Yakama Nation Wetlands and Riparian Restoration Project

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Fiscal Year 2006 Annual Report

April 1, 2005 – March 31, 2006

Contract Number 96-BI-93554

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Executive Summary

The Yakama Nation's Wetlands and Riparian Restoration Project experienced another successful year in FY2006. This report outlines many of the activities which occurred. The year's highlights included the following:

1) 300 acres were secured for restoration and management (Fig. 1). One addition occurred along Toppenish Creek adjacent to the South Lateral A property. A second acquisition also occurred at the confluence of Toppenish and Simcoe Creeks, though the purchase of the second one has not yet been reimbursed by BPA. The Property-Specific Reports provide further information.

2) A wetland restoration project was completed in FY2006. The Mid-Toppenish Creek floodplain restoration project was completed with funding from the USDA Wetlands Reserve Program ($500,000). Over 25 miles of Toppenish Creek main and side channels were restored by the placement of 28 grade control structures. Over 1,600 acres of wetland hydrology was also reconnected.

3) The funding application submitted in FY2005 to the North American Wetlands Conservation Council was accepted. This project will provide $1,000,000 for wetland, side channel and upland habitatrestoration in the Project Area. Additional cost share for this large, four-year effort exceeds $2.5 million. Contributing partners include the Yakama Nation, the Washington Department of Fish and Wildlife, Ducks Unlimited, Pheasants Forever, the U. S. Fish and Wildlife Service, Bureau of Reclamation, U. S. Natural Resources Conservation Service, City of Grandview, Yakima Basin Environmental Education, Washington Waterfowlers Association, Yakima Valley Audubon Society, Central Washington University, and Lloyd Sak.

4) HEP monitoring field activities occurred on several properties during FY2006. Paul Ashley and the HEP crew assisted in these efforts. Paul also worked with the Project and Joe DeHerrera to develop a comprehensive report on the HEP monitoring activities and results that have occurred on this Project since its inception. This report was submitted to Joe DeHerrera and is included here on disc.

5) Monitoring activities included population monitoring of waterfowl and upland game bird surveys, summer duck banding and harvest information. Photomonitoring points were established at vegetation restoration sites.

6) In FY2005 over 1,000 acres of wetlands and uplands infested with Russian olive were treated. Follow-up chemical applications occurred this year on these properties. This activity was funded by the Bureau of Indian Affairs

7) On 736 acres, vegetation restoration was conducted, including weed control, removal of debris and internal fences, improvement of property boundary fences, and native grass planting. Weed treatments included mowing, disking and herbicide spray (see annual herbicide report) on 450 acres. Native grasses were planted on 46 acres, including basin wild rye and Sandberg's bluegrass. Pheasants Forever provided funding for the native grass seed. Additional acres will be treated for weeds and planted each year.

8) Cultural resources investigations were conducted at several properties. Tule fields were burned to promote growth of desirable plants for traditional harvest and use.

9) Education, public use and publicity:
Numerous tours, articles and presentations were conducted in 2006. Information is provided in the Education and, public use, and publicity section of this report and in the appendices.

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Summary of General Activities

Land Securing Activities

Two general areas were targeted this year for inclusion into the project. New areas totaled 300 acres for a total project area of over 21,000 acres. The Carl Property (160 acres) on Toppenish Creek comprised over half of the acreage this year. The Carl property will be managed as apportion of the South Lateral A property. The Graves Property (140 acres) was also purchased. It is located at the confluence of Toppenish and Simcoe Creeks. The Graves property will be managed as a portion of the Olney Drain property. Reimbursement by BPA for the Graves property has not yet been completed. This purchase is an item being addressed in the discussions related to a 10 year fisheries and wildlife agreement between the Lower Columbia River Tribes and BPA. Information pertaining to each individual parcel is provided in the property-specific reports.

Priority Area Map

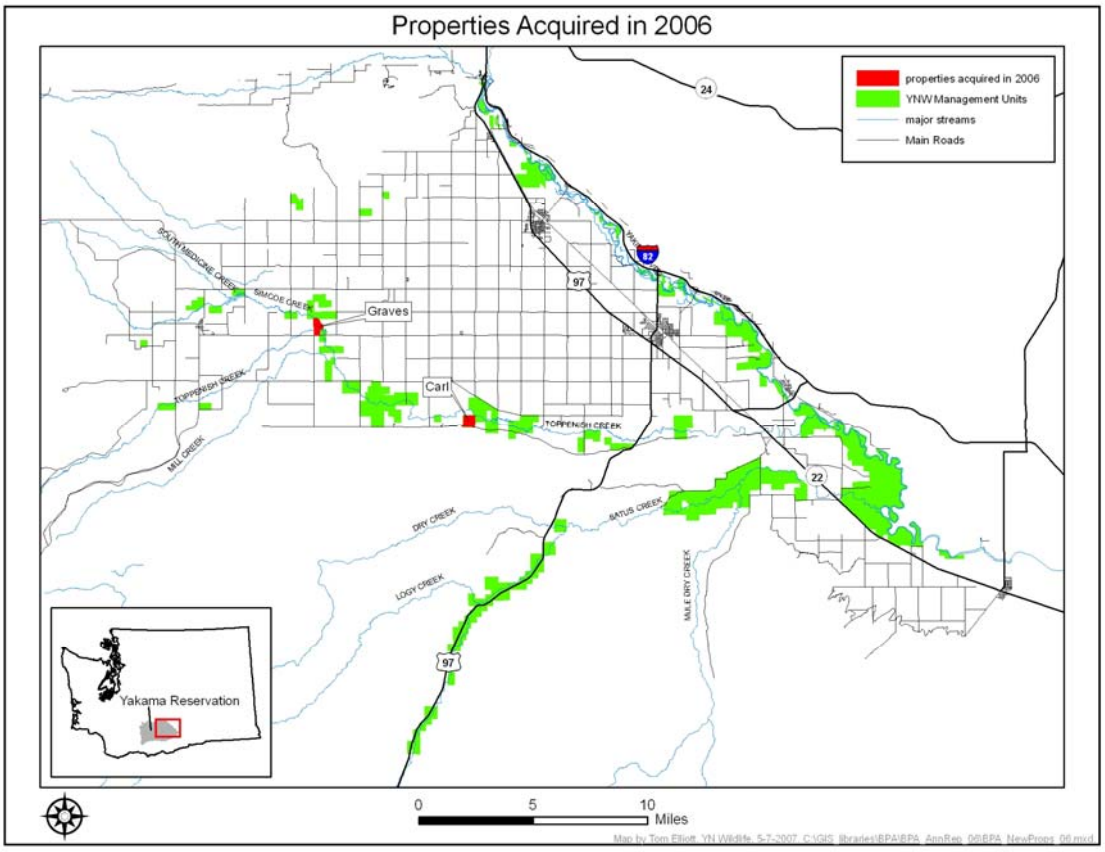


Figure 1. Properties secured in 2006. (Green lands west of Wapato are not included in this Project.)

Monitoring and Evaluation

Habitat Monitoring

Monitoring summary – During the FY07-09 application process through the NW Power Planning and Conservation Council, the Independent Scientic Review Panel asked for an example of some of the monitoring results the project has documented over the years. In response to this, the Project personnel developed a report summarizing monitoring efforts at the South Lateral A property. This summery is an example of the monitoring activities occurring on the restoration areas the details of which do not necessarily appear in the annual reports. Appendix B includes this report.

Habitat Evaluation Procedures (HEP) – Project personnel worked with Paul Ashley and Sara Wagoner to complete the summery of all of the HEP monitoring activities and results that have been generated over the life of this Project. A portion of this report is included in Appendix C. HEP activities in 2006 resulted in the following:

2006 Baseline HEP Results Summary

Property	Acres	Habitat Units
Bailey	**40**	**0**
Mill Creek North	**160**	**141**
Mill Creek South	**165**	**173**
Olney Drain	**450**	**375**

Note : Bailey received no Baseline HUs because the property had been plowed for grass planting. It contained no vegetation at the time of the baseline HEP. It will be measured again in 5 years to measure the HU amounts due to the restoration.

Wildlife Surveys

The Yakima Nation Wildlife Resource Management Program (YNWRMP) conducts several wildlife surveys in the valley portion of the Yakama Reservation. These surveys provide an index to wildlife populations. They also provide information on wildlife responses to our restoration efforts. Although most surveys are conducted through the whole valley, wildlife trends on or near properties managed by the YNYRMP program show a positive trend in wildlife numbers.

Waterfowl Breeding Pair Counts

We conduct waterfowl breeding pair annually during the second week of May. These counts are conducted at 15 different sites. These counts allow us to monitor duck responses to our restoration efforts and make proper management decisions. Results from these counts indicate that the total number of breeding pairs of dabbling ducks has increased since 1955 (Figure 1). This increase has been evident in mallard (Figure 2) Gadwall (Figure 3), and shoveler (Figure 5). Wood Ducks (Figure 6) and teal (Figure 4) numbers have remained relatively constant. In 1999, we added South Lateral A to the Breeding Pair Counts. Counts were initially high, but have remained relatively constant over the last 4 years. When adjusted for the area surveyed, the South Lateral A property produces 11 times as many mallards per acre as is produced on average throughout the valley.

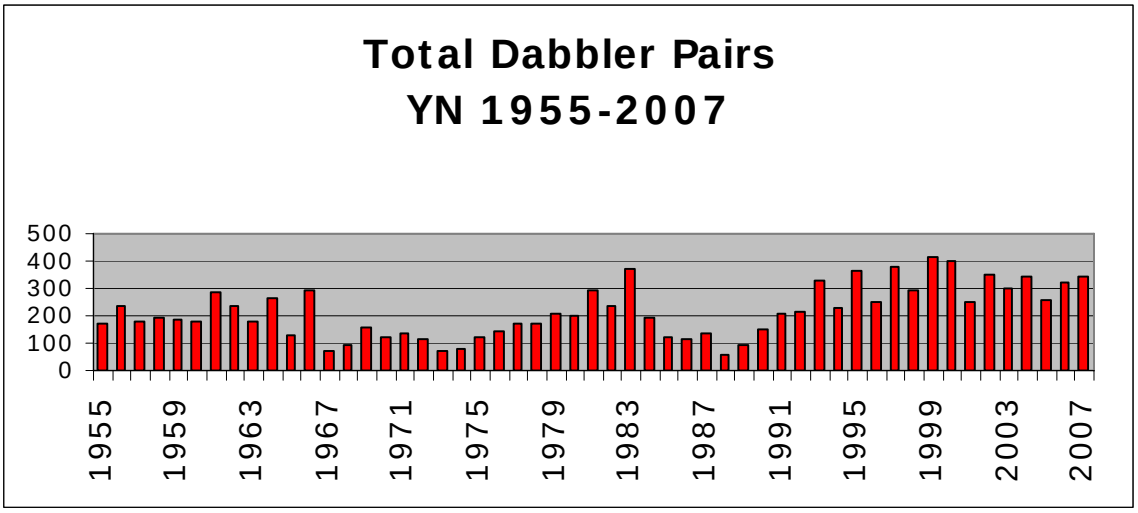


Figure 1: Number of breeding pairs of dabbling ducks observed during counts conducted from 1955-2007 on the Yakama Reservation

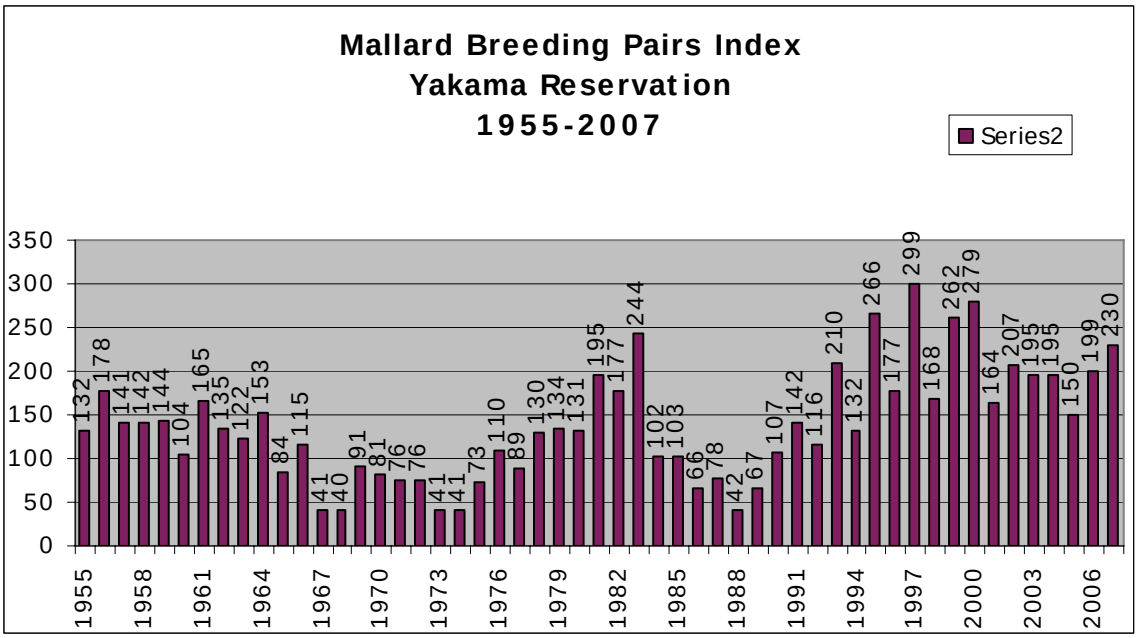


Figure 2: Number of breeding pairs of Mallards observed during counts conducted from 1955-2007 on the Yakama Reservation

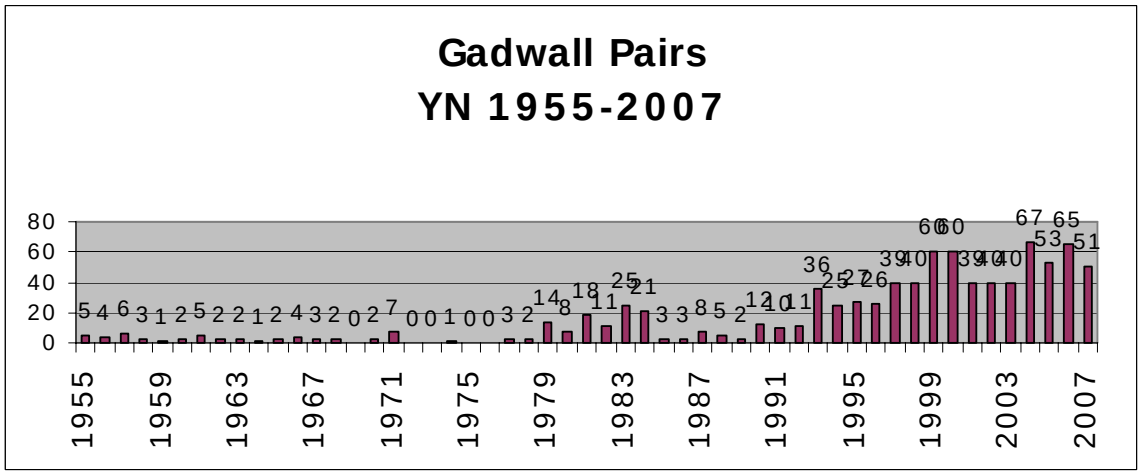


Figure 3: Number of breeding pairs of Gadwall observed during counts conducted from 1955-2007 on the Yakama Reservation

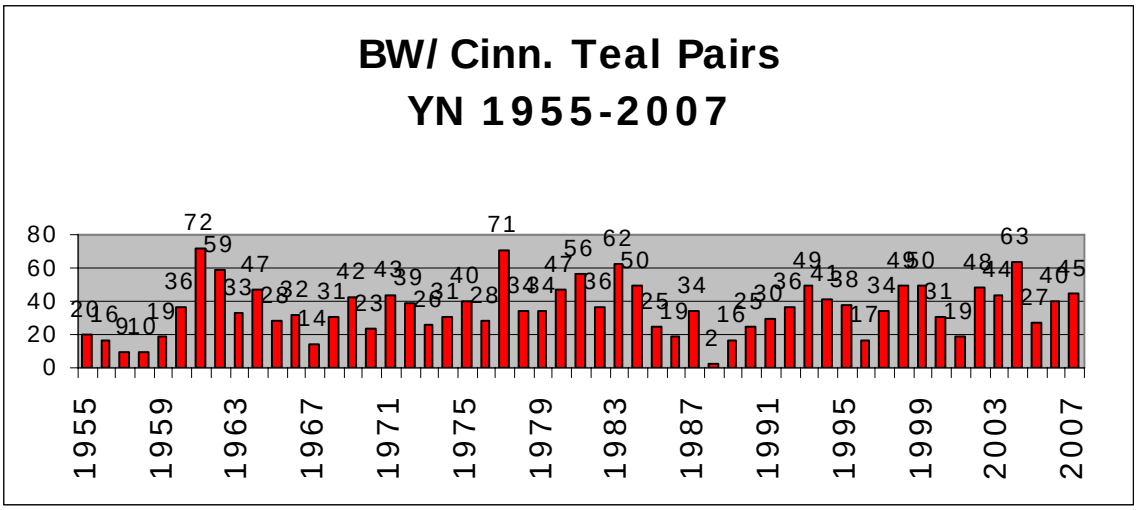


Figure 4: Number of breeding pairs of BW/Cinn. Teal observed during counts conducted from 1955-2007 on the Yakama Reservation

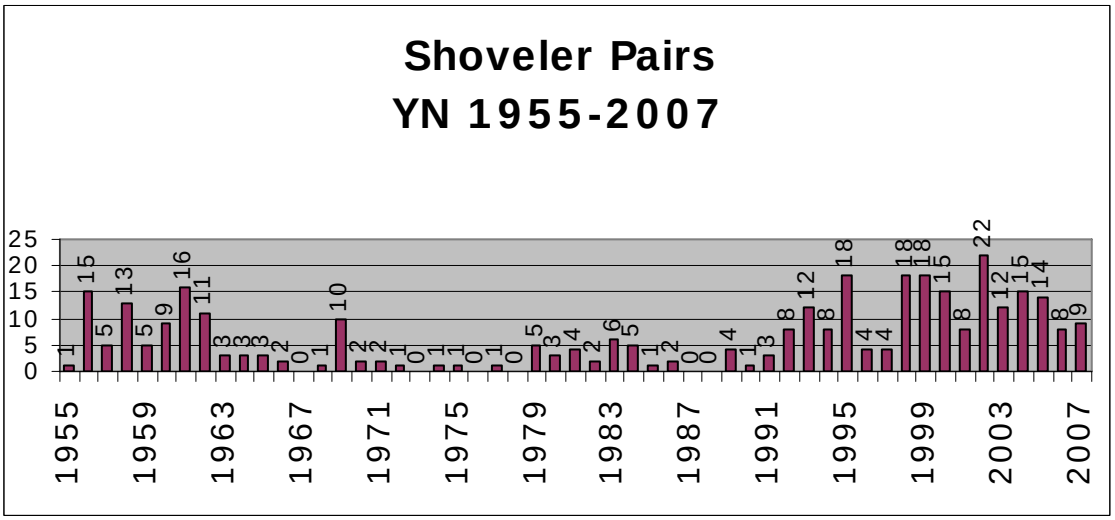


Figure 5: Number of breeding pairs of Shovelers observed during counts conducted from 1955-2007 on the Yakama Reservation

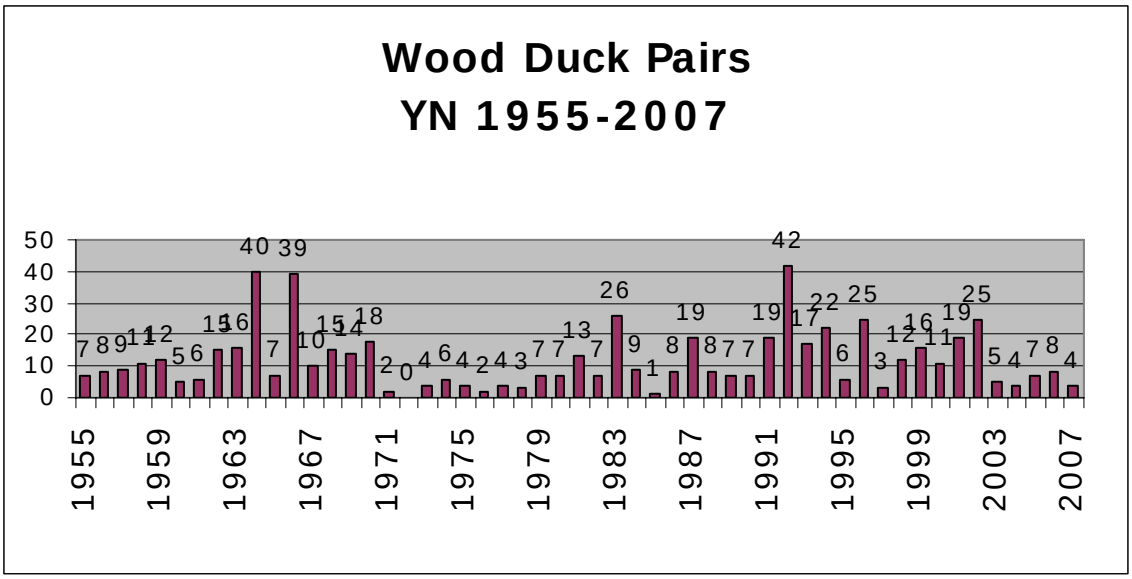


Figure 6: Number of breeding pairs of Wood Duck observed during counts conducted from 1955-2007 on the Yakama Reservation.

