupled with conservation programs This will also assist with wildlife habitat enhancement of riparian areas	Likely if project funding can be secured, and cooperation with local landowners
Reduce sedimentation from flood events	Create sediment catch basin and expand riparian area in reach one	During storm events Sand Canyon is a conduit of stormwater and sediment from the urban and agricultural areas	Enhanced riparian area and educational center near existing County facilities	Funding and full development of project has been a low priority in the region

Sand Hollow Wasteway

Table 57 Management plan recommendations for Sand Hollow Wasteway, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Determine existing and potential fish use of watershed	Full stream investigation (survey) using the biological strategy protocols (PNAMP 2004)	Very little information exists on watershed	This will determine whether further funds for protection or restoration for fish resources is warranted This will also assist with wildlife habitat assessment as related to riparian areas	Funding and low prioritization in a region-wide context

Skookumchuck Creek

Table 58 Management plan recommendations for Skookumchuck Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Determine existing and potential fish use of watershed	Full stream investigation (survey) using the biological strategy protocols (PNAMP 2004)	Very little information exists on watershed	This will determine whether further funds for protection or restoration for fish resources is warranted This will also assist with wildlife habitat to riparian areas	Funding and low prioritization in a region-wide context

Squilchuck Creek

Table 59 Management plan recommendations for Squilchuck Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Determine existing and potential fish use of entire watershed	Full stream investigation (survey) using the biological strategy protocols (PNAMP 2004)	Very little information exists on parts of the watershed	This will determine whether further funds for protection or restoration for fish resources is warranted This will also assist with wildlife habitat assessment as related to riparian areas	Funding and low prioritization in a region-wide context
Eliminate obstructions to adult steelhead and Chinook migration:	Provide fish passage at the South Wenatchee Avenue culvert and other identified barriers (Harza/Bioanalysts 2000)	Allow access to spawning steelhead and salmon and reestablishes connectivity with to the Columbia River	Will provide passage to an unknown amount of the stream	It is unknown how much habitat is available to steelhead/rainbow trout in the Squilchuck watershed, given the many fish passage barriers created by dewatering and low flows conditions and the natural hydro-geologic conditions

Stemilt Creek

Table 60 Management plan recommendations for Stemilt Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Improve water flow in reach two	Work with existing water rights holders to conserve water or acquire rights	Goal to restore year-round flows	This would surely increase fish productivity; Maybe some can be convinced to sell their water rights thus allowing a minimum flow for fish in Reach 2	Highly unlikely that all landowners would sell their water rights
Eliminate obstructions to adult steelhead and Chinook migration	Locate and remove obstructions to fish migration	Allow access to spawning steelhead and salmon	Increase of habitat and likely the population	Landowner cooperation is unknown
Reduce the input of fine sediments	Change land use practices in the upper watershed	Reduce silt input will allow the creek substrate to eventually flush out some of silt currently present thus increase productivity of the creek	Increase in ground cover and controlled overland flow	This would require a change in agricultural practices That may or may not be acceptable to the public

Tarpiscan Creek

Table 61 Management plan recommendations for Tarpiscan Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Determine existing and potential fish use of watershed	Full stream investigation (survey) using the biological strategy protocols (PNAMP 2004)	Very little information exists on watershed	This will determine whether further funds for protection or restoration for fish resources is warranted This will also assist with wildlife habitat assessment as related to riparian areas	Funding and low prioritization in a region-wide context

Tekison Creek

Table 62 Management plan recommendations for Tekison Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Determine existing and potential fish use of watershed	Full stream investigation (survey) using the biological strategy protocols (PNAMP 2004)	Very little information exists on watershed	This will determine whether further funds for protection or restoration for fish resources is warranted This will also assist with wildlifehabitat assessment as related to riparian areas	Funding and low prioritization in a region-wide context

Trinidad Creek

Table 63 Management plan recommendations for Trinidad Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Determine existing and potential fish use of entire watershed	Full stream investigation (survey) using the biological strategy protocols (PNAMP 2004)	Very little information exists on the watershed	This will determine whether further funds for protection or restoration for fish resources is warranted This will also assist with wildlife habitat assessment as related to riparian areas	Funding and low prioritization in a region-wide context
Eliminate obstructions to adult steelhead and Chinook migration	Provide a more defined channel across or remove the extensive alluvial fan	Allows access to spawning steelhead and salmon	Increased access to spawning and rearing habitat to one of the streams with the best water quality	Unknown landownership, high likelihood of use, but duration is unknown How long will it take before the an alluvial barrier may be formed?
Reduce the input of fine sediments	Change land use practices in the upper watershed	Reduced silt input will allow the stream substrate to eventually flush out some of silt currently present thus increase productivity of the stream	Enhanced habitat/fish productivity	This would require a change in agricultural practices That may or may not be acceptable to the public

Whiskey Dick Creek

Table 64 Management plan recommendations for Whiskey Dick Creek, WA.

Objective	Task	Rationale	Outcome	Uncertainty
Determine existing and potential fish use of watershed	Full stream investigation (survey) using the biological strategy protocols (PNAMP 2004)	Very little information exists on watershed	This will determine whether further funds for protection or restoration for fish resources is warranted This will also assist with wildlife habitat assessment as related to riparian areas	Funding and low prioritization in a region-wide context

6.2 Monitoring, Evaluation, and Adaptive Management

6.2.1 Terrestrial/Wildlife

Monitoring Methodology

Recommended monitoring and evaluation strategies contained below for each focal habitat type, including sampling and data analysis and storage, are derived from national standards established by Partners in Flight for avian species (Ralph et al. 1993, 1995) and habitat monitoring (Nott et al. 2003). Protocols for specific vegetation monitoring/sampling methodologies are drawn from USDA Habitat Evaluation Procedure standards (FWS 1980a,b). Wildlife managers will also apply statistically rigorous sampling methods to establish links between habitat enhancement prescriptions, changes in habitat conditions, and target wildlife population responses. A common thread in the monitoring strategies that follow is the establishment of permanent census stations to monitor bird population and habitat changes.

Specific methodology for selection of monitoring and evaluation sites within all focal habitat types follows a probabilistic (statistical) sampling procedure, allowing for statistical inferences to be made within the area of interest. The following protocols describe how M&E sites will be selected (from WDFW response to ISRP http://www.cbfwa.org/files/CCP/cascade/projects/199609400resp.pdf):

- Vegetation/HEP monitoring and evaluation sites are selected by combining stratified random sampling elements with systematic sampling. Project sites are stratified by cover types (strata) to provide homogeneity within strata, which tends to reduce the standard error, allows for use of different sampling techniques between strata, improves precision, and allows for optimal allocation of sampling effort resulting in possible cost savings (Block et al. 2001). Macro cover types such as shrubsteppe are further sub-cover typed based on dominant vegetation features (e.g., percent shrub cover). Cover type designations and maps are validated prior to conducting surveys in order to reduce sampling inaccuracies.

- Pilot studies are conducted to estimate the sample size needed for a 95% confidence level with a 10% tolerable error level (Avery 1975) and to determine the most appropriate sampling unit for the habitat variable of interest (BLM 1998). In addition, a power analysis is conducted on pilot study data (and periodically throughout data collection) to ensure that sample sizes are sufficient to identify a minimal detectable change of 20% in the variable of interest with a Type I error rate # 0.10 and P = 0.9 (Block et al. 2001, Hintze 1999, BLM 1998). Monitoring and Evaluation includes habitat trend condition monitoring on the

landscape scale (Tier 1-HEP) and plant community monitoring (Tier 2) (i.e., measuring changes in vegetative communities on specific sites).