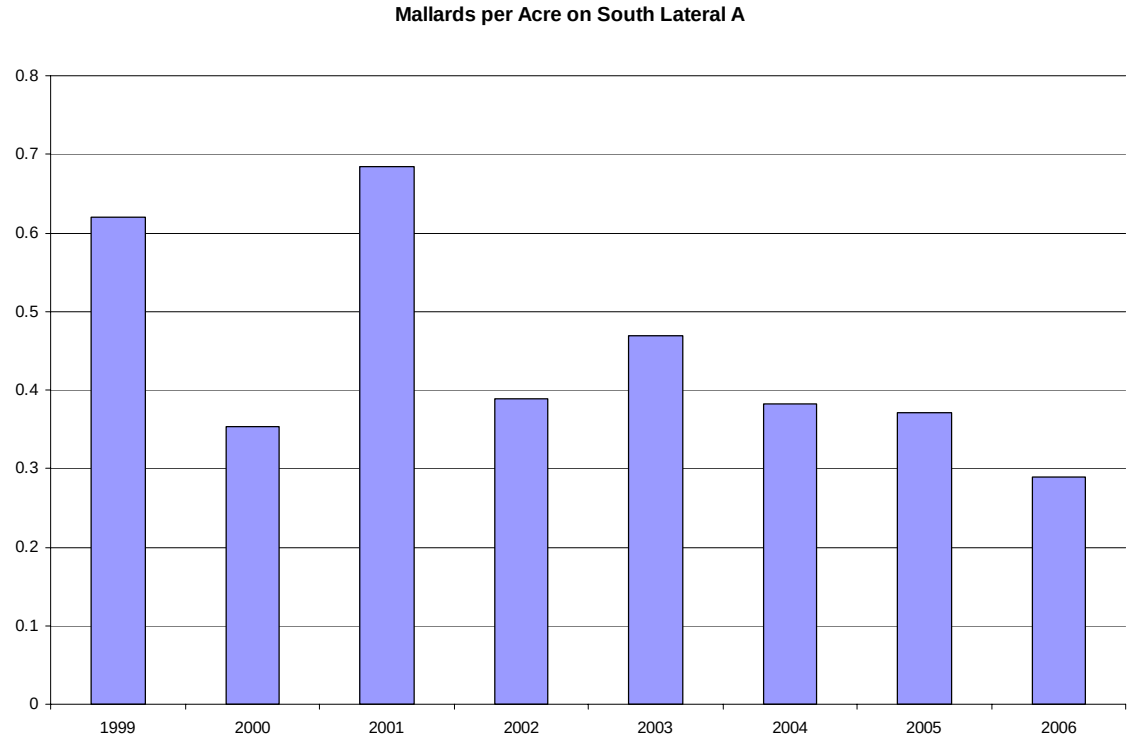


Figure 7: Number of breeding pairs of mallards observed during counts conducted from 1999-2006 on South Lateral A on the Yakama Reservation

Mourning Dove Coo-Counts

In conjunction with the United States Fish and Wildlife Services Webless Migratory Game Bird Program, we conduct mourning dove call-counts to estimate the number of breeding mourning doves. Protocol and routes are chosen by the USFWS. These routes do not change and provide continental population estimates. The population estimates are used by the USFWS to set dove seasons and bag limits. On the Yakama Reservation these counts are conducted annually on 2 routes the last full week in May. Since 2000, the number of breeding pairs has increased, although in 2006 we saw a slight decrease (Figure 8, 9). The increase is greater on the Pumphouse route which follows Toppenish Creek where the YNWRMP and Toppenish National Wildlife Refuge manage a significant portion of the land.

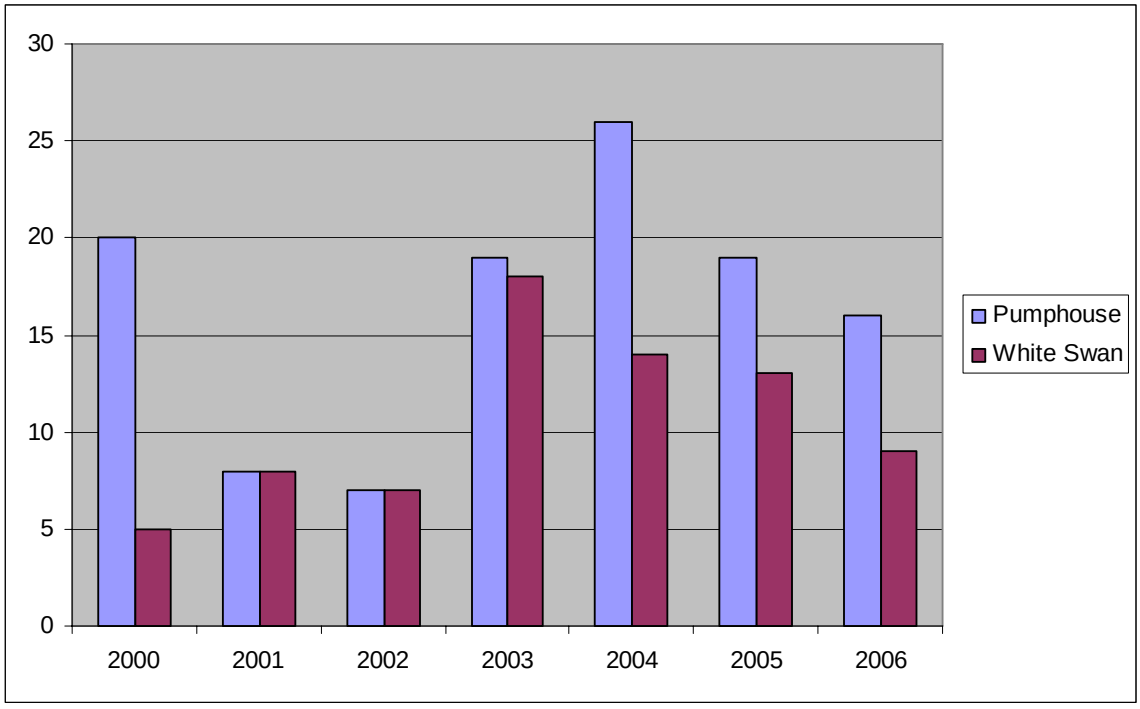


Figure 8: Number of calling doves heard on dove call count routes on the Yakama Reservation from 2000 through 2006.

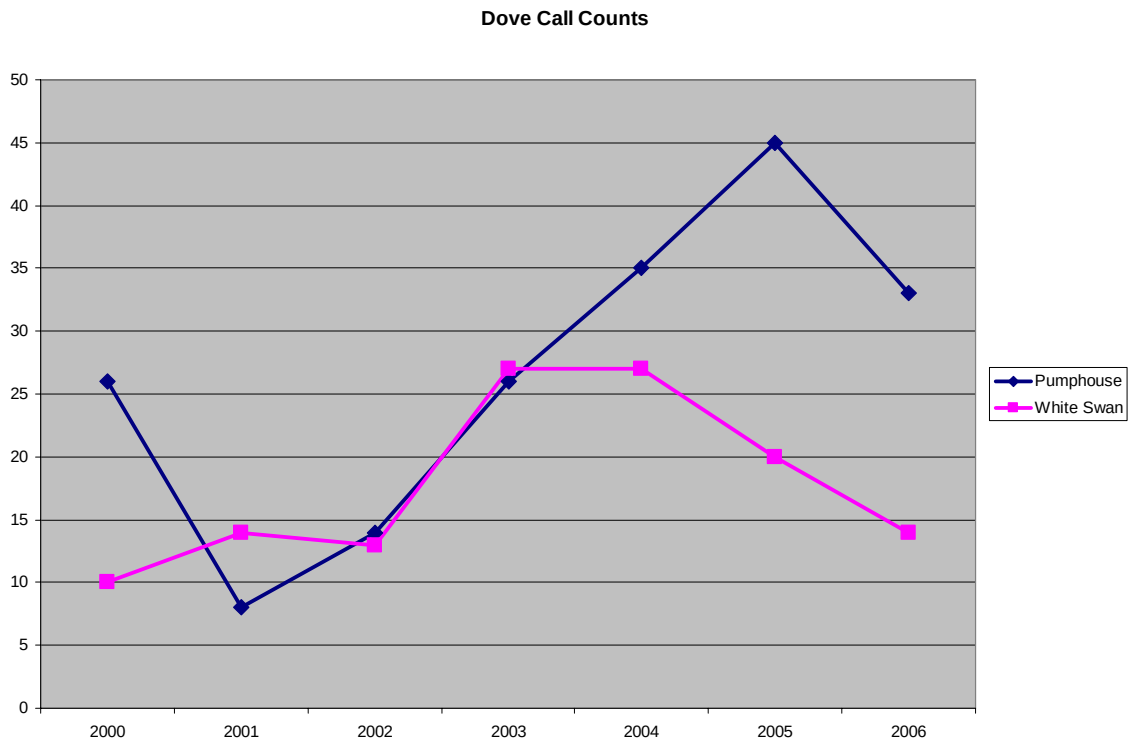


Figure 9: Total number of mourning doves seen and heard on the Pumphouse and White Swan dove call count routes on the Yakama Reservation from 2000 through 2006.

Upland Game Bird Brood Counts

During the last 2 weeks of July and the first week of August, we conduct annual counts of ring-necked pheasant, and California quail broods to index population levels. These counts are done on 7 standardized routes once a week. Dove counts indicate that population estimates in 2006 are higher than 2005 estimates (Figure 10). Quail counts in 2006 showed a slight population decline, however population levels are still above the 13 year average (Figure 11). Pheasant (Figure 12) population estimates have been declining since we began monitoring the populations. Reasons for the decline are unclear however changes in agricultural practices may have detrimental impacts on pheasant populations.

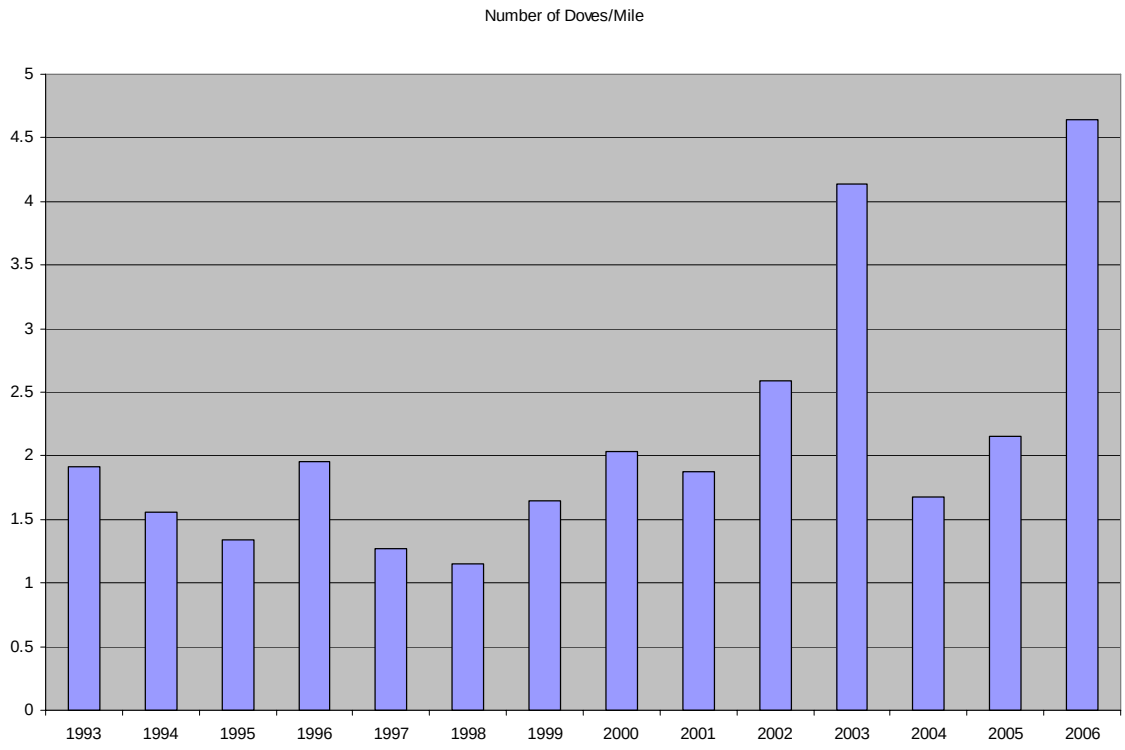


Figure 10: Average number of mourning doves seen per mile on the Yakama Reservation in Washington from 1993 through 2006.

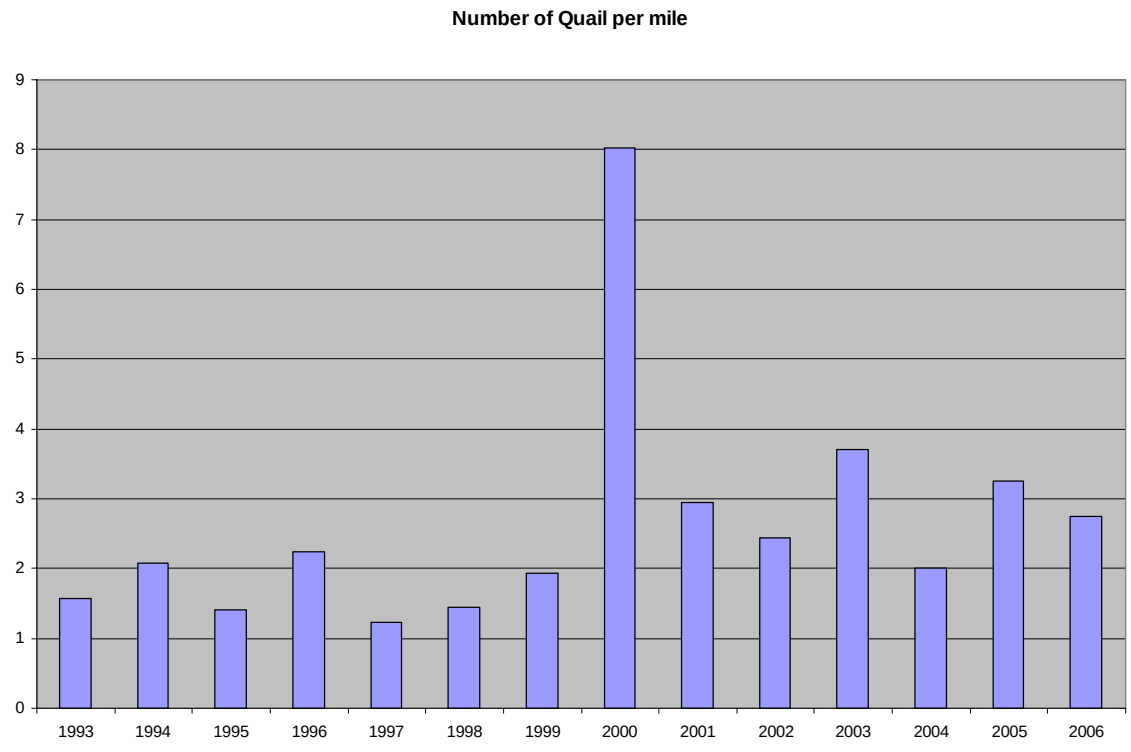


Figure11: Average number of California Quail seen per mile on the Yakama Reservation in Washington from 1993 through 2006.

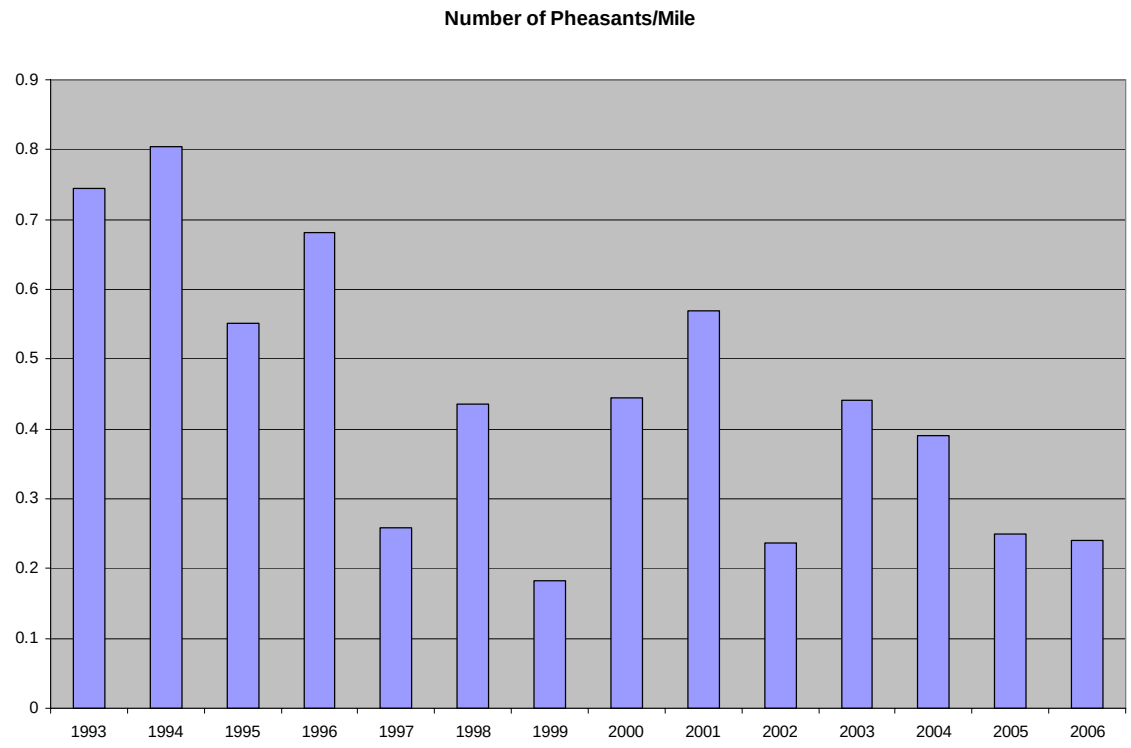


Figure12: Average number of pheasants seen per mile on the Yakama Reservation in Washington from 1993 through 2006.

Opening Day Hunter Success Surveys

During the opening weekend of the Yakama Nation hunting season, we conduct bag checks to determine hunter success rates. We record the number of huunters and birds harvested. Opening weekend harvest of pheasants averaged 0.48 birds/day (Figure 13). On Satus Wildlife Management Area, opening weekend harvest of waterfowl was the highest since 1981 with the average of 4.9 ducks/hunter/day (Figure 14). These counts allow us to monitor our restoration efforts and allow us to make proper management decisions.

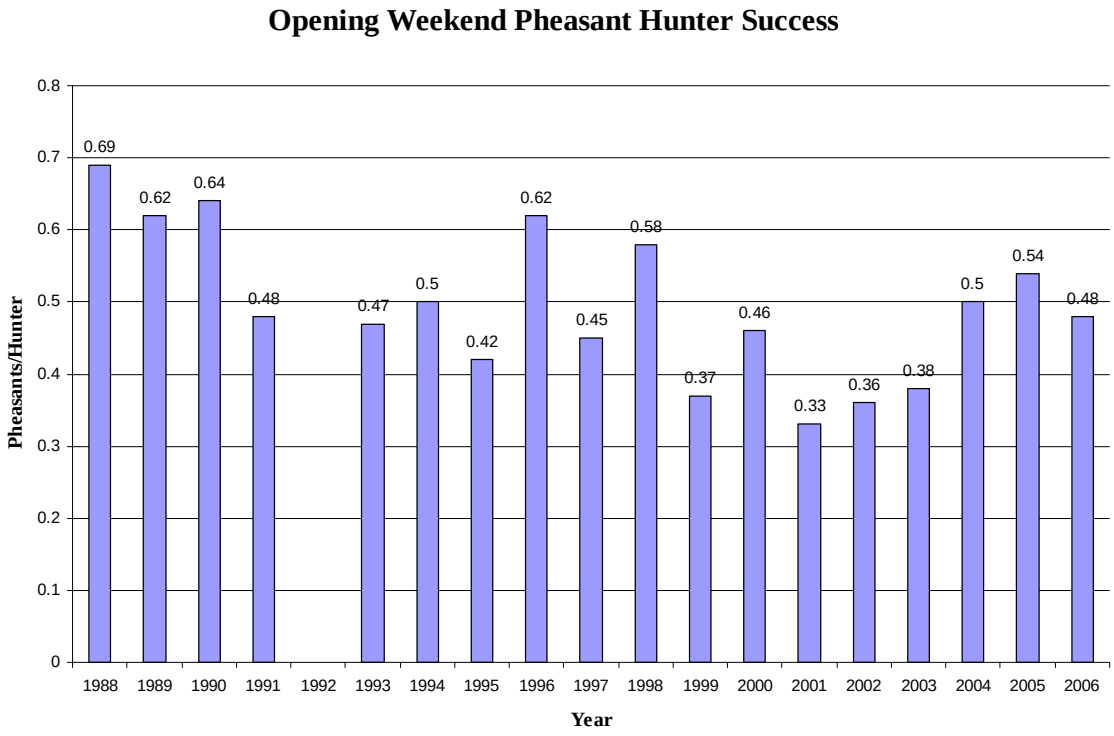


Figure 13: Opening day pheasant success on the Yakama Reservation in Washington from 1988 through 2006.

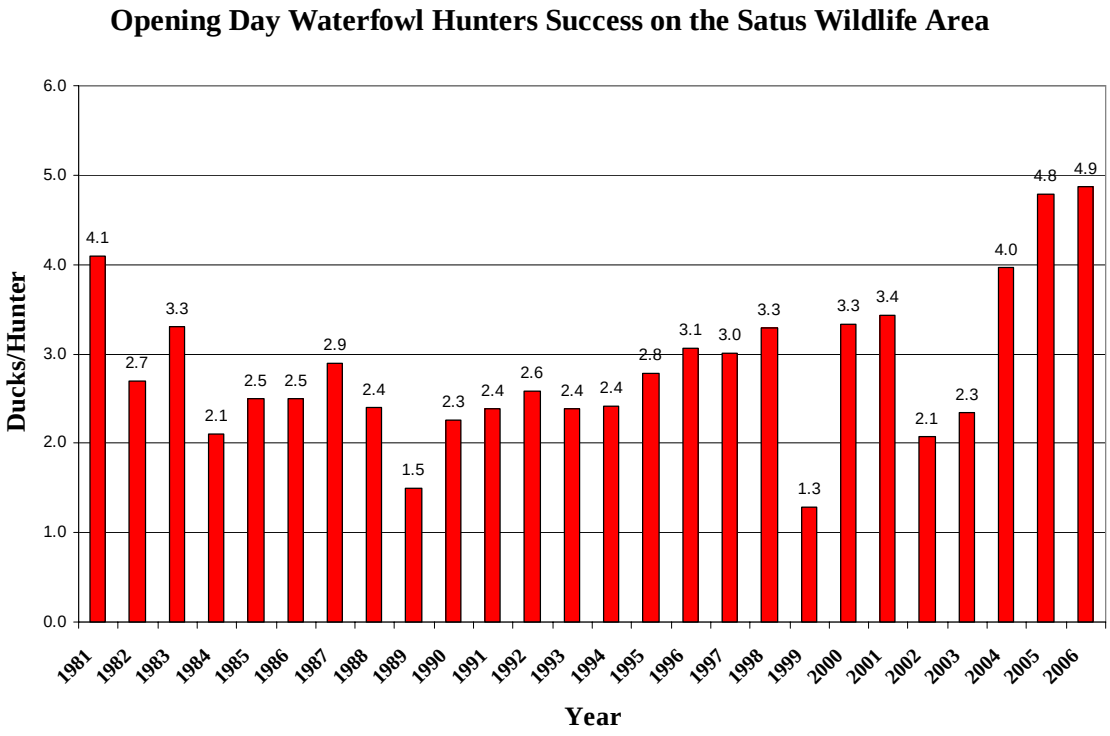


Figure 14: Opening Day duck harvest at the Satus Wildlife Area on the Yakama Reservation in Washington from 1981 through 2006.

Non-Game Birds

With the help of the Yakima Valley Chapter of the Audubon Society, we began documenting birds found on 5 restoration properties. Volunteers visit these properties at least once during each season and record the species and numbers of each species seen during the visit. The number of bird species seen ranged between 6 and 66 per visit. The highest total number of species observed are found on the South Lateral A property (Figure 15) and on the Satus property. This is probably a result of the diverse habitat found on this property and these properties are farther along in their restoration than the other properties. The lowest number of species observed occurred on Campbell Road property even though it is less than 2 miles from the South Lateral A property. The Campbell Road property, however, did host nesting ravens in both 2005 and 2006. This property is just beginning its restoration. These surveys will allow us to document any changes in bird diversity as restoration continues over the course of the next few years. Currently, we are analyzing data and attempting to modify protocol to provide the most reliable data to monitor our restoration efforts. Results from these surveys will allow us to make better management decisions on lands managed by the Yakama Nation Wildlife Resource Management Program. Appendix A – E list the species observed on each property.

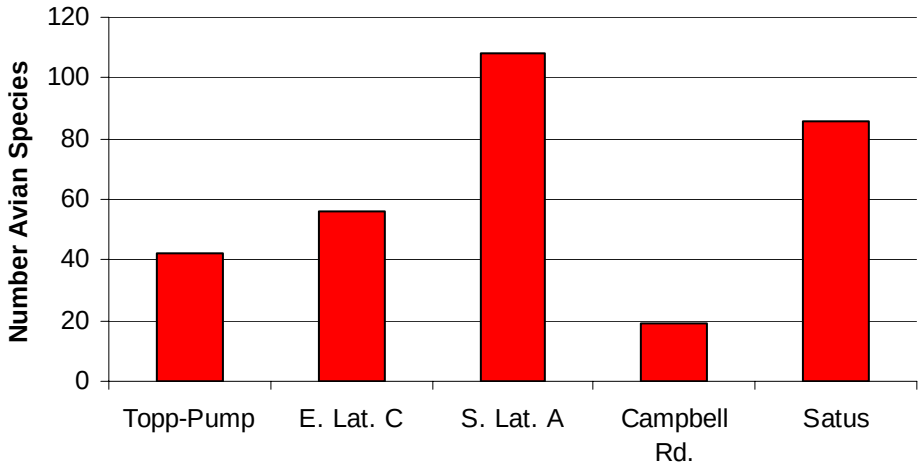


Figure 15: Number of species found on Toppenish-Pumphouse (Topp-Pump), East Lateral C (E. Lat. C), South Lateral A (S. Lat. A), Campbell Road (Campbell Rd.) and Satus Wildlife Area (Satus) properties

Monitoring Nesting Bald Eagles

Since 1997, bald eagles have nested along the Yakima River. All of these nests have been located on this Project's restoration properties. In 2006, we monitored 3 active

nests. One of the 3 nest successfully hatched and reared at least 1 eaglet, 1 nest was abandoned and the third nest, we were not able to determine if it was successful or failed.

Monitoring Bobolink Populations

The western-most population of bobolinks in Washington (and the US) occurs off of Lateral C on the Yakama Reservation. Beginning in 2005, we began monitoring this population. We found one population of 7 breeding males off Lateral C between Pumphouse Road and Marion Drain. The appearance of juvenile bobolinks in this area indicated that some bobolinks successfully reproduced in this population. A second population was found ¾ of a mile north of Marion Drain, however right after this population was located the pasture was hayed and we were not able to get an accurate count of this breeding population. Due to the haying event there was likely no reproduction occurring in the north of Marion Drain population. In 2006, we only documented 8 breeding males displaying off Lateral C. This low number may be the result of the loss of nest due to haying during the previous year.

Bobolink monitoring will continue in 2007. Monitoring activity will include transect surveys of breeding birds, as well as capture and banding. Banding efforts will allow us to track the future success of these birds. A management plan for this population will be developed in 2007 - 2008.

Monitoring Vegetation Restoration Sites

Floristic surveys were initiated at properties, which include an inventory of native and non-native plant species present as well as notation of dominant species. These surveys allow for planning of weed treatments and native plant restoration efforts. Additional properties will be surveyed each year.

Photomonitoring was initiated at vegetation restoration sites on several properties: Buena, Campbell Road, South Lateral A, North White Swan, Old Goldendale, and South Meninick. Permanent photomonitoring points were established in spring and summer 2005. Photograph locations were marked with GPS and landmarks and the compass bearing of each photograph direction was recorded for relocation. Points will be revisited each year to provide a qualitative evaluation of changes in habitat from protection, weed control and native plant revegetation efforts. Additional photomonitoring points will be established at new restoration sites each year.

Vegetation monitoring will be conducted for new hydrologic and vegetation restoration efforts planned for fall 2006. Permanent sampling points will be established perpendicular to active or recreated stream channels in spring and summer. Vegetation composition will be estimated prior to construction activities and resampled annually during the first three years following construction; long-term monitoring will occur on a periodic basis.

Hydrologic Monitoring and Evaluation

Central Washington University

Work completed by the Central Washington University Geography Program is included in Appendix D.

Mid-Toppenish Creek/Marion Drain Groundwater Study

The purpose of the groundwater study is two-fold: to document the seasonal pattern of interaction between Toppenish Creek and Marion Drain and to monitor the effect of water control structures on water table elevation in the Toppenish Creek floodplain. The study was initiated in June 2005, when the first piezometers were placed near Marion Drain and monitoring points were established on bridges. More piezometers have been added to the network since, totaling about 25; most of the measuring points are located between Marion Drain and Toppenish Creek. Data was collected from October 2005 to July 2007 and will continue into the future as is necessary. Over all the monitoring network covers about 10 square miles of flood plain and more than 5 linear miles of Marion Drain and Toppenish creek.

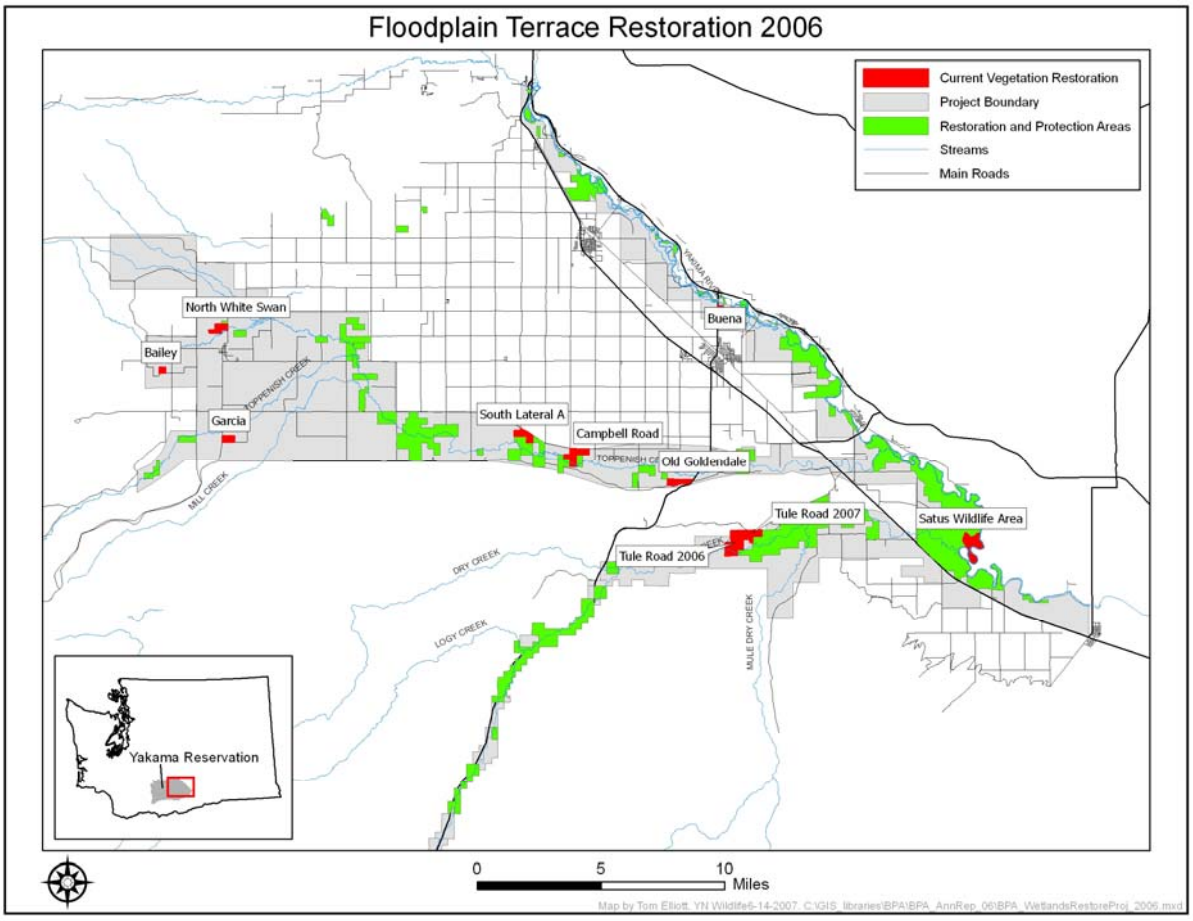
Data is collected about one time per month, especially in the spring and summer during irrigation season. Water levels are measured by hand using water level sounders. Elevations of the piezometer lip, bridge deck, or ring well top are accurately surveyed so that a good estimate of

water surface elevation can be calculated. The information is entered into an excel database for later analysis.

For Marion Drain, the analysis will consist of quantitative and graphical descriptions of seasonal flow patterns. For the grade control projects in Toppenish Creek, the floodplain water table before and after project implementation will be compared. This comparison will provide a measure of how the project has effected the hydrological function of the creek and will guide planning for future similar projects.

Vegetation Restoration

Terrestrial vegetation restoration occurred on approximately 1055 acres in the Project Area, which included site preparation (removal of internal fences and debris, improvement of property boundary fences, and site-specific weed control) and native plant revegetation. Intensive restoration activities require five years for native plant establishment, followed by small maintenance costs to prevent reinfestation of weed species. Pre-planting weed control typically occurs for 1-3 years until weed species are reduced to allow native plant establishment. Native grasses adapted to particular site conditions are seeded using rangeland drills in the fall prior to rains. Basin wildrye (*Leymus cinereus*) and bluebunch wheatgrass (*Pseudoregneria spicata*) were collected locally from the Reservation in 2002 and 2005 and are grown for restoration projects at a regional seed producer. Pheasants Forever provides funding for purchase of native grass seed and for broadcast herbicide treatments. Post-planting weed control occurs for 1-2 years following planting, as slow-growing species native to the arid west become established. Upland native shrubs and forbs may be reintroduced after native grasses are established. Costs per acre are kept to a minimum by utilizing large-scale agricultural methods and rotating weed control techniques to reduce chemical herbicide use.



Red areas on the map indicate sites where terrestrial vegetation restoration (site preparation or revegetation) activities occurred during the 2006 project year.

Site-specific weed treatments were conducted at least once on 947 acres, which included mowing, disking and herbicide spray to kill invasive plant species that compete with reintroduced native species. Herbicide sprays and adjuvants used, as well as spray zones, follow the BPA-approved list of chemicals and treatment restrictions. Target weed species on acquired properties include: wild oats (*Avena ssp*.), knapweeds (*Centaurea ssp*.), purple mustard (*Chorispora tenella*), Canada thistle (*Cirsium arvense*), poison hemlock (*Conium maculatum*), field bindweed (*Convulvulus arvense*), kochia (*Kochia scoparia*), prickly lettuce (*Lactuca serriola*), and perennial pepperweed (*Lepidium latifolium*). Sites infested with perennial weed species typically require at least two years of weed control to kill underground root structures, prior to planting.

Lower Satus (Tule Road 1) site prior to weed treatment in April 2007. The species shown that infests the site is purple mustard.

In September and October 2006, 301 acres were replanted with native grass seed. At the South Lateral A property property, 10 acres were planted with a mix of basin wildrye, Sandberg's bluegrass (*Poa secunda*) and bluebunch wheatgrass using a no-till drill. At the Bailey property, 35 acres were re-seeded with a similar mix. At the Old Goldendale (Pumphouse Road) 114 acres were seeded and at Lower Satus (Tule Road 1) 142 acres were seeded, each with a mix of basin wildrye, saltgrass (*Distichlis spicata*) and Sandberg's bluegrass. The seeded areas were treated

for weeds in late winter/early spring 2007 to suppress competition with germinating native grasses.

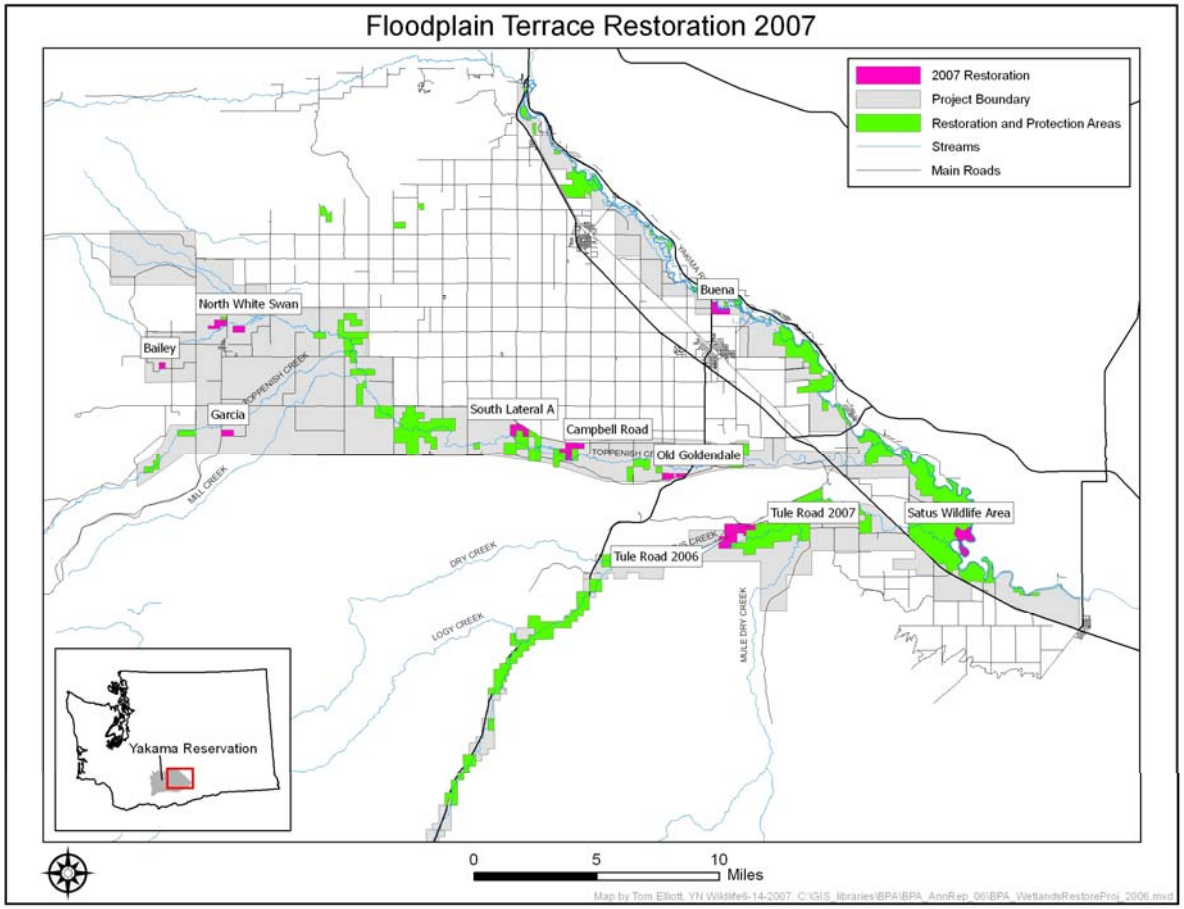
Seeding native grasses at Lower Satus (Tule Road 1) in October 2006. The no-till drill is effective at cutting through cheatgrass thatch and increasing seed-soil contact.

Future Vegetation Restoration

Below is a general workplan for vegetation restoration efforts in the Project Area for 2007. Note that the Status column refers to the status of terrestrial vegetation restoration at a particular site within a property.

Restoration Workplan Overview 2007

Sites	Acres	Status	2007 Spring	2007 Summer	2007 Fall
Bailey	35	Ongoing	Herbicide, Monitor	Herbicide	
Buena	77	Ongoing	Herbicide	Herbicide, Mow	
Cambell Road - East Mink	30	Ongoing	Herbicide	Herbicide	
Campbell Rd - Mink Ranch	28	Ongoing	Herbicide	Herbicide	
Campbell Road - North Buck Little	60	Ongoing	Mow, Burn, Herbicide	Herbicide	
Garcia	80	New	Fencing, Remove debris	Biocontrol	
Lower Satus (Tule Road 1)	160	Ongoing	Herbicide		
Lower Satus (Tule Road 2)	110	Ongoing	Herbicide	Herbicide	Grass seeding
Lower Satus (Tule Road 3)	32	New	Mow, Burn, Herbicide	Herbicide	
Mid-Toppenish Creek Restoration	1	New		Monitoring	Cuttings and stakes
North White Swan -- South 30	30	Ongoing	Herbicide		Reseed
North White Swan - Tilman		New	Inventory	Remove structure	
North White Swan - West Pasture	33	Ongoing	Herbicide		Grass seeding
Old Goldendale - Pumphouse Rd	114	Ongoing	Herbicide		Seed/Plant shrubs
Satus Wildlife Area (back 10 S5 olive unit)	10	Ongoing	Herbicide		Grass seed firelines
South Lateral A - Unit 14	17	New	Mow, Burn, Herbicide	Herbicide	
South Lateral A - Unit 15	22	New	Inventory		
South Lateral A - Units 1,2,4 - infill shrubs only	50	Ongoing	Plant chokecherry	Mow, Burn	Seed shrubs, forbs
South Lateral A - Units 8,9,13	40	Ongoing	Herbicide	Herbicide	Grass seeding



Map indicates all properties where terrestrial restoration activities (site preparation or revegetation) are anticipated for the 2007 project year.

Cultural and Archaeological Resources

By William White, Jon Shellenberger

FISCAL YEAR 2006

The Yakama Nation's Wetlands and Riparian Restoration Project is responsible for the management of over 21,000 acres within the Yakama Nation's 1.3 million acre Reservation. The Yakama Nation Wetlands and Riparian Restoration Project actively manages significant cultural resources on project secured lands in addition to those areas that may be subject to a project's potential effect within the external boundaries of the Yakama Reservation. The principles of preservation, protection and perpetuation are the foundation on which the project manages cultural resources. Federal mandates include the National Historic Preservation Act (NHPA) as amended, the Native American Graves Protection and Repatriation Act (NAGPRA), Executive Order 13007, the Archaeological Resources Protection Act (ARPA), and the American Indian Religious Freedom Act (AIRFA). Federal & Tribal requirements for cultural resource management include identification, evaluation, preservation, protection, and program review. Under the NHPA all ground disturbing project activities utilizing federal funding require Section 106 compliance under the National Historic Preservation Act of 1966 (NHPA) as amended and NEPA. The Yakama Nation strongly advocates this Federal legislation and has passed similar Tribal Resolutions for the protection of its archaeological and cultural resources within the Yakama Nation's Reservation and its ceded lands under the Treaty of 1855. These Tribal Resolutions include T-66-84 and T-92-77. The primary goals in protecting these properties has been one of assessing all land holdings in terms of the cultural and archaeological resources they contain and monitoring any impacts restoration activities will have on these irreplaceable resources of the Yakama Nation. As mandated by Tribal Council Resolution, one goal of this project is to preserve and protect in perpetuity the culture and history of the Yakama people for future generations. The Yakama Nation's Natural Resources Policies plan requires the identification of cultural resources and recommends a three-phase approach including identification,

protection, and preservation. In the case of Traditional Cultural Properties (TCP's) it further recommends enhancement of the cultural resource should it be required. Cultural Resource Management Plans provide the appropriate framework for successful compliance and implementation of these activities on project secured lands. In 2006, six Yakama Nation Wetlands Restoration Project managed properties had cultural resource management plans created and implemented. These include the Bailey property, Garcia property, Plank Road property, Lower Satus Creek property, South Lateral A property, and the Meninick Property.

The following are 4 of the 5 management phases included in each of the cultural resource property management plans implemented fiscal year 2006. The fifth step, Enhancement, varies upon geographic location and how the property was historically managed by the Yakama Nation.

1. Inventory:

NHPA directs federal agencies expending federal funds to identify cultural resource properties on lands under project management. This is accomplished by identifying these cultural resource properties through pedestrian field surveys resulting in an inventory of cultural resources present. Surface mapping and photographic documentation are detailed inventory procedures used to record manmade features present at historic, prehistoric and (rock art) sites. Site forms provide further documentation of the site's proximity to water, natural resources, and food resources.

2. Evaluation:

Cultural Resources identified in the Inventory process are most effectively done by qualified professionals. This requires the establishment of permanently funded positions to evaluate and provide technical expertise in archaeology, architectural history, history, and Yakama culture. Cultural Resources should be evaluated based on several factors such as immediacy of threats (within 1 year, 5 years, 10 years), and the severity of threats (vandalism, natural degradation, erosion, etc). Additional factors to consider should include visual significance, cultural significance, geographic representation,

accessibility, and uniqueness. Case by case evaluation of cultural resources provides the most accurate assessment of the significance of these resources and the most realistic basis for determining appropriate planning recommendations.

3. Monitoring:

Monitoring of cultural resources includes the reporting of erosion, vandalism, construction/development and destructive recreational uses that impact specific cultural resource locations. Grazing presents a significant challenge in protecting cultural resources and contributes significantly to the effects of erosion. Cultural Resource locations experiencing environmental degradation should be assessed at least once on an annual basis and more frequently should environmental degradation become more severe or accelerated from natural or manmade causes. Monitoring procedures should include a site visit log and photographic as well as graphic documentation identifying the date and time field visitation occurred. Measurements documenting the effects of erosion, vandalism, and destructive recreational uses should be kept for assessing the long-term management and protection of endangered cultural resource locations.

4. Stabilization:

In addition to the protective measures noted above, some sites may require riverbank stabilization, tree planting, grass seeding, dike building procedures, etc., so as to protect the existing cultural resources. Great care must be exercised in order to make certain that the ground/site surfaces are protected from additional impact during these stabilization activities. In some instances cutting back the river bank edges, planting of trees and brush groves and/or armoring of river bank/slope surfaces may be required for stabilization. These modifications to the existing landscape will cause displacement of artifacts or the modification of a structural feature (house pit, lithic scatter, etc.). In these instances some data recovery (excavation) may be required prior to the construction of and/or placement of stabilization devices, e.g. the construction of protective dikes; rip rapped or armored banks, etc. The artifacts found during the construction of these

protective structures should be documented and the artifact materials transferred to the Yakima Cultural Center Museum. The rational here is that some impacts cannot be prevented and in situations where these impacts occur, some careful data recovery is advisable prior to any stabilization. The idea is to:

a. Locate and mark those areas that are very sensitive and to minimize impact to those sensitive areas.

b. Remove only those artifact materials that cannot be avoided if stabilization is to proceed.

c. To make certain that all artifacts found during stabilization be transferred to the Yakama Cultural Center Museum to enhance the Yakama Nation's Cultural Education program as required by the Yakama Nation Land and Natural Resource Policies Plan.

d. To collect any archaeological data acquired during stabilization for inclusion in the YN Atlas of Cultural Properties and in the collections housed in the Yakama Nation's Cultural Center Museum.

e. To map the existing surface features and profile the exposed (in the cut bank) archaeological features prior to the implementation of any stabilization procedures that my require ground disturbing activities.

Bailey Property

The Bailey Property is a 40 acre parcel acquired by the Yakama Nation Wetlands Restoration Project in 2004. This property was historically used for grazing. Other historic uses of this property have been strictly agricultural. A cultural resource field survey of this property identified no prehistoric or archaeological resources present on the property. The likelihood of subsurface archaeological resources is remote given the property's location on an active floodplain of Toppenish Creek. The property will continue to be monitored for cultural resources when necessary project activities occur.