- For HEP surveys, specific transect locations within strata are determined by placing a Universal Transverse Mercator (UTM) grid over the study area (strata) and randomly selecting "X" and "Y" coordinates to designate transect start points. Random transect azimuths are chosen from a computer generated random number program, or from a standard random number table. Data points and micro plots are systematically placed along the line intercept transect at assigned intervals. Sample sizes for statistical inferences are determined by replication and systematic placement of lines of intercept within the strata with sufficient distance between the lines to assume independence and to provide uniform coverage over the study site.

- Permanent vegetation monitoring transect locations are determined by placing a UTM grid over the strata and randomly selecting "X" and "Y" coordinates to designate plot locations as described for HEP surveys. One hundred meter baseline transect azimuths are randomly selected from a random numbers table. Ten perpendicular 30 meter transects are established at 10 meter intervals along the baseline transect to form a 100m x 30m rectangle (sample unit). Micro plot and shrub intercept data are collected at systematic intervals on the perpendicular transects.

- Monitoring will be used to define habitat and species population trends and to determine if management actions have been carried out as planned (implementation monitoring). Results will be evaluated to determine if management actions are achieving desired goals and objectives (effectiveness monitoring) and to provide evidence supporting the continuation of proposed management actions.

Areas planted to native shrubs/trees and/or seeded to herbaceous cover will be monitored twice a year. Plant species will be systematically collected and analyzed for frequency, abundance, density, height, and percent cover to describe vegetative trends through time. In addition, the presence of all noxious weeds (e.g., diffuse knapweed, Dalmatian toadflax) will be mapped in GIS using Global Positioning System (GPS) equipment. This information will be used to identify causes of seeding or planting failure (e.g., depredation, weather impacts, poor site conditions, poor seed/shrub quality), modify planting methods and site preparation, develop an annual exotic vegetation control plan, evaluate the effectiveness of noxious weed control methods, and adjust management plans (adaptive management) accordingly.

Monitoring of habitat attributes and focal species in this manner will provide a standardized means of tracking progress towards conservation, not only within the UMM Subbasin, but within a national context as well. Monitoring will provide essential feedback for demonstrating adequacy of conservation efforts on the ground, and guide the adaptive management component that is inherent in the subbasin planning process.

Overall Habitat and Species Monitoring Strategy

Establish monitoring programs for protected and managed focal habitat (shrubsteppe, eastside (interior) riparian wetland, and herbaceous wetland) sites to monitor focal species population and habitat changes and evaluate the success of efforts.

Focal Habitat Monitoring

Addressing factors that affect focal habitats (See Limiting Factors in Assessment section) will address focal species: Pygmy rabbit, sage thrasher, sage grouse, and sharp-tailed grouse, Willow flycatcher, Lewis' woodpecker, American beaver, and red-winged blackbird. If focal habitats are of sufficient quality, extent, and distribution to support focal species populations, the needs of most other focal habitat obligate species will also be addressed and habitat functionality could be inferred.

If sufficient habitat is present to support avian focal species, suitable habitat will be present to support beaver. Beaver will persist in these habitats if appropriate protection measures to preclude overharvest are implemented.

Working Hypothesis

The near term or major factors affecting wildlife focal habitat types are habitat fragmentation and loss, primarily because of conversion to agriculture and urban development, reduction of habitat diversity and function resulting from invasion of exotic vegetation, livestock overgrazing, and recreation. Shrubsteppe habitat has also been negatively impacted by wildfire suppression and increased fire frequency. The principal habitat diversity stressor is the spread and proliferation of invasive exotics. For instance, annual grasses and noxious weeds such as knapweed, Dalmation toadflax, cheatgrass, and yellow-star thistle have either supplanted and/or radically altered entire native bunchgrass communities within shrubsteppe habitat, significantly reducing wildlife habitat quality. These factors, coupled with poor habitat quality of existing vegetation, have resulted in extirpation and/or significant reductions in shrubsteppe, and riparian and herbaceous wetland obligate wildlife species.

Recommended Range of Management Conditions

Shrubsteppe

Pygmy rabbit, sage thrasher, sage grouse, and sharp-tailed grouse were selected to represent the range of habitat conditions of a functional shrubsteppe habitat complex to include:

1. *Deep soil shrubsteppe:* Pygmy rabbit was selected to represent species dependent on deep rock-free soil (greater than 20 inches deep) underlying shrubsteppe habitat with patches of dense tall sagebrush (average 32.7 percent shrub cover and shrub height of 32 inches).
2. *Sagebrush dominated shrubsteppe habitat:* The sage thrasher was selected to represent shrubsteppe obligate wildlife species that require sagebrush dominated shrubsteppe habitats and that are dependent upon areas of tall sagebrush within large tracts of shrubsteppe habitat. Suitable habitat includes 5 to 20 percent sagebrush cover greater than 2.5 feet in height, 5 to 20 percent native herbaceous cover, and less than 10 percent non-native herbaceous cover.
3. *Sagebrush habitat with diverse native herbaceous understory:* Sage grouse were selected to represent species that require/prefer diverse sagebrush habitat with medium to high shrub cover and residual grass. Sage grouse prefer slopes less than 30 percent, sagebrush/bunchgrass stands having medium to high canopy cover (10-30 percent), forb/grass cover at least 15 percent and less than 10 percent non-native herbaceous cover.

4. *Shrubsteppe habitat with multi-structured deciduous trees and shrubs:* Sharp-tailed grouse were selected to represent species that require multi-structured fruit/bud/catkin producing deciduous trees and shrubs dispersed throughout the landscape (10 to 40 percent of the total area). Other habitat conditions include:

- Native bunchgrass greater than 40 percent cover
- Native forbs at least 30 percent cover
- Visual obstruction readings (VOR) at least 6 inches
- At least 75 percent cover deciduous shrubs and trees
- Exotic vegetation/noxious weeds less than 5 percent cover

Eastside (Interior) Riparian Wetlands

Willow flycatcher, Lewis' woodpecker, and American beaver were selected to represent the range of habitat conditions of a functional riparian wetland and uplands habitat complex to include:

- Forty to 80 percent native shrub cover (greater than 50 percent comprised of hydrophytic shrubs), with scattered herbaceous openings, and tree cover less than 30 percent
- Forty to 60 percent tree/shrub canopy closure, shrub height greater than 6 6 feet and trees less than 6 inches DBH
- Mature cottonwoods greater than 21 inches DBH, 10-40 percent canopy cover, and 30-80 percent shrub cover

Herbaceous Wetlands

Red-winged blackbird was selected to represent the range of habitat conditions of a functional herbaceous wetland and uplands habitat complex to include:

- Permanent water present at a depth > 20"
- Emergent vegetation ≥ 0 25 acre with an optimum of open water to emergent vegetation ratio of 40:60
- Larvae of damselflies and dragonflies (order Odonota) present
- Surrounding uplands (≤ 200 yds.) should include sturdy, dense, robust herbaceous vegetation not disturbed by grazing, mowing, burning, haying etc.

Focal Habitat Monitoring Strategies

Establish inventories and long-term monitoring programs for protected and managed focal habitats to determine success of management strategies. Subbasin managers recognize that restoration of shrubsteppe is still very much a fledgling field, and complete restoration of degraded or converted shrubsteppe may not be feasible. These monitoring strategies reflect the commitment to and initiation of the process of long-term management.