5. Enhancement:

Wildlife management should consider setting aside cultural resource areas for traditional use by elderly members of the Yakama Nation. Some of the best ***tule*** stands, for example, lie close to the main roadway in the Satus Wildlife Refuge. Presently these areas are being impacted by hunters and grazing cattle. Tule reed does exist at a number of locations within the study area but these areas are difficult to reach by the elderly members of the Yakama Nation, many find it difficult to walk long distances to find suitable materials at other locations. Access, therefore, may be a very important and significant consideration for the elderly members of the tribe. In addition, many of the older members of the tribe follow the traditional seasonal gathering patterns of their ancestors and the place of gathering may be just as important as the actual gathering itself. Wildlife managers as well as other land managers must become aware of these needs and set aside those specific areas that people feel are traditionally important to them for such gathering purposes.

Garcia Property

The Garcia Property is an 80 acre parcel acquired by the Yakama Nation Wetlands Restoration Project in 2004. This property was historically undeveloped for agricultural use. A cultural resource field survey of this property identified one prehistoric or archaeological feature present on the property. This archeological feature has been identified as a Pit House. This property will continue to be monitored for cultural resources when necessary project activities occur.

5. Enhancement

Today many members of the tribe follow the traditional seasonal gathering patterns of their ancestors where the place of gathering is as important as the actual gathering itself. Wildlife managers as well as other resource managers must become aware of these needs and set aside specific areas that people feel are traditionally important to them for such gathering purposes. Access becomes a very important and significant consideration for the elderly and disabled members of the tribe. Historically this area of the reservation was used in the procurement of small game. Prior to the USDA poisoning of wild rabbits in the 1960's tribal members relied heavily on rabbits as a source of food. Restoration of native vegetation is a critical element in the re-introduction of native wildlife for subsistence activities such as hunting and gathering.

Plank Road Property

Archaeological and cultural resources inventory of the Plank Road Property was completed in FY 2000. The property lies north of the Lower Satus Unit and has been used for agricultural purposes that include alfalfa and hay production. No archaeological resources were discovered on the property as a result of this cultural resources inventory and survey. Monitoring for previously undiscovered archaeological resources will continue during all ground disturbing activities as directed by the Yakama Nation's Natural Resources policy.

5. Enhancement

Today many members of the tribe follow the traditional seasonal gathering patterns of their ancestors where the place of gathering is as important as the actual gathering itself. Wildlife managers as well as other resource managers must become aware of these needs and set aside specific areas that people feel are traditionally important to them for such gathering purposes. Access becomes a very important and significant consideration for the elderly and disabled members of the tribe. The Plank Road property could be utilized in the re-introduction of small game. Historically this area of the reservation was used in the procurement of small game. Prior to the USDA poisoning of wild rabbits in the 1960's tribal members relied heavily on rabbits as a source of food. Restoration of native vegetation is a critical element in the re-introduction of native wildlife for subsistence activities such as hunting and gathering.

Lower Satus Creek Unit

Archaeological and cultural resources inventory of the Lower Satus Creek Unit was completed in FY 2001. This Unit also contains significant cultural resources from the historic and prehistoric periods that will require additional monitoring, protection, and bank stabilization measures. A large winter village site consisting of seven house pits the largest measuring 23 feet was found on a high terrace above the creek. Seasonal flooding of Satus Creek has adversely affected these house pits. Our primary concern is the bank erosion along the creek that continues to extend into the house pits, which will ultimately lead to their destruction. Re-vegetation of the creek banks with native species

is the preferred method of restoration for this resource. The Yakama Nation Cultural Resources Program recommends that cattle fencing be installed along Satus Creek to reduce further erosion and the destruction of this village site.

Lithic Tools

The richness of archaeological resources along this section of Satus Creek can be attributed to several environmental factors, but the major factor appears to be the abundance of game and water. There appears general consensus among archaeologists and geographers in discussing human settlement patterns of the need to be close to water. This concept is certainly corroborated by Yakama culture where religious ceremonies stress the importance of water to the Yakama people. The ridge tops overlooking Satus Creek and adjacent to the project area have yielded important cultural sites to the Yakama Nation in root grounds, burials, historic trails, and historic battle features. Burial Cairns occur on the overlooking ridge tops above Satus Creek as do rock lined "foxholes" along the faces of these ridge tops. These "foxholes" were used as battle staging areas for attacking enemies with rocks, slings, and arrows and additionally served as excellent hunting blinds for game. Informant interviews suggest these "foxholes" are of considerable antiquity that in all likelihood existed long before the Yakama Indian Wars of the 1850's. Both the North and South ridge tops overlooking Satus Creek were

part of the battlefield in which the US Army and the Yakama Tribe engaged in a running battle that stretched from The Dalles, Oregon to Spokane, Washington.

Shattuck's Dike

Cattle grazing and agricultural development have limited the possibility of finding intact pit house villages of the size and magnitude seen in the Satus Wildlife units and have heavily impacted the Lower Satus property from its natural form. Historic features consisting of corrals, loading chutes, and feedlots, along with trash dumps, and irrigation features like the Tule diversion have contributed to the overall landscape alteration of the Lower Satus Creek property.

Stone Bowl

Rock Lined Hunting Blind

5. Enhancement

Today many members of the tribe follow the traditional seasonal gathering patterns of their ancestors where the place of gathering is as important as the actual gathering itself. Wildlife managers as well as other resource managers must become aware of these needs and set aside specific areas that people feel are traditionally important to them for such gathering purposes. Access becomes a very important and significant consideration for the elderly and disabled members of the tribe. The Lower Satus Creek Unit has some intact areas of steppe shrub vegetation that include old growth sagebrush and greasewood that could be utilized in the re-introduction of sage grouse. Historically this area of the reservation was used in the procurement of small game. Prior to the USDA poisoning of wild rabbits in the 1960's tribal members relied heavily on rabbits as a source of food. Restoration of native vegetation is a critical element in the re-introduction of native wildlife for subsistence activities such as hunting and gathering.

South Lateral A Cultural Resources Management Plan

The South Lateral A Property was a 450 acre row crop, rill irrigated farm, legally described as lying within T. 10 N. R. 19 E., Sections 19, 20, 29, 30. The farm known as the Double Z Ranch was unique in that its deeded lands were formerly Indian allotted lands on the Yakama Indian Reservation. Original conversion of the allotments to fee patent status occurred in 1905. A majority of the lands were consolidated into the Double Z Ranch in a series of land transactions from the years 1954 to 1967. James Zimmerman served as the Double Z Ranch's president. Most of these 450 acres lie within the historic flood plain of Toppenish Creek and are subjected to periodic flooding by Toppenish Creek on an annual basis. Approximately 395 acres lie north of Toppenish Creek, and 55 acres lie south of Toppenish Creek. Much of the acreage north of Toppenish Creek is serviced by the Wapato Irrigation District. These lands have been periodically planted in wheat, corn, mint, barley, and alfalfa. Some of the lands have also been used as grass pasture. The 55 acres south of Toppenish Creek remained undeveloped and here native vegetation consisting of sagebrush, greasewood, and salt grass continue to flourish to the present day. Livestock were pastured on these 55 acres.

Ace Gun Club

From 1954 to 1965 these lands were used almost exclusively for duck hunting and were known as the Ace Gun Club. This hunting club was established in 1953 and became one of the most successful gun clubs in the lower Yakima Valley. Later in 1965 the lands of the Double Z Ranch were used for both duck hunting and open ranching. This farm has always been dependent on a series of earthen dikes to prevent spring flood waters of Toppenish Creek from flooding its land. When the lands were purchased about one half of the earthen dikes were present. These were located along the western border of the ranch and along the western half of Toppenish Creek. From 1955 to 1956 the first earthen dikes were completed along the east border of the ranch and the east half of Toppenish Creek. The western earthen dikes have failed only twice once in 1955 and again in 1974. In 1974 with the help of a Federal disaster loan all of the dikes were rebuilt and restored. A series of earthen dikes were constructed in the early 1980's to relieve the frequent flooding experienced by the property owner along the eastern half of the property. The excavation of a waterfowl pond for enhanced hunting opportunities also occurred during this time. Initial and subsequent cultural resource inventory of the property revealed the complete absence of archaeological material and features beginning in 1997 and ending in 2000. The landscape within the management area has been significantly altered by irrigation and grazing activities. "This has resulted in the destruction of a portion of Toppenish Creek, land leveling, wetland drainage, and

installation of buried irrigation pipe" through-out the northern portion of the management area. The wildlife program describes the area in their *Proposal for Yakama Nation Management of South Lateral A* as:

> *...Toppenish Creek with farmland on the north side and pastureland on the south side. This land formerly contained prime wildlife habitat. However, most of this flood plain area has been drained, leveled, and turned into cropland or overgrazed. This land alteration has negatively affected the hydrologic cycle of Toppenish Creek, lowering the ground water table for the surrounding pasture lands and wetlands. The area is identified as priority land for natural resource management. (Proposal for Yakama Nation Management of South Lateral A 1995).*

The Wildlife Resource Management Program as part of their Lower Yakima Valley Wetlands and Riparian Restoration Project has purchased this land for the purposes of wildlife habitat restoration. Among the goals of the project are:

> *1) Re-establishment of the north branch of Toppenish Creek on the property in such a manner that natural flows are returned through the property and to the adjacent lands downstream.*
> *2) Restoration of floodplain landscape to a condition as possible to pre-irrigation development. This includes reestablishing natural land contours and hydrology necessary for wetland, riparian and upland restoration.*
> *3) Restoration of native vegetation communities associated with the floodplain landscape.*
> *4) Provide benefits to wetland and riparian associated wildlife species. This includes re-establishment of reproduction habitat for waterfowl, upland game birds, wetland and riparian dependent songbirds (such as bobolinks), and furbearers. This also includes feeding, migration and wintering habitat for herons, sandhill cranes, waterfowl, raptors, songbirds, and other wetland and riparian associated species.*

5) Development of an area for cost-efficient native plant propagation. Seed or cuttings from these plants would be used for re-vegetation on this property and on other areas within the restoration project.

After acquisition by the Yakama Nation's Wetlands Restoration Project several tributaries of Toppenish Creek were reconnected to restore naturally occurring riparian vegetation. This has allowed the Yakama Nation to restore many of its traditional use riparian plants. This is particularly true for tule (*Scirpus acutus*) reeds that have re-populated the wetland areas with great success. Additionally, Wapato has made a remarkable re-emergence in part due to these better wetlands management practices. One goal from a Yakama cultural perspective would be the successful propagation of willow, cottonwood, chokecherry, serviceberry, elderberry, wild rose, and current native species. The restoration of this property's riparian ecosystem provides tribal members excellent hunting opportunities in the harvesting of traditional food resources such as waterfowl. Restoration and the reconnecting of previously altered tributaries of Toppenish Creek provide fish passage for anadromous fish migration that have been obstructed by manmade diversions.

The archaeological wetlands inventory surveys undertaken by YN archaeologists, Dr. Gordon A. Lothson and Greg C. Cleveland during the 1994 field season consisted largely of a Class I pedestrian survey of several wetland areas along the Yakima River and along Satus and Toppenish creeks. Some Phase II intensive survey was also undertaken at a few selected locations. The general observations of the 1993 survey are applicable to most of the Yakima Valley at Parker, Wapato and Toppenish. Lothson (1994:58) noted in that earlier study that:

Large scale cultural resource surveys undertaken along small stream and minor river courses differ significantly from those that are undertaken along major river systems such as the Snake, Clearwater, Yakima and Columbia Rivers. Prehistoric and historic site location and function differ as do the size, age and season of occupation. Seasonal camps tend to occur more frequently on the small streams and large semi-sedentary villages on the larger streams and rivers.

The wetland areas along Satus and Toppenish creeks contain both settlement types and a number of other historic, prehistoric and traditional use sites as well. Some of the larger Wetland areas such as the South Lateral A and Wapato Recreation Area were subdivided into Study Areas or Study Units along physical and cultural boundaries.

In order to effectively survey the landscape for historic, prehistoric and traditional cultural resources survey transects were located along the major water courses within study units divided along physical and modern cultural (roads, canals, etc.) boundaries. These boundaries have been developed for inventory purposes and have been imposed upon the landscape; therefore, they do not reflect meaningful historic, prehistoric or traditional land use areas (Lothson 1994:58).

As noted these subdivisions were made to facilitate survey of the landscape and were not intended to represent extant traditional, historic or prehistoric, cultural, or land use relationships. A total of 3 wetland areas were examined during the 1994 field season with largely negative results. Only a few lithic scatters and a few isolated features were found during the Class 1 pedestrian survey. Two of the house pit or pit house sites found at Satus Creek and adjacent to the Wapato Recreation Area were mapped as part of the 1994 survey and this data was included in the 1995 Annual Report to BPA.

For the purposes of survey and analysis, the archaeologists have divided the land holding into two Study units: a small-sized study unit located on the south side of Toppenish Creek consisting of overgrazed pasture; and a much larger area situated on the north side of Toppenish Creek that has been significantly altered by agricultural practices. The proposed vegetation restoration of the property and re-contouring of the landforms will hopefully return the area to its previous condition.

Study Unit I (the southern pasture area)

Study unit No. I lies adjacent to, and entirely within, the flood plain of Toppenish Creek. The surface of the landscape is flat-lying and the soils are silt-loams (2 to 3 feet) above a cobble gravel base. Natural vegetation is sparse due primarily to cattle grazing but isolated stands of the original vegetation in the form of sage-rabbitbrush cover type and greasewood-rabbitbrush cover type do occur in isolated areas. Slight depressions contain alkali-marsh plants and wild rye *(Elymus sp.)* and greasewood *(Sarcobatus vermiculatus)* occurs on the better drained portions of the landscape. Archaeological walkover survey was conducted in transects along the edge of the creek and along several tributary drainages. Two other slightly elevated areas were also inspected.

Study Unit II (the northern agricultural area)

Study Unit No. II also lies entirely within the flood plain of Toppenish Creek. Unlike the southern area (Study Area I), this study unit has been significantly modified by agricultural activities and irrigation facilities. Fields have been alter, leveled, drained in some instances, and lowered to promote directional drainage from west to southeast.

Control gates regulate this flow and disperse the water across a field system. Soils in the area grade from coarse cobble gravels in some areas to fine silts and sandy silts in others. Natural vegetation is completely absent in this area and grain and corn has been raised on the irrigated fields. Weeds have taken over in places, and rose, willow and cottonwood trees garland the creek and festoon the fences and drainage ditches. Archaeological survey consisted of walking the plowed fields (disked in 1994) and inspection of the exposed drainage ditches. Rodent burrows were also examined and areas along the river where the elevated dike was constructed on the southern edge of the study unit were closely inspected.

Summary of Results

The initial on-the-ground walkover survey was undertaken on March 22nd and 23rd, 1994 and again in January of 1995 with largely negative results. Some Historic features were found during the survey but these features are of recent origin and do not require analysis as historic properties. These features largely reflect irrigation agriculture activities and were built during the late 1940's, 1950's and on into the early 1980's. NO HISTORIC, PREHISTORIC OR TRADITIONAL USE SITES OF NRHP SIGNIFICANCE WERE FOUND DURING THE FOUR DAYS OF SURVEY UNDERTAKEN AT THIS LOCATION.

Recommendations

Since no sites were found during the walkover survey we recommend that no additional Phase I or Phase II surveyor testing be undertaken at the location. We do recommend that the locale be monitored by either the BPA archaeologist or by a member of the Cultural Resource Management Program. This monitoring need only be done during the initial earth moving activities in those areas that are relatively undisturbed--i.e. the dike area and those areas located adjacent to the creek. Most of the area located north of the creek has been so altered and disturbed that it is exceedingly unlikely that any evidence of prehistoric or historic occupation would still exist. Only those sites that are very old and lie deeply buried beneath the original surface would likely remain intact--this is a possibility.

The Yakama Nation's Natural Resources Policies plan requires the identification of cultural resources and recommends a three-phase approach including identification, protection, and preservation. In the case of Traditional Cultural Properties (TCP's) it further recommends enhancement of the cultural resource should it be required. This integrated and comprehensive Cultural Resource Management Plan provides the appropriate framework for successful compliance and implementation of habitat restoration activities.

Tule harvest

5. Enhancement

Wildlife management should consider setting aside cultural resource areas for traditional use by elderly members of the Yakama Nation. Some of the best ***tule*** stands, for example, lie close to the main roadway in the Satus Wildlife Refuge. Presently these areas are being impacted by hunters and grazing cattle. Tule reed does exist at a number of locations within the study area but these areas are difficult to reach by the elderly members of the Yakama Nation, many find it difficult to walk long distances to find suitable materials at other locations. Access, therefore, may be a very important and significant consideration for the elderly members of the tribe. In addition, many of the older members of the tribe follow the traditional seasonal gathering patterns of their

ancestors and the place of gathering may be just as important as the actual gathering itself. Wildlife managers as well as other land managers must become aware of these needs and set aside those specific areas that people feel are traditionally important to them for such gathering purposes.

Meninick Property

Meninick Property Cultural Resource Management Plan

The Meninick Property is also referred to as the Curlew road property. The natural setting of the Meninick Property has undergone extensive modification along its southwestern portion however its northern portion along the Yakima River remains undisturbed from land altering activities. Most of the original soils, landforms and vegetation patterns that once existed here have remained. Archaeological and Cultural Resource inventory and evaluation began in 2005 and is to be completed by 2006. Initial investigation of the Meninick property has revealed the presence of a small number of pit houses. All of these pit houses are heavily vegetated and are not likely to be impacted by any currently planned restoration activities. Should the pit houses be impacted by any restoration activities avoidance will be the preferred action and cultural resource monitoring will be required during ground disturbing activities. The key to successful management of traditional, historic and prehistoric cultural properties is to treat each situation and each property as unique. This is also how Yakama tribal members see these

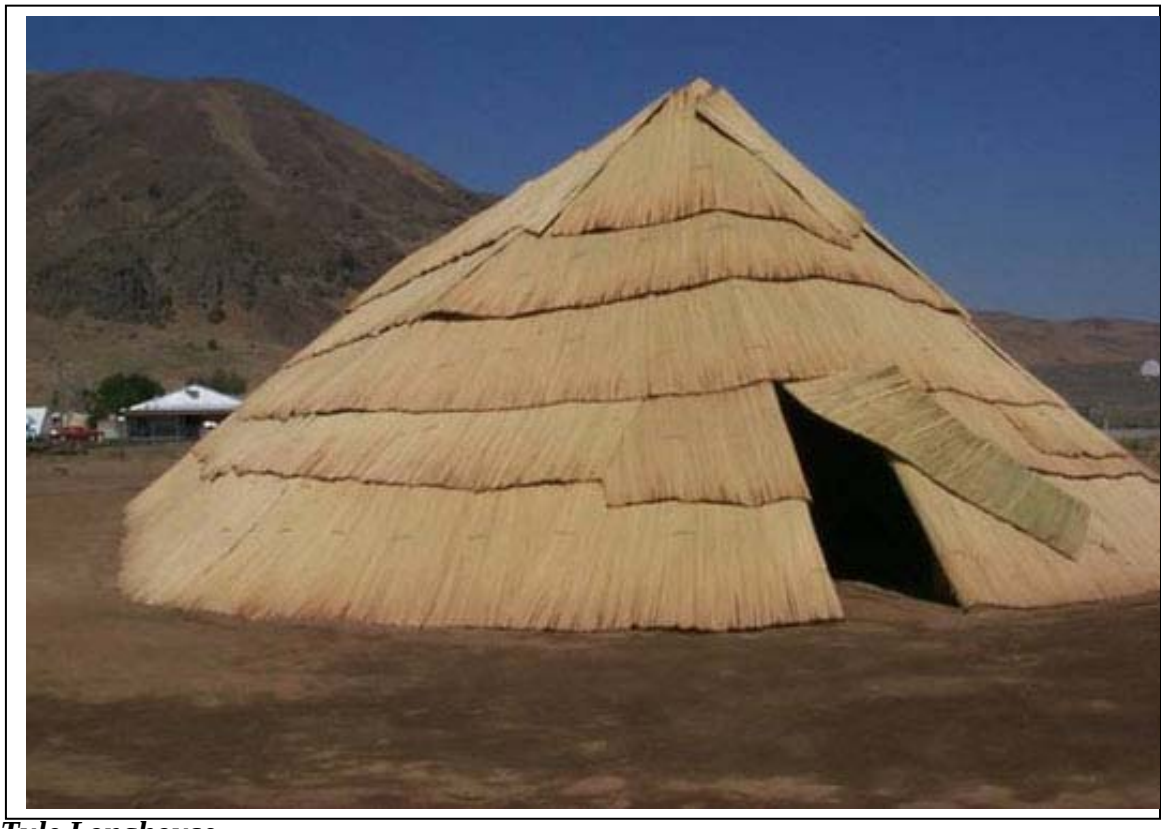
properties within their culture. The effects of cattle grazing, noxious weed infestation, and vandalism continue to threaten and destroy the cultural resources located within the Meninick Property. Only through adequate site protection measures can these cultural resource sites be protected from the adverse effects of ground disturbing activities. Frequent monitoring and restricted access to culturally sensitive locations will deter vandalism. Re-vegetation of native species over sites will further protect them from the adverse effects of artifact looting. The most important protection measure from a management perspective continues to be "avoidance".

Pit House feature

5. Enhancement

Wildlife management should consider setting aside cultural resource areas for traditional use by elderly members of the Yakama Nation. Some of the best ***tule*** stands, for example, lie close to the main roadway in the Satus Wildlife Refuge. Presently these areas are being impacted by hunters and grazing cattle. Tule reed does exist at a number of locations within the study area but these areas are difficult to reach by the elderly members of the Yakama Nation, many find it difficult to walk long distances to find suitable materials at other locations. Access, therefore, may be a very important and significant consideration for the elderly members of the tribe. In addition, many of the older members of the tribe follow the traditional seasonal gathering patterns of their ancestors and the place of gathering may be just as important as the actual gathering

itself. Wildlife managers as well as other land managers must become aware of these needs and set aside those specific areas that people feel are traditionally important to them for such gathering purposes.



Tule Longhouse

Six management plans were written and implemented in fiscal year 2006. These plans are in compliance with federal and tribal laws so as to protect cultural resources in perpetuity the culture and history of the Yakama Nation. These resources are managed within a modern context of local and regional economic development. Within this context, properties are identified, evaluated, protected, monitored and, if necessary, enhanced to help perpetuate the culture of a people who have managed these lands for thousands of years.

Education and Publicity

Education:

The following project presentations were given to the public in 2006.

Northwest Chapter of The Society of Ecological Restoration and The Society of Wetland Scientists Joint Annual Conference, Vancouver, WA – May, 2006. Project restoation and management techniques were presented, highlighting native grassland restoration results. The 2007 annual Conference is scheduled to occur in Yakima to highlight this Project's activities. (~50 individuals)

Washington Waterfowl Association, Southwest Washington Chapter Monthly Meeting, Vancouver, WA – May, 2006. Public hunting, Project, and NAWCA proposal information were presented. (~35 individuals)

Yakima Basin Science and Management Conference, Central Washington University, Ellensberg, WA – June 2006. Project restoration information was presented at this science conference. (~100 individuals)

Vancouver Chapter of Pheasants Forever, Vancouver, WA – October, 2006. Project implementation, public hunting, and NAWCA information was presented at their monthly meeting. (35 individuals)

Annual Meeting of the State Chapter Leaders of Pheasants Forever, Toppenish, WA – November 2006. Pheasants Forever conducted their state leaders meeting in Toppenish this year to highlight the work being done on this Project. A tour of some of the Project areas occurred after the meeting. The Project is scheduled to host the 2007 annual meeting as well. (20 individuals)

Columbia Basin Chapter of the Washington Native Plant Society, Richland, WA March 2007. Presented an overview of Project ecology and habitat restoration activities to the Native Plant Society. (50 individuals)

The following educational tours were conducted in 2005.

Yakima Valley Audubon Society – April 2006. A birdwatching tour of the South Lateral A and other Project properties was conducted. (14 individuals)

Mabton Junior High School – May, 2006. Students toured the Satus Wildlife Area and learned about wetland and riparian restoration. (12 students, 2 teachers)

Yakima Basin Science Teachers Wetlands Training – May 2006. Every other spring, a wetlands training day is scheduled at the Satus Wildlife Area. This training is conducted by Project staff, in coordination with the Yakima Basin Environmental Education Program. It provides wetland educational training to junior and senior high science teachers. (60 teachers)

North American Wetlands Conservation Council – May, 2006. A tour of the Project area was conducted. In attendance were two NAWCA council members who were reviewing the Project areas scheduled for restoration under the NAWCA proposal. (2 individuals)

Washington State University Wetlands Management Class – June 2006. A tour of Project properties was conducted to provide information on floodplain and wetland restoration techniques. (6 students, 2 teachers)

Summer Duck Banding – July-August, 2006. Several times per week individuals, school groups, boy scout groups, etc participate in duck banding activities on Project properties. Information is provided during these events pertaining to Project implementation, biology, etc. (>100 individuals)

Columbia Basin Fish and Wildlife Authority – July, 2006. A tour of Project properties was conducted for the Wildlife Group in association with their July monthly meeting. Duck banding activities were included in the tour. (12 individuals)

Washington Waterfowl Association (WWA) – August, 2006. The WWA toured Project properties and participated in duck and quail banding activities. (15 individuals)

Yakama Nation Wildlife Wilderness Youth Camp – August 2006. A tour of Project properties was conducted for Tribal youth ages 14-16 as a component of the camp activities. Duck banding, firearm safety and trap shooting activities were included. (40 students)

Senator Cantrell and Murrey Staff Members – October 2006. Staff members for the two senators toured the Mid-Toppenish Restoration project. General information on Project implementation was also included in the tour. (2 individuals)

United States Department of Agriculture Staff, October 2006. Regional staff from USDA came to tour the Mid-Toppenish Creek restoration project. (6 individuals)

Mabton Junior High School – December, 2006. Students toured the Satus Wildlife Area and learned about wetland and riparian restoration. (8 students, 2 teachers)

Natural Resources Conservation Service Regional Staff – March 2007. Regional staff toured the wetland restoration projects located on the Satus Wildlife Area. (4 individuals)

Publicity

Hunting With Rachael Television Program – This nationally-syndicated television program highlights hunting and wildlife conservation activities throughout the Nation. A 10 minute segment of the program highlighted pheasant hunting on the South Lateral A property, and the Project's cultural approach to restoration. This episode was filmed in October 2006, and aired in the winter of 2006. This program occurs weekly on the Outdoor Life Network. A prominent lawyer who works for BPA can be seen in this episode hunting pheasants with his dog, Dixie.

South Yakima Conservation District Newsletter – February 2007. An article outlining the Mid-Toppenish Creek restoration project was included in this month's newsletter. This is included in Appendix A.

Wetland Ventures – An article highlighting the Mid-Toppenish Creek Project was written for this regional publication. It will be included in the April 2007 issue.

United States Department of Agriculture Conservation Showcase Publication – An draft article addressing the Mid-Toppenish Creek restoration project has been written for NRCS publications and websites. This article will be completed in FY07. A draft version is included in Appendix A.

Budget

Budget Information

Budget and expenditure information is summarized below. The operating budget expenditures totaled $749,438. The land securing portion totaled $765,107.

Personnel

The largest allocation of the budget is devoted to salaries and fringe benefits. In FY06, the project personnel included the following:

Position	FTEs	Budget
Biologist	2.4	$115,657
Archaeologist	0.5	$29,246
Habitat Technician	4.8	$155,390
Office Support	1.1	$37,375
Planner/Realty Specialist	1.0	$34,864
Subtotal	9.8	$372,532
Fringe		$85,644
TOTAL	**9.8**	**$458,176**

Project Cost Savings

The **North American Wetlands Conservation Act** (NAWCA) project completed in FY99 was considered such a success by the funding agency they requested that a follow up project be submitted. A NAWCA grant proposal was submitted in March 2006. It was approved for funding in September 2006. This project will provide $1,000,000 to restore wetlands at the Lower Satus Creek Wildlife Area, the Old Goldendale, Meninick, and Pumphouse Properties. Some of these funds will also be used for work on Washington Department of Wildlife's Sunnyside Wildlife Area. This proposal was included as an Appendix in the Projects FY05 annual report. This project is the only project approved by NAWCA to use BPA dollars as non-federal cost-share. This is because the Yakama Nation was instrumental in the writing of the federal legislation covering the Yakima River Basin Water Enhancement Plan (YRBWEP). Language in this bill specifically defines BPA funds as non-federal cost share in the Yakima Basin. Cost share commitments by the ten partners in this proposal total over $2,500,000. The proposal provides details regarding the partners, projects and funding levels of each entity.

Funding from another USDA program, the **Wildlife Habitat Incentives Program** (WHIP) has been secured for restoration activities at two Project sites, the North White

Swan and Campbell Road properties. The funding for these two projects exceeds $10,000. The funded work is related to native grassland restoration activities. This work will occured in 2006.

A large wetlands restoration project funded by the USDA's **Wetlands Reserve Program** (WRP) was implemented in late summer 2006. The Mid-Toppeniah Creek Restoration Project, totaling over $500,000, occured within the Toppenish Creek floodplain from the South lateral A property through the Campbell Road property. Encompassing more than 3 miles of floodplain lands, this is one of the most comprehensive hydrologic restoration actions completed to date along Toppenish Creek. Wetland, sidechannel and main channel reconnection was emphasized. Information on this project is included in the site-specific reports.

Funding was secured through the NRCS **Environmental Quality Incentive Program** (EQIP) to fund a portion of the Teal Lake repair at the Satus Wildlife Area. Funding from EQIP totals over $40,000. This work will occur in the summer of 2008.

A proposal to fund wetland restoration at the Satus Wildlife Area will be submitted to the **Intermountain West Joint Venture** (IWJV) Council in June of 2007. This proposal will ask for $20,000 for work restoring the hydrology of Teal Lake.

The following list is a summary of the project savings for 2006-2008.

Program	Savings to the Project
NAWCA	$1,000,000
NAWCA Partners	$2,500,000
USDA WRP	>$500,000
USDA WHIP	$10,000
USDA EQIP	$40,000
IWJV (proposed)	$20,000
Total	**>$4,700,000**

PROPERTY-SPECIFIC REPORTS

This information is provided as a separate report for 2006.

Appendix A

South Yakima Conservation District

Conservation News **February 2007**

Toppenish Creek Restoration

The Yakama Nation has been restoring habitat these last few years along Toppenish Creek. One of the latest projects is a large effort aimed at restoring hydrology to a section of Toppenish Creek from Lateral A Road downstream to Old Goldendale Road. Historically, this area contained a diverse assemblage of riparian, wetland and grassland habitats. Past alterations to this section of creek have caused the creek to jump out of its main channel. This has caused the creek to incise, drying up the wetlands and other habitats.

The purpose of this project was to lift the creek, allowing water to flow into historic channels and wetland basins. This was accomplished by installing 28 large rock grade control structures which act like beaver dams. The structures hold back water while allowing for fish passage. Water now flows into areas that have been dry for nearly half a century.

Grade control structure on south channel of Toppenish Creek.

This project is funded by the U.S.D.A. Natural Resources Conservation Service Wetlands Reserve Program. Bonneville Power Administration funds provided habitat protection and maintenance in this area. Pheasants Forever is funding the grassland restoration. Engineering design was provided by Ducks Unlimited and Geomax, Inc. Project implementation was completed through contracts with Timberline Group LLC and High-Point Excavation. Other partners include local landowners and lessees — Tule Gun Club, and cattlemen Joe Shattuck and Robert Lundberg.

If you would like further information on this project please contact Tracy Hames, wildlife biologist, with the Yakama Nation's Wildlife Resource Management Program at 865-5121.

On March 6, 9 a.m. to 1 p.m., please stop by SYCD's office at 1116 Yakima Valley Highway to vote for the Sunnyside area's representative on our Board of Supervisors. The position is currently held by Jim Newhouse.

Irrigation Efficiency Analyses

Improving on-farm irrigation system efficiency can increase crop production, decrease pumping costs, and decrease nutrient leaching. In 2001-2002, the Roza-Sunnyside Board of Joint Control worked with the Natural Resources Conservation Service and Cal-Poly to conduct distribution uniformity analyses of 20 growers' sprinkler and drip systems. SYCD obtained grant funding to again offer growers irrigation system evaluation and analyses — this time working with Dr. Troy Peters, irrigation specialist with WSU Extension in Prosser, who emphasized that "we will provide data-based recommendations for reducing costs and improving productivity."

The project will begin this summer. Growers interested in having their irrigation system evaluated (including rill irrigation systems) should call Marie Zuroske at 837-7911 for more information. The cost? Your taxpayer dollars already covered it.

Appendix B

199206200 - Yakama Nation - Riparian/Wetlands Restoration

Sponsor: Yakama Confederated Tribes
Province: Columbia Plateau **Subbasin:** Yakima
Budgets: FY07: $1,575,163 FY08: $1,623,313 FY09: $1,673,842
Short description: Continue implementation on YN Wetlands/Riparian Restoration Project by protecting and restoring native floodplain habitats along anadromous fish-bearing waterways in the agricultural area of the Yakama Reservation (~2,000 acres per year).
Recommendation: Response requested

This is an important project and the habitat conservation goals in some critical areas of the Yakima basin are being achieved. What is missing is evidence of a strong biological monitoring component. The proposal states that their website will be updated in FY 07 to include all the biological monitoring results, but reviewers would benefit from an interim product which covers 1992-2005. Seven years of data might reveal trends to determine if the restoration is working. A synthesis should be provided in summary form in a response to show benefits to focal species.

Requested Response to ISRP Comments

<u>Biological monitoring of project protection and restoration activities.</u>

This project consists of protection and restoration of floodplain habitats along the Yakima River, Toppenish and Satus Creeks on the Yakama Reservation in south central Washington. Currently over 20,000 acres are protected and undergoing restoration. This acreage is divided into distinct management units. A site-specific management plan is developed for each management unit. The site-specific plans identify restoration goals and the measures required to meet the goals for each propertry. A monitoring plan is also included in each site-specific plan to track the progress toward the realization of the goals for each property.

South Lateral A Wildlife Area

Though monitoring activities are occurring for all of the management units, for the purposes of this report, one management unit will be used to demonstrate the monitoring components used in this project. The unit chosen is the South Lateral A Wildlife Area. This 440 acre property along Toppenish Creek was purchased in 1993. This property,

once consisting of creek channel, wetland and upland habitats, was leveled for irrigated agricultural development beginning in the 1920's and continuing through the 1980's. The restoration goals for the South Lateral A property are listed below. These goals are taken from the site-specific management plan for the South Lateral A Wildlife Area. The monitoring of the progress toward these goals will be presented for each goal in the plan.

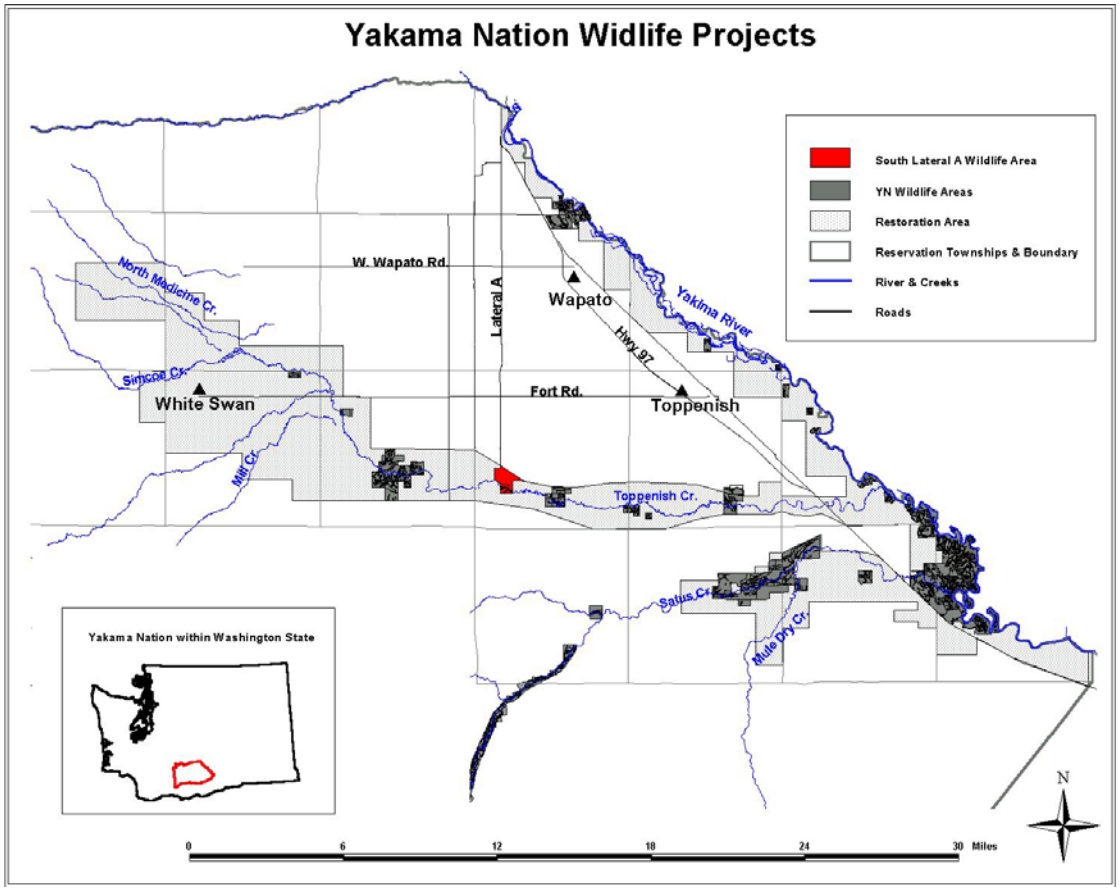


Figure 1. Location of the South Lateral A property in relation to the other lands protected in the Yakama Nation's Wetlands and Riparian Restoration Project.

Restoration Goals for the South Lateral A Wildlife Area:

1) Re-establishment of the north channel of Toppenish Creek on the property in such a manner that natural flows are allowed to return through the property and on to the adjacent lands downstream.

2) Restoration of the floodplain landscape as close as possible to a pre-irrigation condition. This includes reestablishing natural land contours and hydrologic conditions necessary for wetland, riparian and upland restoration.

3) Restoration of native vegetation communities associated with the floodplain landscape.

4) Manage lands to provide benefits to wetland and riparian associated wildlife. This includes the reestablishment of reproduction habitat for waterfowl, upland game birds, wetland and riparian dependent songbirds, and furbearers. This also includes feeding, migration, and wintering habitat for herons, sandhill cranes, waterfowl, raptors, songbirds, and other wetland and riparian associated species.

5) Manage lands to provide benefits to anadromous fish. This includes the restoration of riparian tree and shrub communities to shade the creek and to provide woody debris for juvenile hiding cover. Provide flow management in wetlands to allow passage of adult and juvenile salmonids.

6) Restore culturally important vegetation for traditional use by the Yakama People. This includes tule and great basin wild rye enhancement.

7) Provide access for traditional resource utilization for Yakama enrolled members. Provide supervised access for the non-enrolled public for the purposes of small game hunting, non-consumptive wildlife activities, and educational purposes.

Monitoring of the Progress Toward Meeting the Restoration Goals for the South Lateral A Wildlife Area:

Goal 1) Re-establishment of the north channel of Toppenish Creek on the property in such a manner that natural flows are allowed to return through the property and on to the adjacent lands downstream.

Toppenish Creek reconnection: In 1995 a large landscape restoration project was implemented. This project used historic aerial photographs to recreate, as best as possible, the pre-irrigation landscape features of the property. In 1996, additional restoration was completed to enhance the flood passage capabilities of the property.

Monitoring information for this goal is included in the discussion for Goal 2 below.

Goal 2) Restoration of the floodplain landscape as close as possible to a pre-irrigation condition. This includes reestablishing natural land contours and hydrologic conditions necessary for wetland, riparian and upland restoration.

Landscape restoration: In addition to the creek channel reconnection, the 1995 project was also designed to recreate, as much as possible, pre-irrigation landscape

conditions. These include channel, wetland and upland area recreations according to historic photos and current landscape constraints.

North Channel and Landscape Features

Restoration and monitoring for these 2 goals involved the use of historic photos. The earliest aerial photos of this property were taken in 1937 (Fig. 2). Disturbance had already occurred by this time. Wetland and channel features, however, can be seen. The north channel, though disturbed by this date, is also visible. Additional aerial photos were created approximately every 10 years since 1937. The gradual conversion of the property to its state at the time of purchase can be seen in these photos. The photo from the 1980's represents the condition upon inclusion into this project (Fig. 3).

Restoration of the landscape features, including the north channel occurred in 1995-1996. The 2002 aerial photo is used to compare the restored landscape with the historic (Fig. 4).

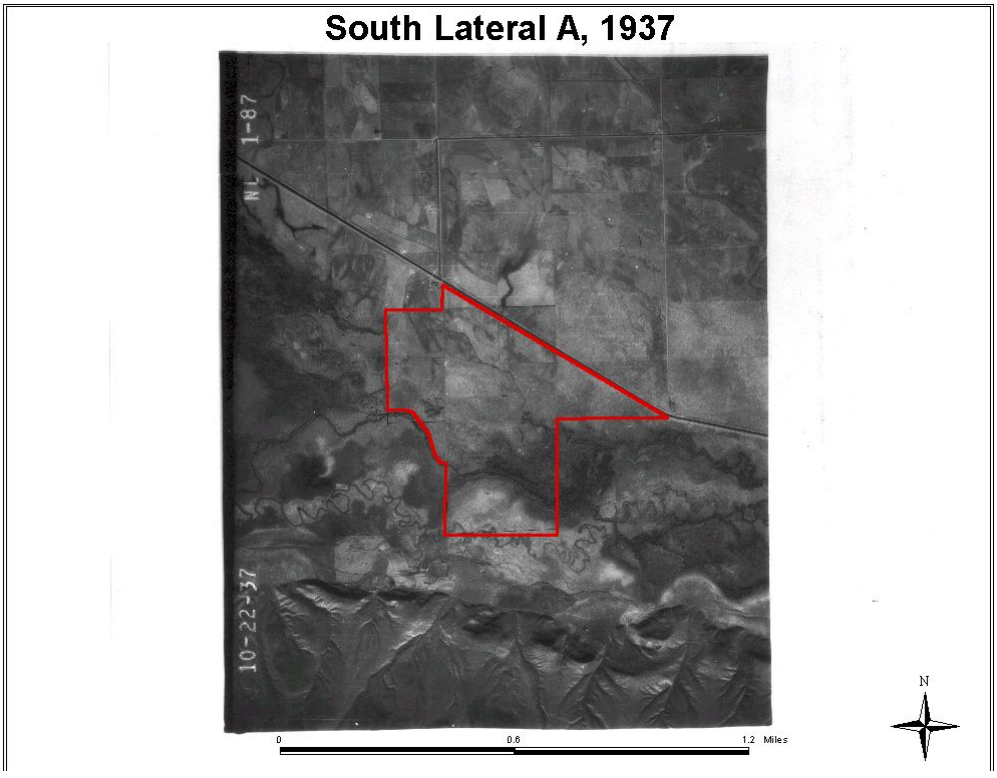


Figure 2. South Lateral A property aerial view – 1937.

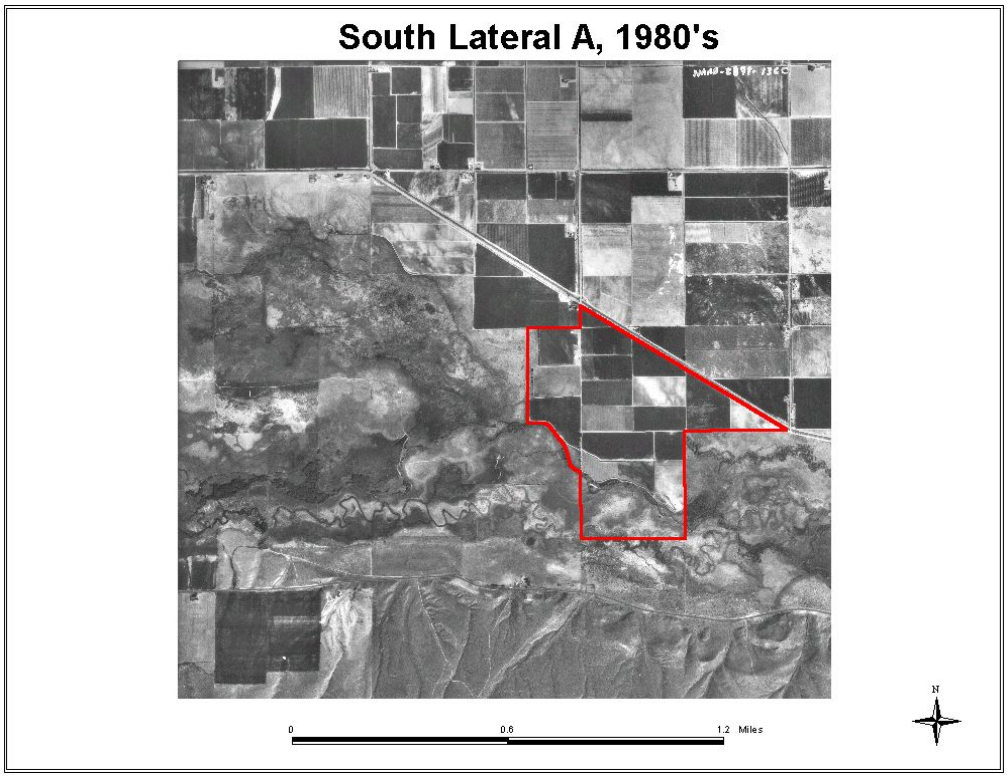


Figure 3. South Lateral A property aerial view – 1980's.