- Identify shrubsteppe and riparian and herbaceous wetland habitat sites within the subbasin that support populations of focal species
- Evaluate habitat site potential on existing public lands and adjacent private lands for protection of focal species habitat (short-term strategy i e , < 2 years)
- Enhance habitat on public lands and adjacent private lands (intermediate strategy; 2 to 10 years)
- Identify high quality/functional privately owned shrubsteppe sites that are not adjacent to public lands (long-term strategy; 2 to 15 years)
- Establish permanent censusing stations to monitor focal species populations and habitat changes

Sampling Design

Permanent survey transects will be located within shrubsteppe habitats using HEP protocols. HEP is a standardized habitat-analysis strategy developed by the U.S. Fish and Wildlife Service. It uses a variety of Habitat Suitability Indices (HSI) for select wildlife species to evaluate the plant community as a whole (Anderson and Gutzwiller 1996). Sites are stratified by cover type, and starting points are established using a random number grid. Minimum length of a HEP transect is 600 ft, and patches of cover must be large enough to contain a minimum transect without extending past a 100 foot buffer inside the edge of the cover type. In addition, at any permanently established avian species monitoring site established within the Shrubsteppe habitat, structural habitat conditions will be monitored every 5 years as per Habitat Structure Assessment protocol (Nott et al. 2003).

Sampling Methods (FWS 1980a and 1980b)

(Sampling methods listed below apply to all habitat types except as noted)

- *Bare ground or cryptogram crust* (applies to shrubsteppe only) measurements are taken every 20 ft. on the right side of the tape (the right is always determined by standing at 0 ft and facing the line of travel). The sampling quadrat is a rectangular 0.5m^2 microplot, placed with the long axis perpendicular to the tape, and the lower right corner on the sampling interval. The percentage of the microplot consisting of either bare ground or cryptogram crust is estimated via ocular estimate.
- *Herbaceous* measurements are taken every 20 ft. on the right side of the tape (the right is always determined by standing at 0 ft and facing the line of travel). The sampling quadrat is a rectangular 0.5m2 microplot, placed with the long axis perpendicular to the tape, and the lower right corner on the sampling interval. In shrubsteppe habitat, herbaceous cover % is measured via an ocular estimate of the percentage of the microplot shaded by any grass or forb species.
- *Shrub* canopy cover is measured using a point intercept method and is visually estimated before starting each transect. If the total shrub cover is anticipated to be >20%, shrub data are collected every 5 ft (20 possible “hits” per 100 ft segment). If shrub canopy cover is anticipated to be <20%, data are collected every 2 ft (50 possible “hits” per 100 ft segment).

In shrubsteppe habitat, shrub canopy cover is measured on a line intercept 'hit' or 'miss' and measurements are taken every 2 or 5 feet, depending upon shrub density.

- *Shrub* height measurements are collected on the tallest part of a shrub that crosses directly above each sampling intercept mark. For shorter shrub classifications (i.e., all shrubs less than 3 feet), the tallest shrub is measured that falls within that category.
- *Tree* canopy cover measurements are taken every ten feet along a transect. Basal and snag measurements are taken within a tenth-acre circular plot at the end of each 100 ft segment. The center point of the circular plot is the 100 ft mark of the transect tape, and the radius of
- *Structural Habitat Conditions* will be measured every 5 years at permanently established avian species-monitoring sites within the herbaceous wetland habitat, as per Habitat Structure Assessment protocol (Nott et al. 2003).

Analysis

Transects are divided into 100 ft. segments, and total transect length is determined using a "running mean" to estimate variance (95% probability of being within 10% of the true mean).

$$\text{Sample size equation: } n = \frac{t^2 \times s^2}{E^2}$$

Where: t = value at 95 percent confidence interval with suitable degrees of freedom

s = standard deviation

E = desired level of precision, or bounds

For herbaceous wetlands:

Open water to emergent vegetation ratio is measured from high quality aerial photographs (Short 1985).

Presence of carp in the wetland is determined by seining, using local data about carp presence, or direct observations of carp or signs of their presence (Short 1985).

Focal Species Monitoring

Pygmy Rabbit (Shrubsteppe)

Sampling Strategy

Monitoring of pygmy rabbit populations is needed to provide baseline data to discern population trends, changes in distribution, and other population parameters. To avoid trapping and handling pygmy rabbits, trend data should be obtained through survey and classification of burrows (WDFW 1995).

Methods

Burrow surveys should be conducted between late fall and early spring, when pygmy rabbits are most closely associated with burrows. Estimates of active burrows over an entire habitat area are

best obtained from randomly selected, circular plots that allow for 100% detection of active burrows. Pins driven into the ground mark plot centers at Sagebrush Flat and these should be used in surveys conducted annually. Burrow activity classification should be based on whether or not passages are open and recent tracks or fecal pellets are present (WDFW 1995). Application of this technique on the Sagebrush Flat Wildlife Area is described in WDFW (2004a).

Sage Thrasher (Shrubsteppe)

Sampling Strategy

Survey points will be placed among habitat types of interest using a stratified random design. Number of survey points in each habitat type will be determined using power analysis with the goal of being able to detect a 35% increase in abundance of key species with a power of 0.8 or greater.

Methods

Birds will be surveyed at sites in different vegetation types and levels of fragmentation. Each site will have 4 100-m fixed-radius point counts (Ralph et al. 1993) established 200 meters apart along a transect. The outer points of the point-count circles will describe a rectangular plot of 16ha that will be the focus of all survey work in Objectives 2-4. Each point will be marked with a permanent fiberglass stake (1m electric fence post) and colored flagging will be placed on shrubs at 50 and 100m from the point in each of the 4 cardinal directions to aid in determining distance. Counts at each point will be 5 minutes in duration during which all birds seen or heard will be noted, along with their sex (if known), distance from the point (within 50m, >50 but <100m, or beyond 100m), and behavior (singing, calling, silent, or flying over the site). Surveys will be conducted once each in May and June and within prescribed weather parameters (e.g., no rain and low wind).

Sage Grouse and Sharp-tailed Grouse (Shrubsteppe)

Sampling Strategy

Male greater sage grouse and sharp-tailed grouse congregate during the spring on relatively traditional breeding sites, usually referred to as leks or lek complexes. Females visit these sites during the peak of the breeding season to select and copulate with males. These lek surveys are designed to be consistent with similar surveys being conducted on an annual basis in all western states with populations of either greater sage grouse or sharp-tailed grouse.

Methods

Methods are based on Washington Department of Fish and Wildlife grouse survey protocol (WDFW 2004b).

Sage grouse lek counts should consist of a complete count of male birds. The number of females should also be recorded when possible. There should be at least four counts of each lek spaced at seven to twenty one day intervals throughout the breeding season to account for the variation in male attendance. The first count should be in early to mid-March (depending on weather) and the last count should be in the latter third of April. The peak of breeding is about March 20, while the peak of male attendance is about a month later as young males become more established.

Sharp-tailed grouse leks are usually difficult to observe. Lek counts should consist of a complete count of birds and differentiate by sex when possible. There should be at least two counts of each active lek; with counts spaced at least ten days apart between March 10 and May 25. The peak of lek activity (i.e., female attendance and breeding) is early April in most years.