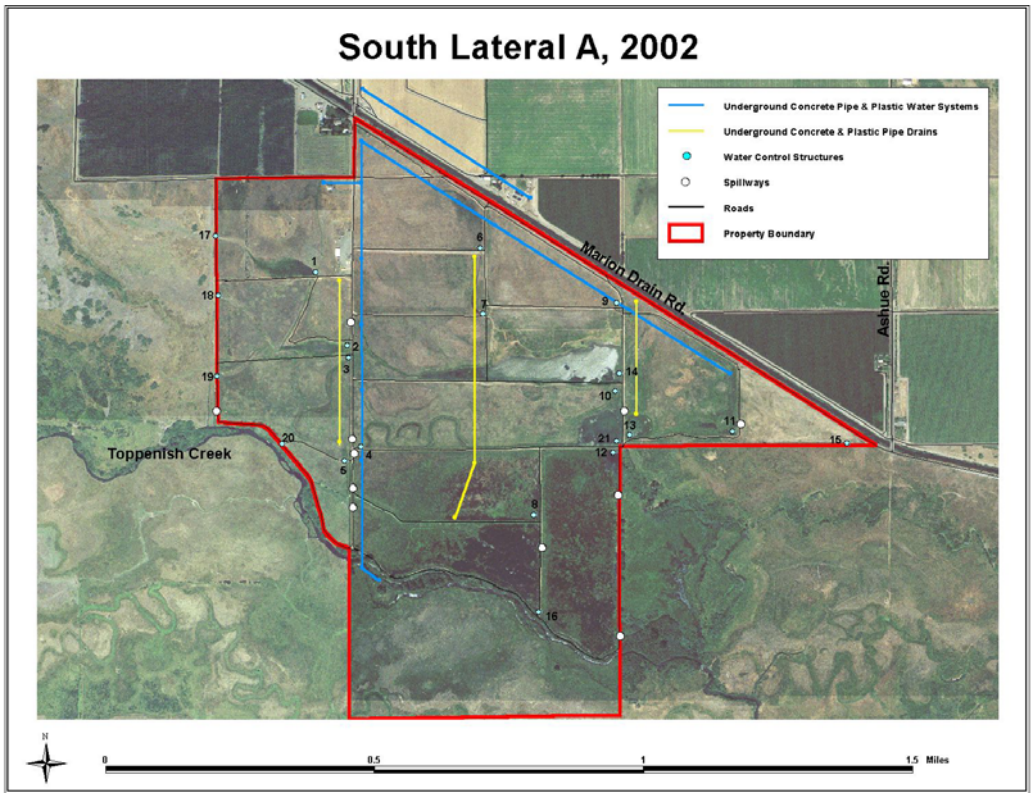


Figure 4. South Lateral A, 2002.

Groundwater Monitoring

In addition to aerial photo interpretation, hydrologic restoration is being monitored through the use of a series of piezometers and surface water measuring locations. This monitoring effort began in 2005. In addition to showing the hydrologic response of restoration on the South Lateral A property, this project is designed to document the hydrologic effects of a large agricultural drain on the Toppenish Creek hyporheic zone, and to measure the response to a large channel and wetland reconnection project that is occurring from the South Lateral A property downstream for 3 miles. Grade control structures are being installed to raise the level of the currently incised creek channels to their historic elevation. This work will be occurring in August and September of 2006. The monitoring at this point documents the baseline conditions (Figs. 5-6).

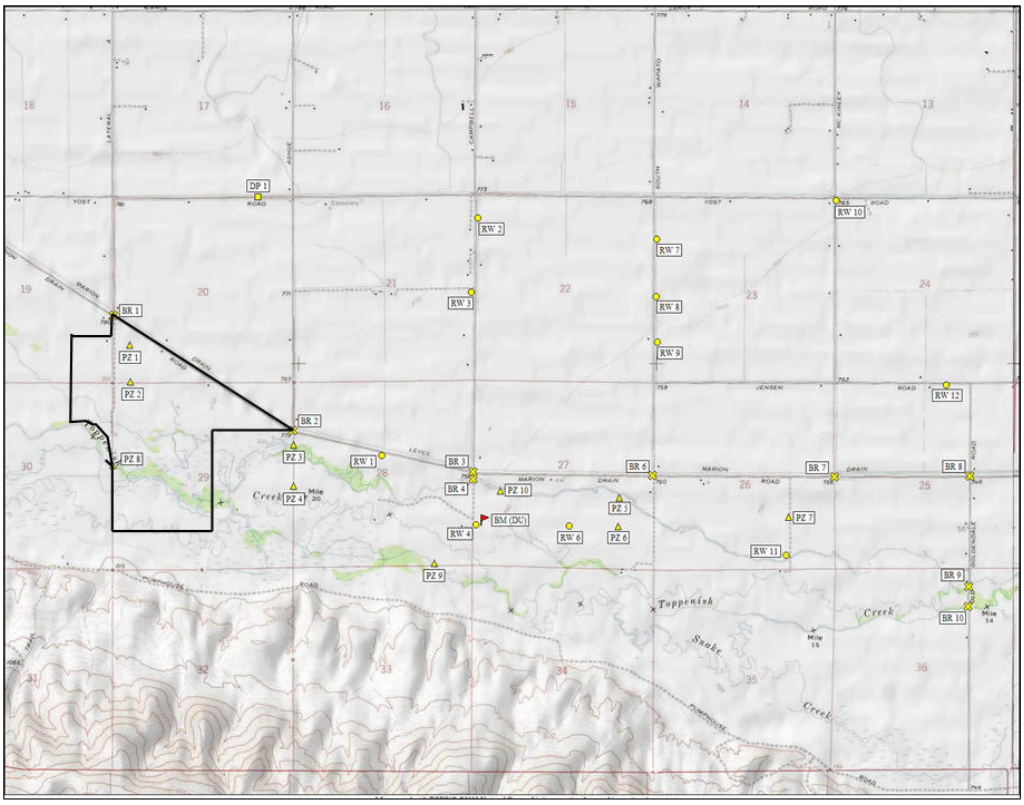


Figure 5. Locations of groundwater and surface water monitoring sites on South Lateral A property and adjacent areas.

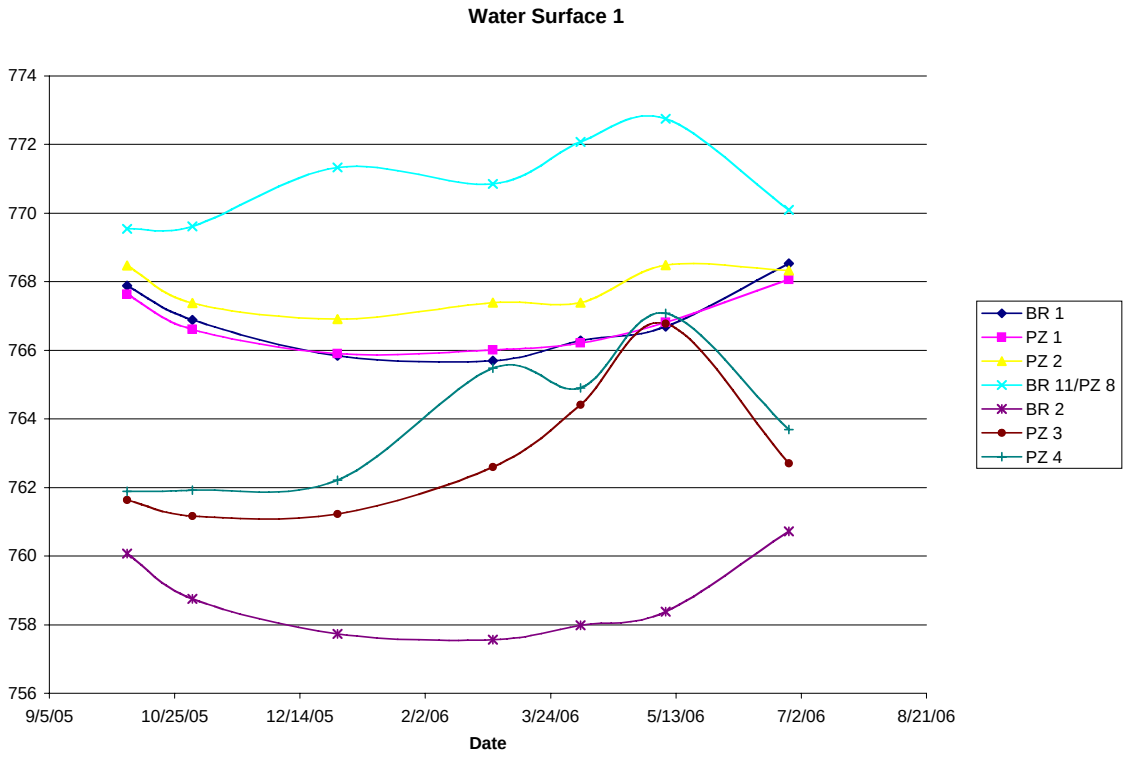


Figure 6. An example of the baseline water surface elevations on the South Lateral A Wildlife Area.

Goal 3) Restoration of native vegetation communities associated with the floodplain landscape.

Vegetation monitoring consists of quantitative, qualitative and photomonitoring components. Because the Toppenish Creek corridor still contains a source of native wetland and riparian plant seed, most of the revegetation of these areas is being allowed to occur naturally. The exceptions to this are the limited areas that were planted with willow and cottonwood cuttings in 1996 and 1997 by a Salmon Corps crew. These plantings occurred along the channels and wetlands recreated in the 1995-1996 project. Upland areas do not re-vegetate naturally, and are being replanted to Great Basin wild rye.

1) Comparison of vegetation cover type acres between 1995 and 2005 using vegetation cover type maps

Table 1. Extent of vegetation cover types on the South Lateral A Wildlife Area.

Year	Agriculture acres	Shrub-Steppe/Grassland acres	Emergent Wetlands acres
1995	361	46	0
1999	1	257	139
2005	17	259	140
change 1995-2005	**-344**	**+213**	**+140**

Vegetation cover type maps of the South Lateral A property have been compiled in 1995, 1998, and 2005. A comparison of cover types from 1995, when restoration was initiated, and 2005 shows that some vegetation cover types (Figs. 7-8) show substantial change between 1995 and 2005. Most of this change occurred in from 1995 to 1999, which reflects the conversion of agricultural lands to more natural cover types. While different methods (grid dot-count in 1995, GIS heads up digitizing in 2005) were used to interpret cover types from aerial photos, observations by Yakama Nation Wildlife staff and management confirm the direction and magnitude of the change. In addition, GIS analysis showed that in 2005 over 40 acres of the emergent wetland consisted of tule, tule/cattail, and wapato dominated areas. These are important cultural resources and contribute substantially to the value of the South Lateral A site. Cover type definitions can be found in Bich 1991.

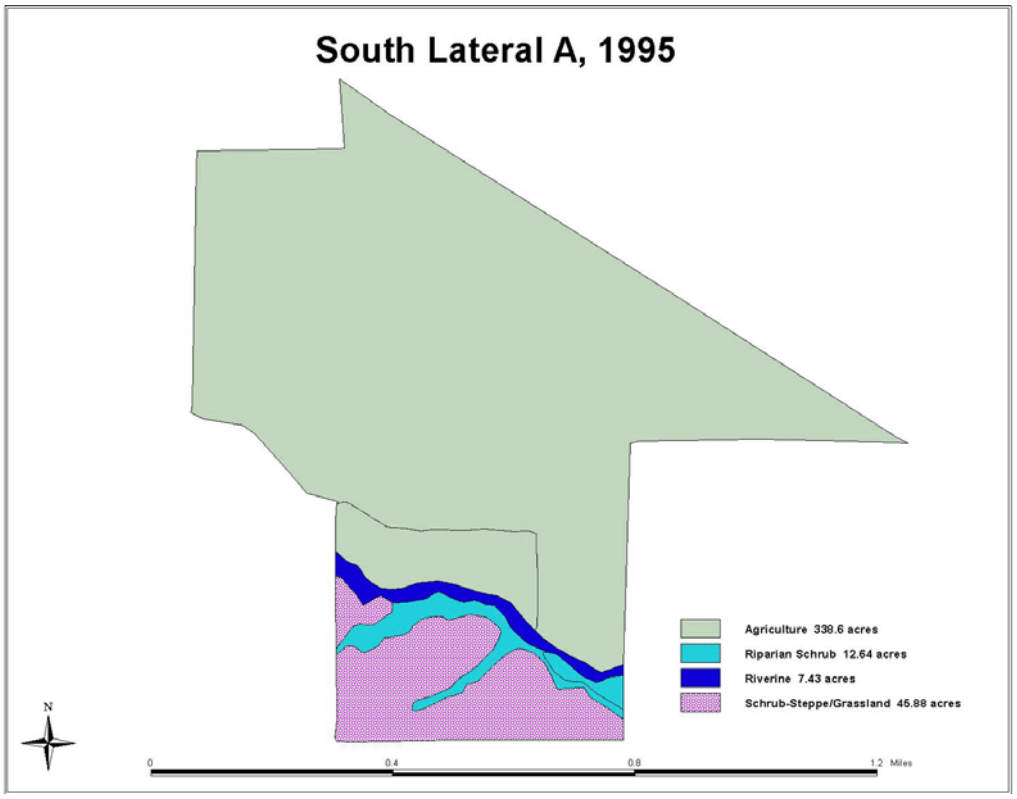


Figure 7. South Lateral A baseline habitat cover types – 1995.

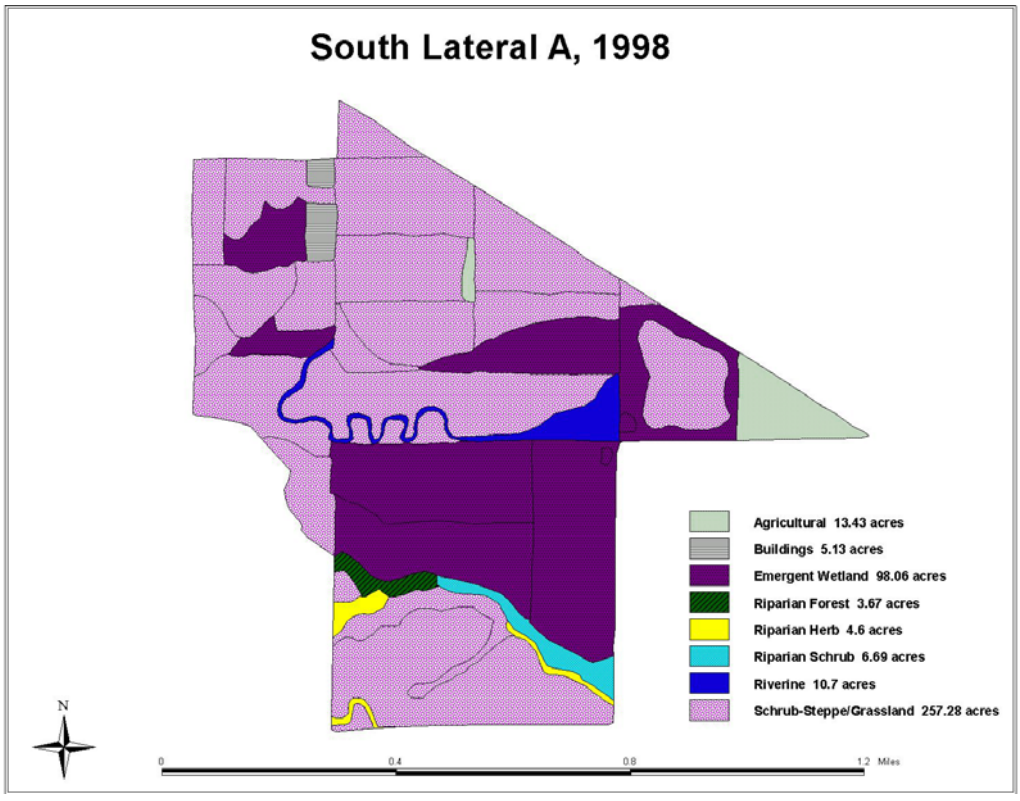


Figure 8. South Lateral A habitat cover types – 1998.

2) Comparison of extent of riparian scrub along Toppenish Creek from 1992 to 2005.

Table 2. The extent of riparian scrub habitat on the South Lateral A property.

Year	Acres of Riparian Scrub	Linear feet of scrub polygons (perimeter/2)
1992	3.4	1260
2005	4.8	2265
Percentage change	**+ 41 %**	**+ 80 %**

The boundary of riparian scrub was delineated along Toppenish Creek within the South Lateral A boundary. Area and perimeter were calculated using ArcView GIS. Results are shown in Table 2. A time series of the area described can be seen in Figure 9.

3) Vegetation point intercept transect data.

Table 3. Pooled averages for 4 grassland transects, 1998 (Raedeke 2000) and 2005 data (Ashley 2005).

Year	Cover Type	Total % canopy cover
1998	Shrub-Steppe Grassland	58
2005	Shrub-Steppe Grassland	92
	Percent change	**+ 59**

Total mean canopy cover increased for all transects, perhaps as a result of recovery from agriculture and grazing use.

Table 4. Pooled averages for 2 riparian scrub, 1992 (Raedeke 2000) and 2005 (Ashley 2005).

Year		species	mean height (ft)	% canopy cover
1992	Riparian Shrub	All species	0	3
2005	Riparian Shrub	willow species	6.4	34
2005	Riparian Shrub	Russian olive	3.8	0.3
	Percent change (willow only for 2005)			**1033**

Mean canopy cover and height increased substantially from 1992 to 2005, reflecting the increase in extent and stature of riparian scrub along Toppenish Creek. This data shows a similar trend for shrubs as does the riparian shrub cover data shown in Table 2. The increase in shrubs can be also be observed visually (Fig 9.).

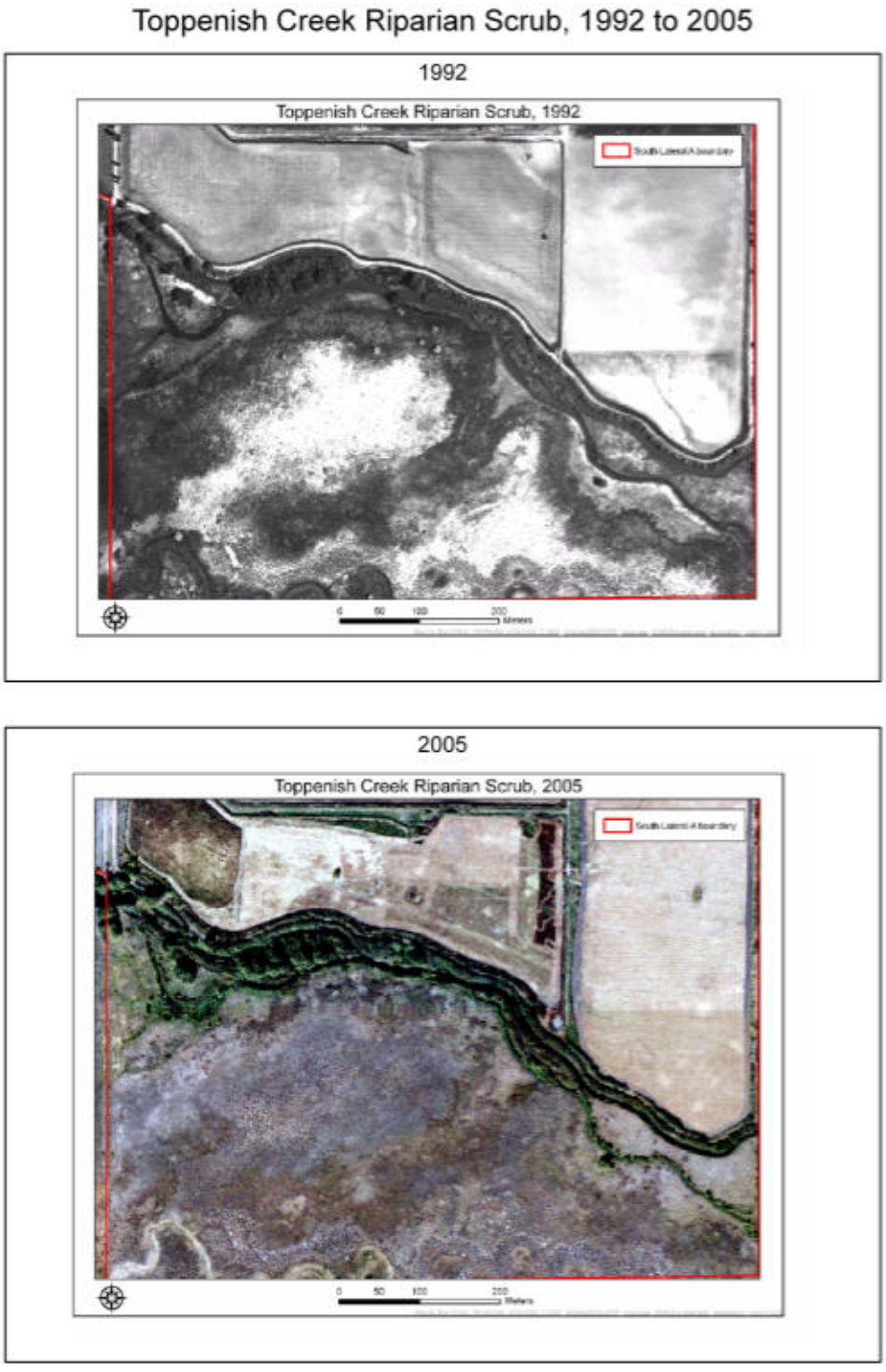


Figure 9. Riparian scrub on the South Lateral A property 1992 and 2005.

Photomonitoring

Photomonitoring sites have been developed to provide visual documentation of vegetation changes over time. The photos included here are a subset of those developed for the property. These photos (Figs. 10-20) were chosen to show the change in vegetation pre- and post restoration. Some of the photos were taken before the property was purchased.

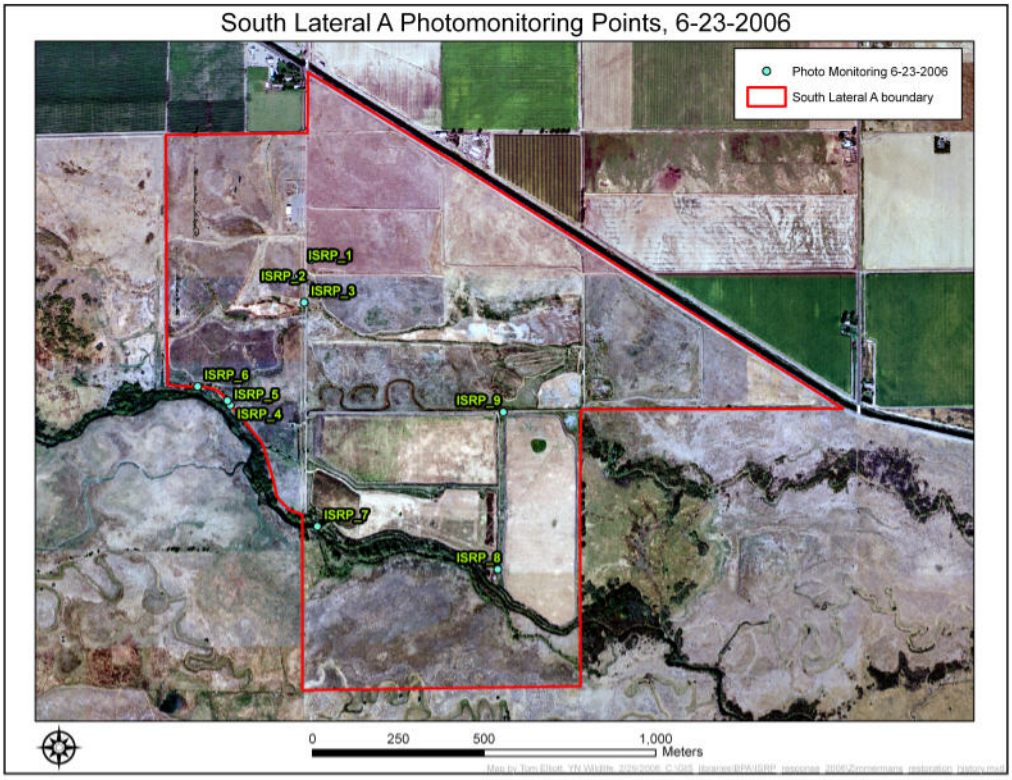


Figure 10. Photomonitoring locations on the South Lateral A Wildlife Area. This photo was taken in August 2005 when the wetlands on the property were drawn down for management purposes.

Figure 11. Photopoint 1, View A – looking north. Hay and wheat fields have been converted to native grass.

Figure 12. Photopoint 1, View B – looking northeast. Hay and wheat fields have been converted to native grass and shrubs.

Figure 13. Photopoint 2, View A – looking southwest. Hay and wheat fields have been converted to native grass and shrubs.

Figure 14. Photopoint 3, – looking south. Hay and wheat fields have been converted to native grass and shrubs.

Figure 15. Photopoint 4, – looking west. No riparian vegetation existed pre-restoration on this portion of Toppenish Creek.

Figure 16. Photopoint 6, with human – looking southeast. Currant and willow have returned to previously barren areas on Toppenish Creek.

Figure 17. Photopoint 7, with subject – looking south. Willow and grass restoration on Toppenish Creek.

Figure 18. Photopoint 8, View A – looking northwest. A wheat and barley field has been restored to a tule, wapato, burreed dominated emergent marsh.

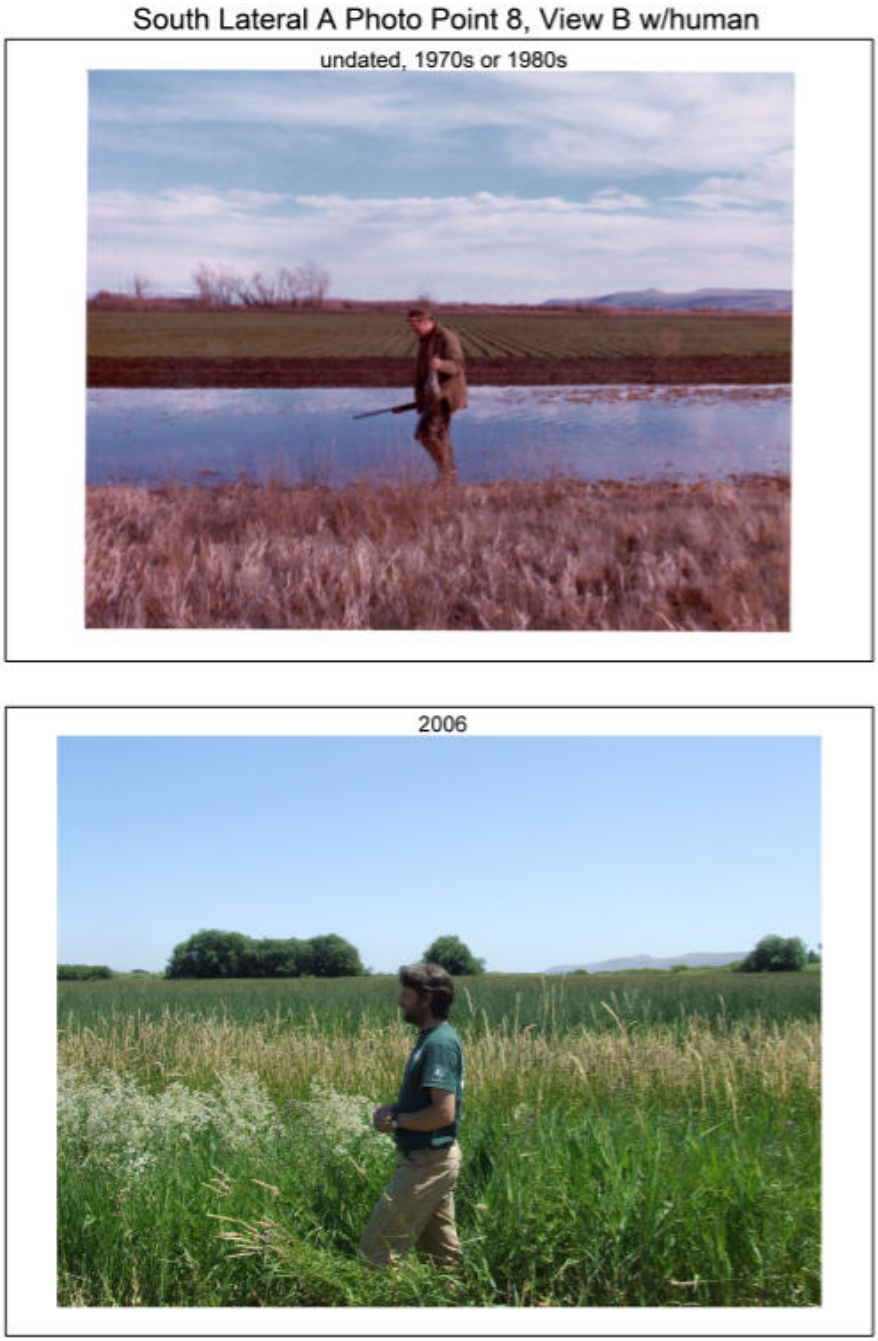


Figure 19. Photopoint 8, View B, with subject – looking east. A wheat and barley field has been restored to a tule, wapato, burreed dominated emergent marsh.

Figure 20. Photopoint 9, – looking south. A wheat and barley field has been restored to a tule, wapato, burreed dominated emergent marsh.

Summary

In general, vegetation cover of grassland, emergent wetland, and riparian shrub have increased substantially on the South Lateral A property from the early 1990s to the 2005, as shown by GIS cover type mapping and vegetation point intercept data. These trends correspond to the direct observations of managers and staff. This change may be attributed to 2 major factors: the cessation of agricultural use for crops and grazing, and concomitant management actions to restore floodplain hydrology, control exotic plants, and restore native grassland vegetation. The improvement in the integrity of the vegetation has provided wildlife habitat, cultural resources, and aesthetic values for an area that is key to ongoing restoration in the Toppenish Creek floodplain.

Goal 4) Manage lands to provide benefits to wetland and riparian associated wildlife. This includes the reestablishment of reproduction habitat for waterfowl, upland game birds, wetland and riparian dependent songbirds, and furbearers. This also includes feeding, migration, and wintering habitat for herons, sandhill cranes, waterfowl, raptors, songbirds, and other wetland and riparian associated species.

The actions described above also benefit the wildlife resources of the property. In addition the benefits derived from hydrologic and habitat restoration, conditions favorable to wildlife will be maintained through strict control on human access into the property. Because a major portion of the Yakama Nation's Wetland and Riparian Restoration Project is devoted to the restoration of native plant and hydrologic conditions (habitat), artificial nesting structures will only be used under very special circumstances. There are currently no plans to utilize them in any matter on the property. Responses of wildlife to our restoration efforts are monitored through annual counts and banding operations. We conduct annual counts on non-game birds, quail and pheasant broods, breeding eagles, doves and waterfowl, wintering waterfowl and bald eagles. Due to the landscape nature of these counts, they are not specific to individual properties that we have under restoration, but provide us with trend data in areas containing these properties. We also conduct annual operations banding waterfowl and doves.

Mourning Dove Coo-Counts

In conjunction with the United States Fish and Wildlife Services Webless Migratory Game Bird Program, we conduct mourning dove call-counts to estimate the number of breeding mourning doves. Protocol and routes are chosen by the USFWS. These routes do not change and provide continental population estimates. The population estimates are used to set dove seasons and bag limits. On the Yakama Reservation these counts are conducted annually on 2 routes the last full week in May. Since 2000, the number of breeding pairs has increased 23% (Fig. 21). The increase is greater on the Pumphouse route which follows Toppenish Creek where the South Lateral A Wildlife Area is located.

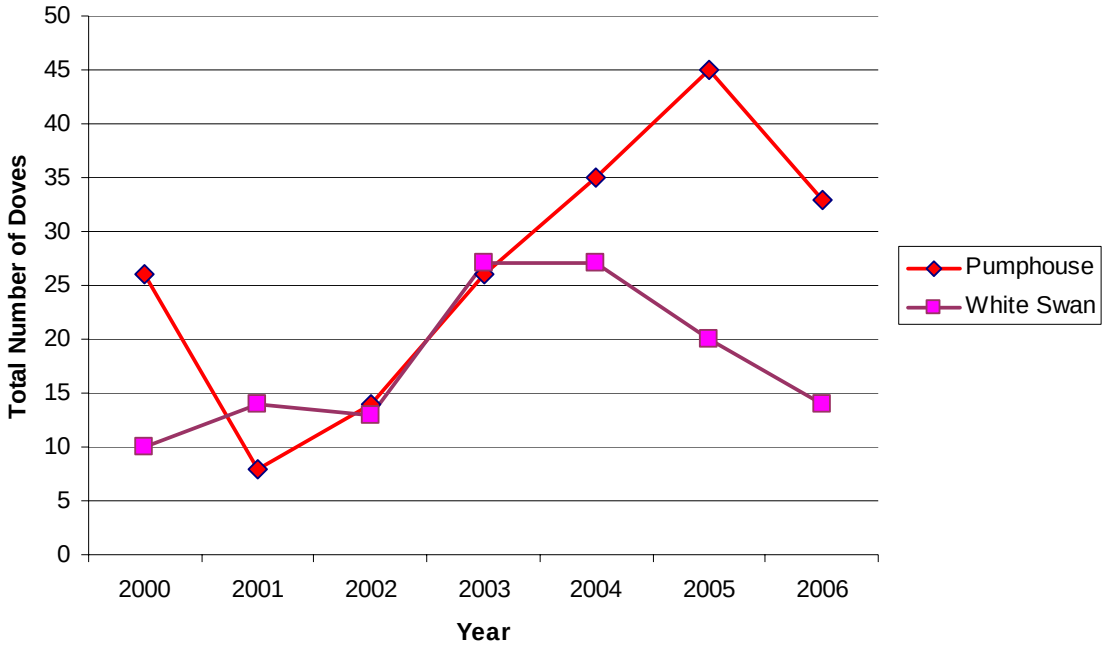


Figure 21. Total number of mourning doves seen and heard on the Pumphouse and White Swan dove call count routes on the Yakama Reservation from 2000 through 2005.

Non-Game Birds

With the help of the Yakima Valley Chapter of the Audubon Society, we began documenting birds found on 5 restoration properties. Volunteers visit these properties at least once during each season and record the species and numbers of each species seen during the visit. The number of bird species seen ranged between 6 and 66 per visit. The highest total number of species observed are found on the South Lateral A property (Fig. 22) and on the Satus property. This is probably a result of the diverse habitat found on this property and these properties are farther along in their restoration than the other properties. The lowest number of species observed occurred on Campbell Road property even though it is less than 2 miles from the South Lateral A property. The Campbell Road property, however, did host nesting ravens in 2005. We are just beginning to restore this property. These surveys allow us to document any changes in bird diversity as restoration continues over the course of the next few years. Currently, we are analyzing data and attempting to modify protocol to provide the most reliable data to monitor our restoration efforts. Results from these surveys will allow us to make better management decisions on lands managed by the Yakama Nation Wildlife Resource Management Program.

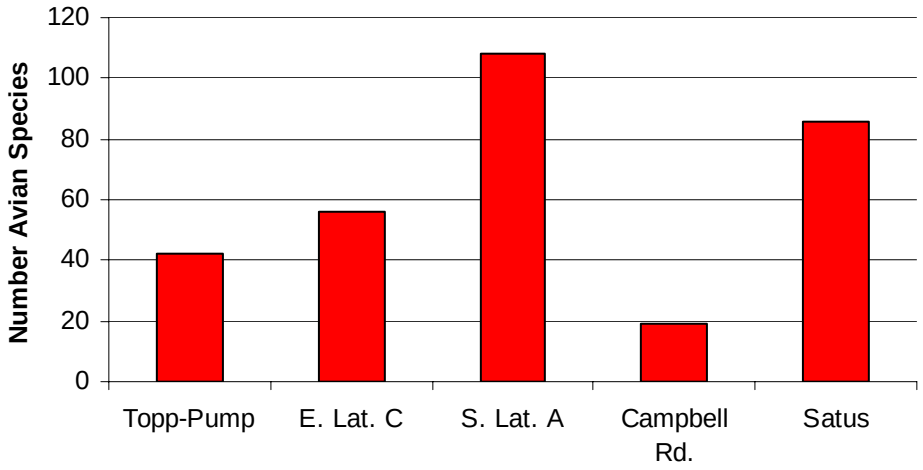


Figure 22. Number of avian species found on Toppenish-Pumphouse (Topp-Pump), East Lateral C (E. Lat. C), South Lateral A (S. Lat. A), Campbell Road (Campbell Rd.) and Satus Wildlife Area (Satus) properties.

Waterfowl Breeding Pair Counts

We conduct waterfowl breeding pair annually during the second week of May. These counts are conducted at 15 different sites. These counts allow us to monitor duck responses to our restoration efforts and make proper management decisions. In 1999, we added South Lateral A to the Breeding Pair Counts. Counts have remained relatively constant over the last 4 years (Fig. 23). When adjusted for the area surveyed, the South Lateral A property produces 11 times as many mallards per acre as is produced on average throughout the valley.

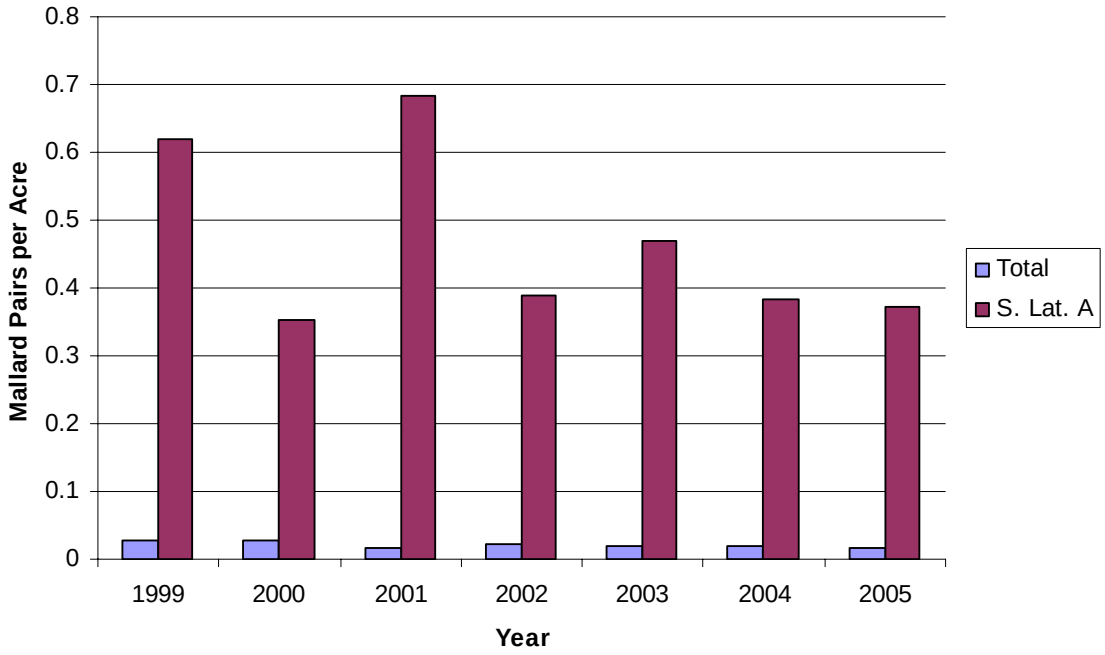


Figure 23. Number of mallard pairs per acre counted during pair counts conducted in May on the Lower Yakima Valley compared to South Lateral A properties.

Mid-Winter Waterfowl Counts

In conjunction with the U.S. Fish and Wildlife Service, we conduct winter waterfowl counts during January and February. These counts provide us an estimate of the wintering waterfowl population and the distribution of wintering waterfowl. The Toppenish Creek count is divided into 4 areas. No waterfowl hunting is allowed in both the West Refuge (W. Refuge) and East Refuge (E. Refuge). Both these areas contain land managed by the U.S. Fish and Wildlife Service and the Yakama Nation Wildlife Management Program. The Toppenish National Wildlife Refuge allows very limited hunting on a small portion of the refuge and is managed by the U. S. Fish and Wildlife Service. The Mid-Toppenish Creek (Mid-Topp) is a mixture of land owned by private individuals, duck hunting clubs, U.S. Fish and Wildlife Service, and the Yakama Nation Wildlife Management Program. South Lateral A is in the Mid Topp portion of Toppenish Creek. Mallard counts from January show a large portion of the wintering waterfowl using the refuges (Fig. 24). This is probably due to hunting pressure on other portions of Toppenish Creek. After the hunting season, the mallard distribution shifts towards the Mid Topp area as indicated by the February counts (Fig. 25). This shows that Mid Topp is an important waterfowl wintering area that provides important food for waterfowl.

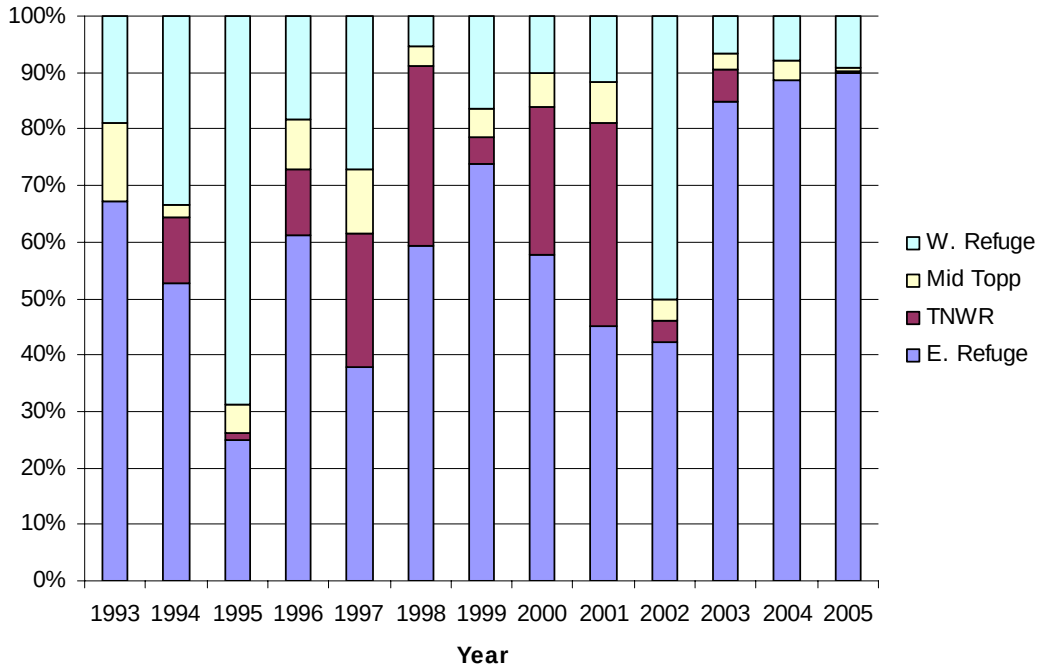


Figure 24. Distribution (percent of wintering population) of wintering mallard on Toppenish Creek during January waterfowl counts on the Lower Yakima Valley.

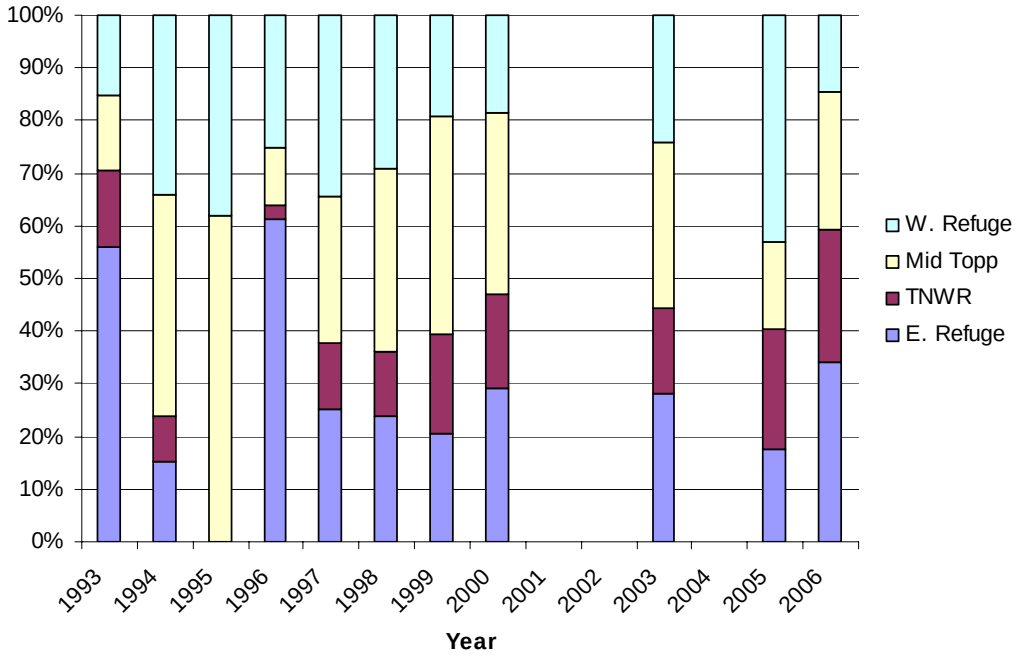


Figure 25. Distribution (percent of wintering population) of wintering mallard on Toppenish Creek during February waterfowl counts on the Lower Yakima Valley.

Goal 5) Manage lands to provide benefits to anadromous fish. This includes the restoration of riparian tree and shrub communities to shade the creek and to provide woody debris for juvenile hiding cover. Provide flow management in wetlands to allow passage of adult and juvenile salmonids.

As with wildlife, the anadromous fish goals are tied in to the restoration of the hydrologic and vegetative conditions. Restoration of native hydrologic conditions provides for safe passage by adult and juvenile salmonids. Wetland and floodplain reconnection allows for the natural recharging of groundwater necessary for maintaining the quantity and quality of water necessary for salmonid needs.

Monitoring of salmonids populations in the Toppenish Creek watershed is conducted by the Yakama Nation Fisheries Program under contract with Bonneville Power Administration (Project Number 199603501). One example of this effort is provided in the table below.