If a lek cannot be clearly observed without disturbance, then birds may have to be counted when flushed. Flushing is best accomplished with at least 2 observers or one person with a trained dog, as peripheral birds often will not flush if the observer is too far away. Males are often best counted returning to the leks. In many situations, a viewpoint is available that permits careful observation of birds with the aid of a spotting scope. Multiple counts of a large lek in a single morning may be needed to insure an accurate and consistent count. This can be done by scanning from left to right and then from right to left and then repeating the procedure 10-15 minutes later. Observers should be aware that young males and/or males on the edge of lek may be difficult to see. Likewise young males may be difficult to differentiate from females, even for greater sage grouse.

Lek counts should be conducted when the weather is good (wind < 10 MPH, no precipitation, temperatures > 20^{o}F, >50% bare ground). Weather matters less during the peak of the breeding season (late-March for greater sage-grouse and early April for sharp-tailed grouse). If the weather is not acceptable, it is likely the count will be abnormally low and have to be repeated.

Counts may be low if the birds are disturbed by predators, people, or unknown factors. Counts that appear to be abnormally low compared to previous years should be repeated. Sharp-tailed grouse are very likely to return to the lek 10-20 minutes following disturbance whereas greater sage grouse will often remain off the lek until the next morning.

Willow Flycatcher, Lewis' Woodpecker (Riparian Wetland), and Red-winged Blackbird (Herbaceous Wetland)

Sampling Strategy

Survey points will be placed among habitat types of interest using a stratified random design. Number of survey points in each habitat type will be determined using power analysis with the goal of being able to detect a 25% increase in abundance of willow flycatcher, Lewis' woodpecker, and red-winged blackbird with a power of 0.8 or greater. This protocol is based on the point count survey (Ralph et al. 1993, Ralph et al. 1995), with each survey station referred to as a "point count station." In addition to these bird survey data, information about the distance at which individual birds are detected will also be collected, allowing absolute density estimated to be made using distance-sampling methodology.

Methods

Birds will be surveyed on randomly selected (stratified) points along the riparian corridor and at herbaceous wetlands. Each site will have 4 100-m fixed-radius point counts (Ralph et al. 1993) established 200 meters apart along a transect. Each point will be marked with a permanent fiberglass stake (1m electric fence post) and colored flagging will be placed on shrubs at 50 and 100m from the point in each of the 4 cardinal directions to aid in determining distance. Counts at each point will be 5 minutes in duration during which all birds seen or heard will be noted, along with their sex (if known), distance from the point (within 50m, >50 but <100m, or beyond 100m), and behavior (singing, calling, silent, or flying over the site). Surveys will be conducted

once each in May and June and within prescribed weather parameters (e.g., no rain and low wind).

Analysis

Analysis is described by Nur et al. (1999). Absolute density estimation (Buckland et al. 1993) can be estimated using the program DISTANCE, a free program available on the World-Wide Web (http://www.ruwpa.st-and.ac.uk/distance); an example is given in Nur et al. (1997). In brief: for species richness and species diversity, these can be analyzed as total species richness or as species richness for a subset of species; the same is true for species diversity. Species diversity can be measured using the Shannon index (Nur et al. 1999), also called the Shannon-Weiner or Shannon-Weaver index. Statistical analysis can be carried out using linear models (regression, ANOVA, etc.), after appropriate transformations (examples in Nur et al. 1999).

6.2.2 Aquatic/Fish

Working Hypothesis

The extent to which the small tributary watersheds can support salmon and steelhead/rainbow trout is most strongly limited by the natural hydrology in an arid environment, and geology and soil development that is relatively low. Because of the reliance on snow accumulation and snowmelt to support instream flows in the watershed and the high permeability of the soils, access to habitat is very limited. This condition is worsened during low water years. Surface water diversions contribute to dewatering and low flows in several of the tributaries, although three tributaries benefit from irrigation return flows. Given the natural geology of the watersheds, Chinook salmon use is naturally limited to the lowest reach of the streams before steeper channel gradient and shallower channels precludes upstream fish passage. Adult steelhead trout, being stronger swimmers and entering the drainage during spring runoff, could naturally penetrate higher into the watersheds on good water years, given passage at culverts and diversion dams. However, intermittent flows later in the year, coupled with severe habitat degradation present in some areas create significant limitations to steelhead/rainbow productivity in the tributaries.

Existing Monitoring Programs

The overall goal of the Monitoring and Evaluation Plan (M&E Plan) for the Mid-Columbia Hatchery Program (MCHP) is to determine the degree of success of the MCHP, or lack thereof, and to adjust the MCHP accordingly. Due to inherent, critical uncertainties (ability of physical facilities provided to meet needs of MCHP, potential risk imposed on native salmon and steelhead, and efficacy of MCHP to restore these populations) identified in the MCHP, an outline was developed to guide monitoring and evaluation efforts and to detect and potentially ameliorate problems encountered in implementation of the MCHP. The M&E Plan sets three specific objectives to obtain the data required to address each critical uncertainty (species-specific evaluations are discussed below): 1) Determine if the Mid-Columbia Hatchery Program is capable of meeting the Phase A production requirements of the Agreement; 2) Determine that actions taken under the Mid-Columbia Hatchery Program conserve the genetic integrity and long-term fitness of naturally spawning populations of salmon and steelhead in the Mid-Columbia Region; and 3) Determine if juvenile salmon and steelhead released from Mid-

Columbia hatcheries interact adversely with natural production in the Mid-Columbia Region (DCPUD 2002).

It is expected that these objectives, and their associated tasks, will form the basis for development of evaluation plans which will include details of the specific hypothesis to be tested, methods, analysis, and report development. The evaluation plans should be dynamic, with provision for assignment of new tasks directed at solving problems that may become apparent from the initial evaluations (DCPUD 2002).

Summer/Fall Chinook

Extensive monitoring and evaluation of the existing summer/fall Chinook salmon programs has been underway since 1992. These studies are expected to continue, and include any additional summer/fall Chinook salmon facilities or production groups developed in the MCHP. Specific study objectives are as follows: determine if Program facilities are capable of meeting the Phase A production objective and whether release-to-adult survival of fish is sufficient to achieve the Phase A plug number compensation; determine if actions conserve the reproductive success, genetic integrity, and long-term fitness of natural spawning populations of salmon in the Mid-Columbia Region; determine whether smolts released from the rearing and acclimation facilities disperse and migrate downstream without impacting the natural population (DCPUD 2002).

Spring Chinook

The evaluation plans for artificial propagation of spring Chinook salmon are aggregated into two components: the programs used for adult-based supplementation and those used for captive rearing of fish throughout their life history. Each component is meant to complement each other, provide information leading to adaptive management of spring Chinook salmon, and be useful in the evaluation and management of the other Plan Species in the Mid-Columbia Region. The evaluation plan for the adult-based supplementation component addresses the critical uncertainties and three objectives identified above and: Determine if hatchery facilities are capable of meeting their production objectives, if the MCHP conserves the genetic integrity and long-term fitness of naturally spawning populations of spring Chinook, and if salmon released from Mid-Columbia hatcheries interact adversely with natural productivity in the streams (DCPUD 2002).

Steelhead

The Hatchery Working Group recommended hatchery supplementation, with a transition from a single broodstock source to several locally adapted sources to recover steelhead populations at risk of extinction. A rapid transition may initially lessen hatchery production, and ultimately, natural escapement, so a well-defined evaluation plan that addresses the following questions is required to minimize impacts on the natural population: (1) does development of a local broodstock improve overall performance of hatchery released steelhead, (2) can residualism be controlled through various cultural techniques, (3) does acclimation differ from scatter plants in reducing impacts upon natural production, (4) do the hatcheries collect an appropriate sample of both natural and hatchery fish, and (5) what are the Natural Cohort Replacement Rates for selected supplemented populations in the region (DCPUD 2002).

The following evaluations strategy will help answer these questions (1) Implement a data base management system at each facility; (2) Evaluate fish cultural operations at each facility; (3)

Estimate reproductive potential of hatchery and natural steelhead in the river; (4) Assess the need to develop local broodstock, particularly on the Wenatchee River; (5) Monitor steelhead preparedness to migrate downstream at time of release; (6) Determine if the natural steelhead in the mid-Columbia tributaries genetically different from those produced in the hatcheries; (7) Determine the most effective allocation of production in a year of low adult returns (less than full seeding of habitat and broodstock collection requirements) (DCPUD 2002).

Sockeye

Most of the sockeye salmon evaluations for the MCHP will address the most effective means to increase natural production of the two rearing lakes. Specific questions to be addressed are: (1)What is the survival rate from release to emigration of juvenile sockeye salmon in Lake Wenatchee and, if the transboundary issue is resolved, in Lake Osoyoos? (2) What is the population size of hatchery and wild sockeye salmon that emigrate from Lake Wenatchee and, if the transboundary issue is resolved, Lake Osoyoos? (3) What is the smolt to adult survival rate for hatchery and wild sockeye salmon? and (4) In Lake Wenatchee, what release strategy for sockeye salmon reduces predation by bull trout? Additional evaluations will determine if the MCHP is capable of meeting the Phase A sockeye salmon production objectives (DCPUD 2002).

For the Lake Wenatchee production, these questions will be addressed through the following objectives: evaluate the release strategy for net pen reared sockeye; estimate populations of hatchery and wild juvenile sockeye emigrating from Lake Wenatchee; describe physical characteristics of Lake Wenatchee and the Wenatchee River that initiate emigration; determine the extent of predation/mortality during the release period, the post-release growth and fingerling-to-smolt survival rate of hatchery-reared juvenile sockeye, and determine the smolt-to-adult survival rate of Lake Wenatchee sockeye through extensive spawning surveys. Additional objectives were set to help hatcheries meet survival guidelines and production objectives of the MHCP. Biologists will determine the survival rates of various life stages of sockeye salmon at the hatchery and net pens. Fish health will also be monitored to develop cultural methods that alleviate fish health problems (PNAMP 2004).

Proposed Monitoring Programs

The proposed monitoring plan draws from existing monitoring strategies (ISAB, Action Agencies/NOAA Fisheries, and WSRFB) and outlines an approach specific to the Upper Columbia Basin. The plan is designed to eliminate duplicate work, reduce costs, and increase monitoring efficiency, while addressing the following issues: current habitat conditions; abundance, distribution, life-stage survival, and age-composition of ESA-listed fish in the Upper Columbia Basin (status monitoring); how these factors change over time (trend monitoring); and effects that tributary habitat actions have on fish populations and habitat conditions (effectiveness monitoring) (PNAMP 2004).

The porposed monitoring plan report is divided into seven major parts. Section 2 identifies valid statistical designs for status/trend and effectiveness monitoring. Sections 3 and 4 discuss issues associated with sampling design. Section 5 identifies classification variables. Sections 6 and 7 identify and describe biological and physical/environmental indicators and methods for measuring each indicator variable. The last section deals with how the program will be implemented. The four appendices attached to the plan describe how the plan will be implemented within each of the four major subbasins within the Upper Columbia Basin. The

Plan does not include a detailed Quality Assurance/Quality Control (QA/QC) Plan (PNAMP 2004).

Finally, the success of this plan requires all organizations involved to cooperate and share information. This includes implementing valid sampling designs, following standardized data collection and reporting protocols, selecting sensitive indicators, and sharing monitoring responsibilities. See Appendix F for a complete copy of this document (PNAMP 2004).

6.2.3 Comprehensive Plans

(Information sourced from the following: Chelan County 2000, Grant County 1999, DCTLS 1995, Okanogan County 1964)

Comprehensive plans are required by the 1990 Growth Management Act (GMA). In response to increased pressures from unprecedented population growth in Washington State, the State Legislature passed the GMA. The GMA (RCW 36.70A) is intended to avoid the possibility of uncoordinated and unplanned growth inherent in anticipated population increases. It requires county and city governments to adopt locally-derived plans and regulations around a basic framework of natural resources issues defined by the state legislature. One of the primary intents of the GMA is to prevent unwise use of natural resource and critical areas in accommodating urban growth. Each jurisdiction must classify and designate their resource lands and critical areas, and each must adopt development regulations for their critical areas. In addition, some jurisdictions must adopt planning policies and comprehensive plans that address many aspects of urban growth and development that are expected to occur in the county, including land use, housing, utilities, transportation, and others. Subsequent amendments to the GMA require that counties and cities include the best available science in developing policies and development regulations to protect the functions and values of critical areas. In addition, counties and cities must give special consideration to conservation or protection measures necessary to preserve or enhance anadromous fisheries. GMA and Shoreline Management Act (SMA) adoption, revision, and review dates for UMM Subbasin counties are detailed in Table 65.

Table 65 GMA and SMA adoption, revision, and review dates for UMM Subbasin counties

Description	Dates	Chelan County	Douglas County	Grant County	Kittitas County	Okanogan County4	Colville Tribes5
CAO[1]	Adoption[2]	1999	1992	1993	1998	1994	
	Most Recent Revision	2000	2003[3]				
	Next Required Revision	2006	2006	2006	2006	2007	
Comprehensive Plans	Adoption[2]	2000	1995	1999	1996	1964	
	Most Recent Revision	2000	2003[3]				
	Next Required Revision	2006	2006	2006	2006	2007	
Development Regulations	Adoption[2]	2000	1997	2000	1999		
	Most Recent Revision	2000	2003[3]				

Description	Dates	Chelan County	Douglas County	Grant County	Kittitas County	Okanogan County4	Colville Tribes5
	Next Required Revision	2006	2006	2006	2006	2007	
Resource Lands	Adoption[2]	1999	1992	1993	2001	1994	
	Most Recent Revision	2000	2003[3]				
	Next Required Revision	2006	2006	2006	2006	2007	
SMA	Adoption[2]	1972	1972				2000
	Next Required Revision	2005[6] /2013	2005[6] /2013	2013	2013	2014	

[1] CAO = Critical Area Ordinance.

[2] Original adoption dates since legislation for Growth Management Act (GMA) in 1990. The Shoreline Management Act (SMA) was originally adopted by legislature in 1970, completely overhauled Dec. 2003. Generally, cities all have respective dates of adoption for GMA and SMA plans associated to their county's adoption.

[3] For those jurisdictions deciding to plan earlier than required, the most recent revision may have been intended to fulfill the requirement (i.e., dates for local planning review requirements have changed several times over the last 5 years).

[4] Okanogan County is not required to address all of the elements of the GMA.

[5] The Colville Tribes are not under the authority of the State of Washington, but do have their own Comprehensive Plan and Shoreline Plan.

[6] Chelan and Douglas counties are expecting to start a review /update of their Shoreline Master Program in 2005.

The Washington Department of Fish and Wildlife (WDFW) has biologists in five of its six regions that provide technical assistance to local jurisdictions in complying with the requirements of the GMA regarding fish and wildlife resources. One of the primary goals of WDFW is to integrate its Priority Habitats and Species (PHS) program into the local jurisdictions' GMA planning activities. The GMA requires the fastest growing counties to adopt new comprehensive land use plans in compliance with the new law and to address the following 13 goals (RCW 36.70A.020):

Goal (1) Urban Growth – Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.

Goal (2) Reduce Sprawl – Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.

Goal (3) Transportation – Encourage efficient multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans.

Goal (4) Housing - Encourage the availability of affordable housing to all economic segments of the population of the state, promote a variety of residential densities and housing types, and encourage preservation of existing housing.

Goal (5) Economic Development - Encourage economic development throughout the state that is consistent with adopted comprehensive plans; promote economic opportunity for all citizens of the state, especially for unemployed and disadvantaged persons; and encourage growth, all within the capacities of the state's natural resources, public services, and public facilities.

Goal (6) Property rights - Private property shall not be taken for public use without just compensation having been made. The property rights of landowners shall be protected from arbitrary and discriminatory actions.

Goal (7) Permits - Applications for both state and local government permits shall be processed in a timely and fair manner to ensure predictability.

Goal (8) Natural Resource Industries – Maintain and enhance natural resource-based industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands, and discourage incompatible uses.

Goal (9) Open Space and Recreation – Encourage the retention of open space and development of recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands, and discourage incompatible uses.

Goal (10) Environment – Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.

Goal (11) Citizen Participation and Coordination - Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts.

Goal (12) Public Facilities and Services – Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards.

Goal (13) Historic Preservation – Identify and encourage the preservation of lands, sites, and structures that have historical or archaeological significance.

A comprehensive plan is a legal document adopted by local elected officials establishing policies that will guide the future development, growth, and land use within the counties over the next 20 years. The Plans strive to maintain the uniqueness of each area/community and enhance the existing quality of life that comes from a sense of community, customs, economic progress, open spaces, aesthetic/scenic beauty, recreational opportunities, clean air and water, abundant fish and wildlife, healthy ecosystems, historical and cultural resources, and increased access to land and water resources. In addition, the Plans provide for expansion of these opportunities, while maintaining an adequate infrastructure to accommodate this growth.

Comprehensive plans [Plan(s)] are typically broken down into elements: land use, transportation, capital facilities, economic development, utilities, and rural. The following are summaries of the Chelan, Douglas, Grant, and Okanogan County Comprehensive Plans by element. These summaries focus on commonalities and differences among the Plans.

Land Use Element

Natural Systems / Critical Areas

The Plans provide for the protection of critical areas, which include the following areas and ecosystems: (a) wetlands; (b) groundwater resources and aquifer recharge areas; (c) fish and wildlife habitat conservation areas; (d) frequently flooded areas known to be critical parts of the natural drainage system; and (e) geologically hazardous areas. The land use element is also required by the GMA to review; where applicable, drainage, flooding, and storm water run-off and to provide guidance for corrective actions to mitigate for those discharges that pollute waters of the state.

Plan goals help to identify and protect critical areas, and provide for reasonable use of private property while mitigating adverse environmental impacts. This includes protecting the quality and quantity of ground water used for public water supplies, preserving frequently flooded areas by limiting and controlling potential alterations and / or obstructions to those areas, and avoiding or mitigating significant risks that are posed by geologic hazard areas to property (public and private), health, and safety. They also ensure that development minimizes impacts upon significant natural, historic, and cultural features and preserves their integrity.

Resource Lands

County goals assure conservation and continued use of agricultural, forest, and mineral resource lands that have long-term significance for commercial production. The Plans provide for reasonable, limited use of designated resource lands that are compatible with the long-term production of natural resource products. They also facilitate a healthy, diverse, and competitive agricultural industry, control encroachment of incompatible uses and ensure public health and safety. Grant County calls for the mitigation of conflicts between resource and non-resource land uses in designated resource lands.

Resource lands in Douglas and Grant counties include agricultural and mineral lands. Forestlands have not been included because they do not meet the minimum criteria for lands of "long-term commercial significance" within these two counties.

Residential Development

While recognizing that residential development is important and necessary to the sustainability of the communities, housing goals were developed to ensure that future development is compatible with surrounding land uses and can be efficiently and effectively served by public facilities and services. In addition, residential designations shall provide for an adequate supply of land to accommodate housing needs, and a variety of residential opportunities to serve a full range of income levels. The Okanogan Plan also calls for maximum utilization of the land.

Urban Growth Areas

The GMA stipulates that UGAs are to include areas and densities sufficient to permit the urban growth that is projected to occur in the County over a twenty year planning period. Urban growth is encouraged within designated Urban Growth Areas (UGAs) (areas already characterized by urban development where existing public facility and service capacity is available). Otherwise, in areas where public or private facilities or services are planned or could be provided and used in an efficient manner. Grant county also states that UGAs should concentrate medium- and higher-

intensity residential, commercial and industrial development in a way that ensures livability, protection of cultural resources, and preservation of environmental quality, open space retention, varied and affordable housing, and high quality urban services at the least cost, and orderly transition of land from county to city. In this way the counties are also able to achieve their goal of an orderly, phased transition from rural to urban uses (see Population of Subbasin Counties).

Commercial and Industrial Development

Similar goals apply to commercial and industrial development. Commercial and industrial development is limited to areas zoned for these activities within the urban growth boundaries (areas with the infrastructure and services to support such development) and in rural lands when consistent with the GMA. County goals maintain the existing commercial and industrial base and promote further diversification, while maintaining compatibility with surrounding land uses. The Okanogan Plan requires heavy industrial areas to be buffered from all other uses so as to not create any adverse effects on other types of land use.

Additionally, commercial and industrial goals call for the designation of adequate areas, which will allow for a range of opportunities and the diversification of area economies. They also require the mitigation of impacts on other land uses and the community, where appropriate. A goal of the Chelan Plan is to retain docking facilities at the Stehekin Landing for both commercial and private use.

Open Space / Recreation

Plan goals encourage the retention of open space (underdeveloped land that helps define the rural character of the County), the development and maintenance of recreational facilities to meet the needs of residents and tourists, and the coordination of federal, state, local, and private planning. Plans also provide for public access to recreation sites and the reasonable, limited use of privately-owned land within the Open Space designation, provided that such development is reasonably compatible with open space recreation and fish and wildlife habitat conservation (Douglas).

Plans also specify that park and recreation planning and development should take into consideration impacts on surrounding land uses, critical areas, and significant natural, scenic, historic, and cultural features. For instance, the Okanangan Plan assures that the density of urban and recreational development in areas with stream and lake frontage where no public sewerage and water facilities are available is low enough to prevent the pollution of streams and the lowering of water tables.

Master Planned Resorts

Another objective of the plans is to provide opportunities for Master Planned Resorts (MPRs: destination resort facilities that may be located outside of the UGA) consistent with the provisions of RCW 36.70A.360. These opportunities include encouraging and enhancing a diversity of recreational, lodging, and economic opportunities, and providing resorts in existence as of July 1, 1990, which match the definition of an MPR, a means to be classified as such. The plans also require that development regulations governing the review of MPRs shall incorporate appropriate environmental and design standards.

Transportation Element

Transportation goals provide for the efficient use of existing and future transit facilities for all citizens through a systematic approach of monitoring and maintaining the transport systems. The goals integrate many types of transportation systems and facilities (e.g., road, rail, air, bike, pedestrian, etc.) and establish levels of service, by coordinating transportation planning with other elements of the comprehensive plan (e.g., land use and rural areas), and coordination with other jurisdictions and transportation providers to meet shared needs. They also promote safe, efficient access to land, while maintaining the integrity and minimizing impacts of the transportation systems, and providing for the health and economic well-being of county citizens. Transportation improvements and development are provided through a fiscally sound approach that stays within the counties funding capacity. Finally, the Plans provide for a systematic process for reviewing and updating the Transportation Improvement Program.

The transportation element for Okanogan County is more general in nature and deals only with arterials. Goals for management of arterials are similar to other counties in that they contain proposals relating to the standards and locations of roads and tie road use to present and future land use and public facilities within the county. In addition, they call for cost effective construction and maintenance of streets.

The Okanogan Plan also alludes to other potential goals related to implementation of the arterial plan. They include, encouraging travel on the designated arterials through use of arterial standards in design and construction (e.g., properly located signs - “stop” and “yield”; giving preference to major arterials), and by adopting and enforcing subdivision regulations.

The Okanogan Plan devotes an entire section to road planning. Their goal is to assure that roads into future urban, recreational, and agricultural areas will be of a sufficient standard and width to meet present and future needs (Okanogan).

Planning for other forms of transportation are not addressed in the Okanogan Plan except for air travel. Airport planning is included within the public facilities element and focuses on enhancing a number of undeveloped airstrips (Oroville, Tonasket, Okanogan, and Brewster) in order to attract tourist activity, enhance economic well-being, and improve quality of life. The Pangborn Memorial Airport, a regional facility, has its own comprehensive plan that, as required, is developed and consistent with the Douglas County Comprehensive Plan.

Capital Facilities Element

Plan goals ensure that adequate public facilities and services (e.g., fire, police, water, sanitary sewer, storm water, schools, hospitals, parks, etc.) are planned, located, designed and maintained in a timely, economical, efficient, and equitable manner, according to future development of the county and in coordination with other elements of the comprehensive plan (e.g., land use and transportation) and other jurisdictions. This includes: establishing and achieving levels of service standards; encouraging compatible, multiple uses of public facilities; maximizing use, including rehabilitation of existing facilities and replacing worn out or obsolete facilities, when and where feasible; ensuring funding for facilities and services that are within the counties capacity; and encouraging land use patterns that minimize (make reasonable) the cost of providing facilities and services. Douglas County requires developments to pay for their fair share of impacts on capital facilities and to maintain service standard levels. The Chelan County Plan encourages

participation in, and the establishment of, a regional forum to address area wide public facility and service and utility needs as they arise.

With regard to environmental protections, the Chelan County Plan ensures that public services and facilities are adequately planned and designed to prevent significant negative environmental impact, to assure access, and to protect public health, safety and welfare. Specifically, the county supports and encourages water conservation education and measures, energy conservation design strategies, and the design of facilities and services that are in keeping with the rural and scenic character of the county. Also, fire provisions provide for proper disposal of vegetative debris associated with capital development. Douglas County requires mitigation to prevent adverse impacts on the environment and other public facilities resulting from the design and location of public facilities and they promote user respect and care for recreation resources and facilities.

The public facilities element of the comprehensive plan for Okanogan County is less comprehensive than the other plans, focusing primarily on future development of the county's parks, schools, and water and sewer facilities. The technical design and construction does not fall within the scope of the plan except for the fact that they should be coordinated with the comprehensive plan to insure that the facilities will be adequate to handle future demands.

The Okanogan County Plan devotes more attention to recreational development than the other plans because it offers the highest potential of any economic activity for future improvement of the county’s economic base. The Plan suggests sites, priorities, and types of recreation facilities needed and encourages development by private groups, individuals and public agencies for the use of both tourists and county residents. The planning process also considers varied means of securing and preserving the proposed parks, as well as providing access, while preventing encroachment from incompatible uses.

There are several other types of public facilities in Okanogan County that also need development. These other facilities include county road district shops, airports, garbage dumps, and gravel pits. Plan goals call for the relocation of road district shops to the industrial sections of the towns and location of garbage dumps to limit negative impacts on sight, smell, and health on citizens and the environment. Airports are included in the transportation element of this report.

At present Okanogan County does not have any sewerage and water controls. There are several areas within the county (e.g., Elmway Area between Omak and Okanogan; the west shore of Lake Osoyoos; Malott and Loomis) that are beginning to have, or will have in the near future, problems relating to water and sanitation. The plan states that it is imperative for the future health and welfare of the residents of Okanogan County that adequate sanitation regulations be implemented and enforced by the county.

Economic Development Element

County goals are designed to increase efforts to support, retain, and expand the existing agricultural industry (includes expanding value-added agricultural products) and other local business, while diversifying the economy by promoting other opportunities for economic development that provide diverse work opportunities and job security, and ensure a healthy, stable, growing economy. The plans seek to attract businesses and industries that complement and build upon existing enterprises and those that conserve natural resources and open spaces,

maintain environmental quality and rural character, and enhance the overall quality of life. Development of tourism and recreation was a key goal for each of the counties.

County Plans also encourage economic growth through other means. They propose to involve citizens and other jurisdictions in the creation of decisions/direction for future growth in economic development including educational partnerships that provide the technically skilled labor force to attract and retain good paying industries. They encourage economic growth through planning and development of the region's public services and facilities' capacity and they pursue legislative changes (including tax increment financing) and provide regulatory incentives to foster public/private partnerships and economic development.

The counties also have individual needs and requirements that are expressed in their goal statements. Douglas County supports and encourages development that creates local re-investment funds, and growth of non-resource industries that are consistent with local quality of life issues. Chelan County recognizes the need to be proactive in addressing ESA listings and entering into watershed planning efforts because of their potential impact on economic development efforts and the ability to pursue sustainable economic development. They will also work to retain and develop their site limited industrial sector and to diversify the local economy by strengthening manufacturing and promoting producer services and other basic industries. Grant County will focus business recruitment and development on firms that will diversify the local economy and can effectively serve state, national, Pacific Rim and other global markets from a Grant County location. To facilitate this process, they will ensure an adequate supply of commercial and industrial sites, encourage high value-added resource based products and businesses, and encourage the establishment of industrial parks and other light manufacturing facilities and provide zoning of facilities engaged in producer services, including computer, health services, and telecommunications.

The Douglas County Plan emphasizes the need to develop and implement land use regulations that are flexible enough to recognize the changing nature of business and industry. The Plan supports phased infrastructure development and the designation of lands for commercial industrial development in rural and industrial service centers where there is evidence of community support. It also allows the designation of light manufacturing and other industrial development in areas without sanitary sewer, but where acceptable and adequate alternative disposal facilities can be provided. Further, the Plan proposes developing a process for authorizing the siting of new major industrial developments outside of designated Urban Growth Areas that is consistent with the provisions of RCW 36.70A.365 and pursuant to the Countywide Planning Policy.

The Okanogan Plan does not include an economic development section. Rather, goals pertaining to economic development are general in nature and are encompassed within the other comprehensive plan elements discussed herein.

Housing Element

Housing goals provide for the adequate supply of affordable housing in a variety of prices, densities, and types, to meet the needs of existing and projected populations of all economic segments within these counties and as a means of attracting industry. To conserve current housing resources and maximize their use, the Plans encourage the appropriate preservation of existing housing stock and, where appropriate, provide for higher density residential housing

developments within existing residential communities and urban growth areas where adequate infrastructure and services can be provided. Plans also call for innovative regulatory strategies that can create incentives for developers to provide housing affordable to low and moderate income households.

Agriculture is a significant economic activity in these counties and Douglas and Chelan County Plans require necessary support services and facilities to be accommodated in order for the industry to remain economically viable. This includes the construction of year-round and seasonal agricultural worker housing units. Douglas County encourages innovative, viable housing opportunities for agricultural workers, both on the farm site and within the community, while Chelan County calls for housing located in or adjacent to orchard areas. When farmers provide agricultural housing on-site, Douglas County states that local regulations and requirements guiding the development of housing should promote the health and safety of the targeted inhabitants, while still recognizing the temporary, seasonal nature of the facilities. In contrast, Chelan County encourages planners to consider the reduction of site development and fire protection standards for temporary housing units for migrant workers, where permitted by state agencies.

Utilities Element

County utility goals promote increased efficiencies and quality service, multi-jurisdictional cooperation, coordination with other elements of the comprehensive plan (e.g., land use and transportation), and the provision of adequate, timely, safe, and cost effective utilities (e.g., power, water, sewer, telecommunications and, in some areas, irrigation) to support current and future development. This includes identifying the proper location of utilities, minimizing cost and disruption of normal activities, increasing effectiveness of the resource, and protecting the public and environment from negative impacts associated with the siting, development, and operation of utility services and facilities. Counties will also promote the continued use, maintenance, development and revitalization of existing utilities whenever possible. Utility development regulations should be flexible, receptive to innovations, and based on specific situations. Grant County encourages the location of necessary utility facilities within existing and planned transportation and utility corridors and the joint use of transportation rights-of-way, provided that such joint use is consistent with limitations as may be prescribed by applicable law and prudent utility practice.

With respect to maintaining the quality of life and the environment, the Chelan and Grant County Plans state utilities should be provided in a manner that minimizes negative visual and noise impacts and, where facilities may have negative impacts, regulations shall provide for adequate buffering and screening of facilities. They also encourage energy conservation, including new construction, and the use of cost effective alternative energy sources (e.g., solar and wind power). Further, Grant County requires that utility providers avoid placement of facilities in areas designated as environmentally sensitive or critical areas unless no feasible alternative exists and only after a site assessment and mitigation plan has been approved under the provisions of Grant County's Resource Lands and Critical Areas Ordinance.

Chelan County has set guidelines specific to the Stehekin Study Area. These goals encourage the continued use and maintenance of hydroelectric facilities and the enhancement of hydroelectric power capabilities through system efficiency and the protection of facilities from erosion and

flooding. Further, they seek to decrease future reliance upon diesel powered electricity by encouraging the use of alternative energy sources.

The Okanogan Plan does not include a separate discussion of utilities. Water and sewer are discussed within the capital facilities section and there is no specific mention of power or water. There are a number of references within various sections of the Plan to the provision of utilities. These deal primarily with the efficient and cost effective location and development of utilities in coordination with an orderly outward growth of urbanizing areas.

Rural Element

Rural areas are those areas not designated for urban growth, agriculture, forest, or mineral resources. However, agriculture, farming/ranching, forestry, mineral, recreation and other similar activities are inherent within this designation. Plan goals take into consideration both human uses and the natural environment. They encourage rural development that maintains the rural character and visual integrity of the land and protects and restores the land and water environments required by natural resource-based economic activities, fish and wildlife habitats, rural lifestyles, outdoor recreation, and other open space. Other primary stipulations for rural development include developing at low levels of intensity, ensuring that the provision of public facilities and services are consistent with rural character and lifestyle, reducing the inappropriate conversion of rural lands to sprawling low-density development, and promoting coordination with other jurisdictions and sections of the plan.

Comprehensive Plans provide for a variety of rural densities and designations, while striking a balance between maintaining the existing pattern of uses (e.g., residential, small-scale commercial, cottage and resource industries, tourism, recreation, agricultural, light industrial and limited natural resource processing, sales, and support services) and providing opportunities for future, compatible development. To accomplish this, counties will promote the continuation and enhancement of clustering (i.e., MPRs, designated rural service centers fully contained communities), density transfer, design guidelines, conservation easements, and other innovative techniques. Open space will be part of the development in order to protect rural values and buffer adjacent resource use/critical areas. Also, whenever feasible, rural developments will be encouraged to use community systems for domestic water and sewage disposal to increase efficiency, lower costs of providing these services, and to cause fewer impacts on the environment (e.g., aquifer recharge areas, water quality and quantity). Development and recreational opportunities in rural shoreline and other rural areas shall minimize potential adverse impacts on water quality, slope stability, vegetation, wildlife and aquatic life.

The Okanogan Plan does not deal specifically with rural designated lands. Much of Okanogan County is sparsely settled and most of the recommendations contained in the plan pertain to areas of population concentration and intensive agriculture in the Okanogan, Methow, and Columbia River Valleys; and to areas of present and potential recreational value such as the Upper Methow Valley and land along the county's major lakes and streams.

6.3 Research

6.3.1 Aquatic/Fish

More information is needed to determine proper management strategies and how to direct funds and efforts to effectively improve habitat conditions in the tributaries. Currently it is unknown

what effect other factors such as year-round water quantity and quality have on salmonid production.

Comprehensive studies of water quality are needed to establish baseline data and to determine the effects of water conditions on productivity. More information is needed on year–round flows, water temperatures, the location and effects of water diversions on year–round flows and water temperatures, watershed land use practices, blockages to migration, and chemical contaminants (from agricultural lands and other sources).

Because the ultimate goal is to increase rainbow/steelhead and salmon abundance, base line information concerning fish population size and composition and macroinvertebrate populations needs to be established prior to any habitat work. Without this information it will be impossible to monitor and evaluate the effects of any habitat improvement efforts. Aquatic macroinvertebrate species composition, diversity, and abundance vary based on differences in water quality and ecosystem productivity. Establishing base line information concerning invertebrate populations and monitoring any changes to these populations over time provides a useful means to measure any increases or decreases in system productivity because of efforts to improve water quality or habitats. An example would be to increase nutrient input (i.e., increased input of vegetation) through restored riparian vegetation. Base line information also needs to be colleted concerning sediment characteristics, particularly fine sediment and embeddedness. Management recommendations for future research on bull trout, white sturgeon, and Pacific lamprey are as follows:

Bull Trout

Improve current knowledge base on bull trout throughout the Upper Middle Mainstem of the Columbia River Watershed.

- Complete a bull trout fish use study in the Upper Middle Mainstem of the Columbia River.
- Complete a life history study throughout the Upper Middle Mainstem of the Columbia River

White Sturgeon

- Determine the location and degree of spawning throughout the Columbia River from Wanapum Dam to Chief Joesph Dam.
- Determine the degree of predation by native and non-native species on larval sturgeon.
- Determine effects of hydro-electirc project on all life stages
- Determine how flows affect existing spawning habitat and rearing success.
- Complete a life history study throughout the Upper Middle Mainstem of the Columbia River.
- Determine the effects of a supplementation progam on thecurrent population.
- Pacific Lamprey
- Determine effects of passage through the hydroelectric projects and how the project areas may be modify to facilitate more success

- Determine migration periods of Pacific lamprey through the system and in to the tributaries.
- Determine effects of hydro-electirc project on all life stages.
- Complete a life history study throughout the Upper Middle Mainstem of the Columbia River.
- Improve enumeration of lamprey at the hydro-electric projects.
- Conduct adult telemetry studies to determine population distribution.

All projects conducted to alter habitat to improve the productivity of an aquatic system should have a monitoring and evaluation component. The ability to evaluate the consequences of any habitat alteration is needed not only to determine the effectiveness of these efforts but also to provide understanding that would, if needed, lead to adaptive management strategies that would better achieve the desired outcome.