	Ladder Counts (July 1 to June 30)				Redd Counts			
Year Ending	Prosser Wild	Prosser Hatchery	Roza Wild	Roza Hatchery	Satus	Toppenish	Ahtanum	Naches Tribs
1985	2191	0	6	0	*	*	*	*
1986	2230	0	3	0	*	*	*	*
1987	2424	41	0	0	*	*	*	*
1988	2601	239	0	0	445	*	*	*
1989	1066	96	0	0	404	45	*	*
1990	727	87	0	0	289	26	*	*
1991	730	104	0	0	125	*	*	*
1992	2012	251	107	9	*	*	*	*
1993	1104	80	15	0	73**	*	*	*
1994	540	14	28	0	114	*	*	*
1995	838	87	22	1	85***	*	*	*
1996	450	54	90	2	148	*	*	*
1997	961	145	22	0	76	5**	*	*
1998	948	165	51	0	190	13**	*	*
1999	1018	52	14	0	130	78	*	*
2000	1571	40	14	0	169	185	11	*
2001	3032	57	133	7	102	355	8	*
2002	4491	34	236	2	240	111***	13***	*
2003	2190	45	128	6	319	161***	16***	*
2004	2739	16	211	2	93	56***	12***	94
2005	3377	74	224	0	108	99	16	140

* No survey

** Partial survey.

*** Survey affected by poor redd visibility

Cultural Resources

Goal 6) Restore culturally important vegetation for traditional use by the Yakama People. This includes tule and great basin wild rye enhancement.

Natural revegetation has allowed for a large increase in wetland plants important to the Yakama People. This is due to the efforts of restoring the native hydrologic and landscape components of the property. Tule beds, nearly non-existent when the property was farmed, are now common enough to provide harvest opportunities each year to many tribal members. As the upland and riparian areas develop, they will also soon be providing opportunities for the harvest of wild rye, dogwood and wild rose. Wildlife resource use is occurring in the form of waterfowl harvest. Yakama tribal members use of the property for waterfowl and furbearer harvest is increasing annually.

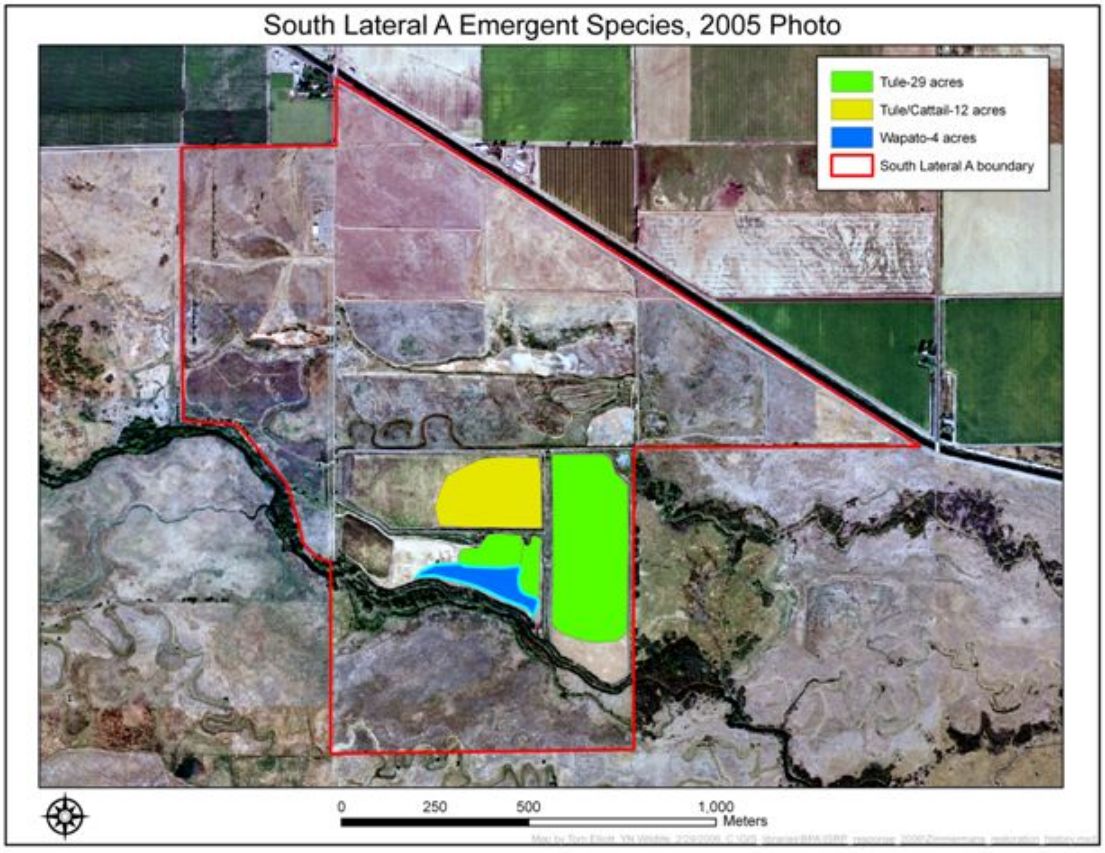


Figure 26. Extent of tule and wapato in the south wetland areas of the South Lateral A Wildlife Area.

The acquisition of the South Lateral A property by the Yakama Nation's Wetlands Restoration Project has allowed the Yakama Nation to restore many of its traditional use plants.

Tule: (*Scirpus acutus*)
Restoration activities have succeeded in producing 29 acres of tule and an additional 12 acres of mixed tule and cattail. (Fig. 26) This wetland plant was not present on the property until after restoration activities began. At the South Lateral A property tule reed has succeeded in establishing itself due to better wetlands management practices. The success of this restoration activity has been accomplished by the annual draining, mowing, and burning of the tule ponds. These activities have resulted in a higher quality tule according to tribal member interviews.

Wapato: (*Saggitaria sp.*)

Wapato (*Saggitaria sp.*) was also not present on the South Lateral A property prior to the project's restoration activities (Fig. 26). Large patches of Wapato are now present on the South Lateral A property. Future monitoring will determine the exact acreage of this wetland plant.

Great Basin Wild Rye: (*Elymus condensatus*) The acreage of Great Basin Wild Rye has increased on the south side of the property since restoration activities began in 1996.

Goal 7) Provide access for traditional resource utilization for Yakama enrolled members. Provide supervised access for the non-enrolled public for the purposes of small game hunting, non-consumptive wildlife activities, and educational purposes.

Fences and gates have been installed on the property to restrict the accessibility of the property. An access management plan has been developed to ensure that the human use is compatible with resource protection and enhancement. The property has proved to be very attractive to those partaking in tule and waterfowl harvest activities.

Tule: (*scirpus acutus*)

The South Lateral A property represents one of the greatest successes of the Yakama Nation's Wetlands Restoration Project with the emergence of culturally significant marsh plants. The most important of these plants is the tule reed. The tule reed continues to be harvested by the Yakama people on an annual basis at the South Lateral A property. The South Lateral A property is open to Yakama Nation members each year for three weeks in mid to late summer for tule cutting. Traditional activities such as this have significant spiritual meaning to the Yakama People. We do not require harvest reporting of this sensitive information, therefore we do not monitor harvest. Casual observation shows tule harvest occurs regularly when the property is open. It is used in a variety of ways all of which are intimately tied to the Yakama culture and their traditional belief systems. Yakama women are responsible for the annual harvest of tule reeds although men and children sometimes accompany them in the harvest. Tule reeds are selected for harvest based on size and length. Cracked or split reeds are discarded as are reeds exhibiting black spot. The harvested tules are then tied into bundles and used to create woven mats.

Wapato: (*Saggitaria sp.*)

Another success has been the emergence of the traditional food plant Wapato which is called "***stinstin***" in the Yakama language. It is also known by the name "Indian Potato" or "Duck Potato". Every year since restoration activities were initiated on the South Lateral A property, Wapato has flourished and multiplied in number. Yakama women traditionally harvested the plant by wading into the marsh and pulling the roots up with their feet as noted by Lewis and Clark in 1806. Monitoring traditional harvesting and use of Wapato is problematic at this time. Future restoration activities will monitor the effects of draining and burning the areas of Wapato concentration at the South Lateral A property.

Great Basin Wild Rye: (*Elymus condensatus*) Because these stands are just reaching maturation, traditional use of great basin rye has not been documented at this time. Future use of mature plants is anticipated.

Dogbane: (*Agrocynum cannabium*)

In November of 2005 the Yakama Nation Cultural Resources Program requested the Wetland Restoration Project's assistance in the transplanting of Indian Hemp also known as dogbane to the South Lateral A property from a hop field on the reservation. The Yakama people call this "***taxus***" in their language. This species is traditionally used in weaving because of its fiber. Eighty- eight percent of the transplanted plants were successful in re-establishing themselves at the South Lateral A property. Monitoring tribal members' use of this resource has not yet been implemented due to its recent introduction.

Waterfowl

Additional traditional resource utilization access to the South Lateral A property is also provided to Yakama Nation members for the purpose of waterfowl hunting. Yakama Nation members may hunt on any day at the South Lateral A property. Once again, because of the traditional nature of this activity, harvest reporting is inappropriate and not allowed. Casual estimates of tribal use range from fifteen to twenty hunter days per year.

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Appendix C

Yakama Nation Wetlands and Riparian Restoration Project

Compiled By

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For

Tracy Hames – Yakama Nation

and

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February 2007

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Abstract

This Habitat Evaluation Procedures (HEP) report is a compilation of all data collected from 1990 through 2006 on land acquisitions and habitat protection leases associated with the Yakama Nation's (YN) Wetlands and Riparian Restoration Project (WRRP). Since 1990, over 21,600 acres have been protected on 39 separate parcels ranging in size from 22 acres to 4,725 acres. Between 1,000 and 3,000 acres were acquired each year including more than 115 miles of steelhead (*Oncorhynchus mykiss*) bearing stream, river and side channels at an average cost of less than $400 per acre.

Habitat Evaluation Procedures (USFWS 1980) were utilized to document baseline habitat conditions and to determine how many protection habitat units (HUs) to credit Bonneville Power Administration (BPA) for providing funds to acquire/protect project lands as partial mitigation for habitat losses associated with construction of dams on the lower Columbia River. Since 1990, three HEP "methods" including the Yakama HEP study method, the Delphi method, and the Transect method have been employed to document habitat unit gains generated from Yakama Nation mitigation projects. The Delphi method proved unreliable and lacked repeatability and was subsequently rejected after 1999.

The acquisition/protection of 21,631.10 acres of wildlife habitat on the Yakama Reservation yielded 33,860.18 habitat units (HUs) for a habitat unit to acre ratio of 1.57:1. Yakama Nation wildlife mitigation projects account for the largest share (72%) of habitat unit gains associated with McNary, John Day, The Dalles, and Bonneville Dams (Washington State HU losses).

While several HEP species identified in lower Columbia River hydro project loss assessments have not been fully mitigated, the total number of habitat units gained through BPA funded mitigation projects exceed the number lost by more than 2,500 habitat units. As a result, BPA proposes that lower Columbia River wildlife mitigation (Washington State) is complete; due largely to the success of the Yakama Nation's wildlife mitigation program.

Introduction

This Habitat Evaluation Procedures report is a compilation of all data collected from 1990 through 2006 on land acquisitions and habitat protection leases associated with the Yakama Nation's Wetlands and Riparian Restoration Project. This project is a comprehensive effort, funded in part by Bonneville Power Administration, to protect and restore floodplain habitats along anadromous fish-bearing streams in the agricultural portion of the Yakama Reservation. The loss of floodplain function in lower Yakima River watersheds is the primary factor limiting the production and survival of salmonids and associated wildlife populations (YSPB 2004). As a result, protection and restoration of these floodplain habitats are a high priority throughout the Yakima River Basin.

WRRP project objectives include the protection, restoration, and management of 27,000 acres of floodplain habitat along the Yakima River, Satus Creek, and Toppenish Creek (Figure 1). Methods include protection of large contiguous floodplain tracts and associated water rights through acquisitions and leases while restoration emphasizes the return of normative hydrologic processes and ecological functions. Monitoring and subsequent adaptive management actions

will ensure that the restored conditions persist into the future (T. Hames, pers. comm.).

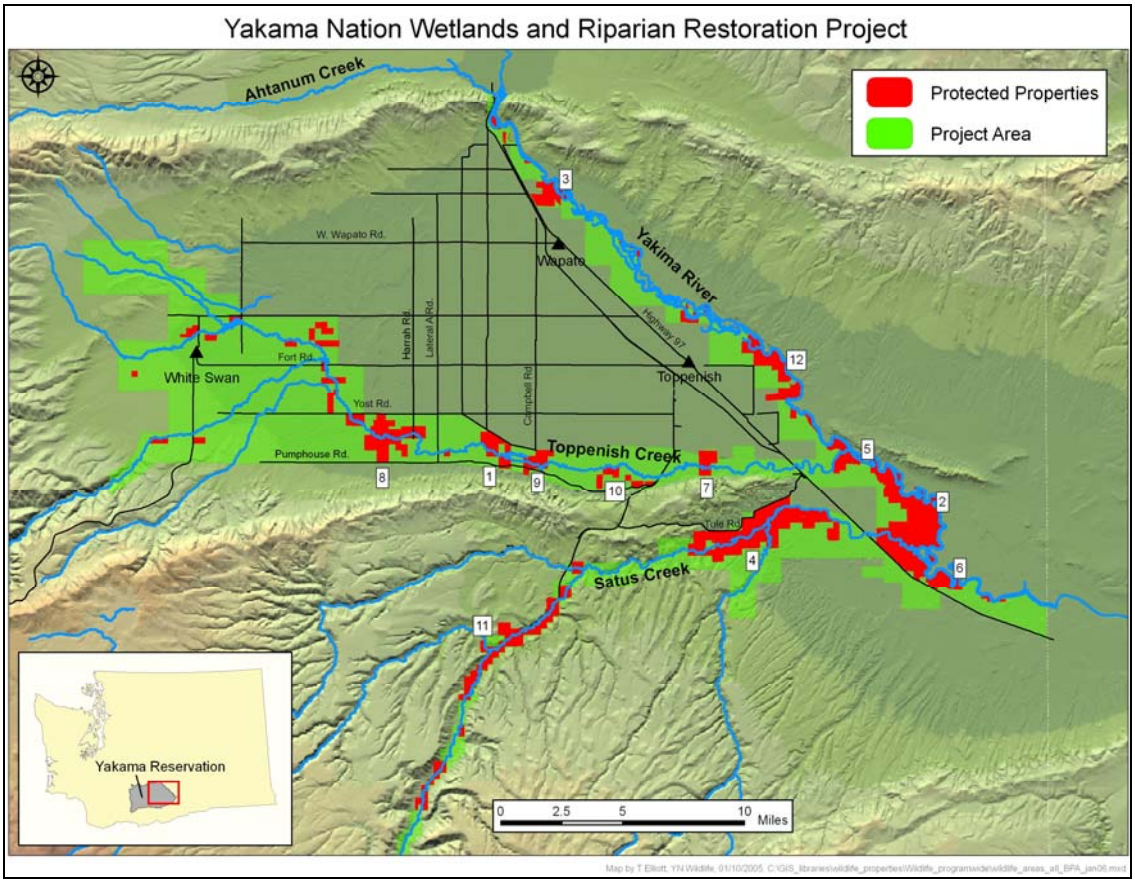

Figure 1. Yakama Nation wetland and riparian habitat mitigation project lands (2006).

Since 1990, over 21,000 acres have been protected under the project. Between 1,000 to 3,000 acres were acquired in most years, including more than 115 miles of steelhead-bearing stream, river and side channels at an average cost of less than $400/acre. In addition to the land, associated irrigation water rights were acquired and allowed to remain in-stream. Water rights for hundreds of acres, including all of the water rights on Satus Creek, have been secured. At the current rate of implementation, 27,000 acres of floodplain habitats should be protected and/or restored by the end of 2012.

No attempt has been made to distinguish the Habitat Units (HU's) protected and restored by BPA-provided funds from those HU's resulting from other funding sources. The Bonneville Power Administration-funded portion of this project includes securing the land, restoration planning, and management/monitoring aspects of this comprehensive effort. Large-scale restoration activities on the secured properties are funded through extensive partnerships.

Project Area

Location

The 50,308 acre project area (Bich et al. 1991) is located along the east slope of the Cascade Mountains within the agricultural valley of the Yakama Reservation and includes the riparian corridors and associated uplands of the Yakima River, Satus Creek, and Toppenish Creek

(Figure 1). As a general location reference point, the confluence of Toppenish Creek and the Yakima River is located at UTM[1] coordinates 10 0718055E, 5133759N (NAD 27).

Cover Types

The cover type section consists of two components. The first component describes general structural conditions and/or floristic characteristics associated with each cover type while the second component identifies specific project sites, cover types, and the number of acres protected each year in a series of tables.

Cover type maps were produced by Yakama Nation Wildlife Department staff using Arcinfo ® GIS software. Cover types were delineated on aerial photographs generally following those described by Bich et al. (1991). Cover type maps located in Attachment 1 are either the original cover type maps generated prior to the HEP surveys, or new cover type maps developed as replacements for "irretrievable" original maps. Although "new" cover type maps may not exactly replicate the original maps, they are included because they are the best alternative to missing and/or inaccurate information. Cover type map source information is also located in Attachment 1.

Map scale varied predicated on project area size and level of detail needed to conduct HEP surveys and the year the maps were produced. Map detail and sophistication generally increased in later years as GIS staff became more familiar with using GIS software and as software programs improved. The Regional HEP Team modified cover type maps based on field observations while Yakama Nation GIS staff corrected field maps as needed.

The project area is comprised of nine macro cover types including riparian shrub, agriculture, riparian forest, riparian herb, sand/gravel/cobble/mud, lacustrine, riverine, emergent wetland, and shrubsteppe/grassland (Bich et al. 1991). Cover type acreage for the project area is compared to the number of acres currently protected in Table 1. Cover types are also described briefly in the following section.

Table 1. Comparisons of extant project area cover type acres and protected acres.

Cover Type	Potential Acres[2]	Protected Acres[3]
Riparian shrub	3,096.00	2,184.80
Agriculture	14,963.00	2,296.90
Riparian forest	2,064.00	2,253.60
Riparian herb	3,096.00	1,666.24
Sand/gravel/cobble/mud	258.00	259.50
Lacustrine[4]	516.00	337.30

[1] Universal Transverse Mercator coordinates
[2] The total number of acres within the 50,308-acre project area depicted in Figure 1.
[3] The number of acres acquired/protected as of November 2006.

Riverine	1,032.00	299.80
Emergent wetland	1,548.00	756.50
Shrubsteppe/grassland	23,735.00	11,558.06
TOTAL	**50,308.00**	**21,612.70**

Riparian Shrub

The riparian shrub cover type occurs on relatively moist sites characterized by deciduous shrubs such as wild rose (*Rosa woodsii*), willow (*Salix* spp.), chokecherry (*Prunus virginiana*), sumac (*Rhus glabra*), blue elderberry (*Sambucus cerulea*), Douglas hawthorne (*Crataegus douglasii*), poison ivy (*Rhus radicans*), and Russian olive (*Elaeagnus angustifolia*) (Bich et al. 1991, P. Ashley, unpublished data). As illustrated in Figure 2, this cover type often serves as a narrow ecotone and is extremely valuable to wildlife providing cover and forage such as fruits and berries.

The riparian shrub cover type occurs along both the Toppenish Creek and Yakima River corridors and may be complex (multi canopy) or simple (P. Ashley, unpublished data). Complex shrub communities generally occur on sites not dominated by Russian olive or disturbed by livestock grazing/fire.

Figure 2. Riparian shrub cover type ecotone example.

Agriculture

The agriculture cover type occurs throughout the proposed mitigation study area and is characterized by crops such as corn (*Zea mays*), wheat (*Triticum aestivum*), alfalfa (*Medicago*

[4] Includes "open water".

sativa), mint (*Mentha* spp.), hops (*Humulus lupinus*), grapes (*Vitis* spp.), asparagus (*Asparagus officinalis*), and pasture (YSPB 2004). Croplands undergo extensive seasonal modification through intensive agricultural practices such as cultivation and irrigation, and thus experience large seasonal variation in vegetation structure and habitat quality (Bich et al. 1991).

Over a period of 6 months or less, vegetative cover may vary from 0% to >90% with a canopy height varying from less than an inch to over six feet. Likewise, the value of these sites to wildlife may vary over a similarly short period from virtually no value to extremely high value as critical forage and/or cover areas (Bich et al. 1991). Pasturelands range from sites infested with noxious weeds (Figure 3) to managed irrigated pasture comprised of introduced grass species (P. Ashley and T. Hames pers. comm.).

Figure 3. Pastureland infested with introduced knapweed.

Riparian Forest

The riparian forest cover type occurs near ponds, lakes, or streams, and is characterized by black cottonwood (*Populus trichocarpa*), and willow trees. Introduced tree species that may also occur in riparian corridors include various fruit trees, maple (*Acer* spp.), elm (*Ulmus* spp.), locust (*Robinia* spp.), and Russian olive (P. Ashley, unpublished data). This cover type often grades into riparian shrub communities and like riparian shrub communities, often provides a boundary between upland and aquatic ecosystems (Bich et al. 1991).

The riparian forest cover type provides extremely valuable cover and foraging habitat for a variety of wildlife species from passerine birds to large mammals such as deer (*Odocoileus* spp.)

and black bears (*Ursus americanus*). It contains high quality nesting habitat for wood ducks (*Aix sponsa*), Canada geese (*Branta canadensis*), great blue herons (*Ardea herodias*), and black-crowned night herons (*Nycticiorax nycticorax*). Due to the multi-layered canopy, this cover type may provide the most diverse vegetative structure of all cover types evaluated (Bich et al. 1991). The riparian forest cover type occurs primarily along the Yakima River corridor (Figure 4).

Figure 4. Riparian forest cover type adjacent to the Yakima River.

Riparian forest corridors provide recreational opportunities, improve water quality for fish and associated wildlife populations (YSPB 2004), and are culturally significant to the Yakama Nation (T. Hames, pers. comm.).

Riparian Herb

The riparian herb cover type occurs on relatively moist sites, often in close proximity to standing water. This cover type is typically dominated by a variety of mesic forbs and/or graminoids such as native sedge *(Carex spp.),* rush *(Juncus spp.), and* saltgrass *(Distichlis stricta)*. Numerous noxious weeds and non-native plant species including reed canarygrass (*Phalaris arundinacea*) and Russian olive dominate and/or persist on a number of wet meadow sites as illustrated in Figure 5 (P. Ashley, unpublished data).

Though often having the appearance of an upland cover type, plants associated with these mesic sites are often hydrophytic and typically do not desiccate as rapidly as plants in upland areas. This extended period of active growth and plant succulence makes the riparian herb cover type valuable wildlife habitat. These sites typically are important foraging areas for wildlife species

such as waterfowl, shorebirds, and aquatic mammals (Bich et al. 1991) and are culturally significant to the Yakama Nation (T. Hames, pers. comm.).

Figure 5. Riparian herb wetland dominated by reed canarygrass.

Sand/Gravel/Cobble/Mud

The sand/gravel/cobble/mud cover type occurs adjacent to riverine and lacustrine cover types primarily along the Yakima River and to a limited extent along Toppenish Creek. This cover type is characterized by fine to coarse substrates that are typically sparsely vegetated as illustrated in Figure 6. Shorebirds forage and nest on these sites while waterfowl loaf in this cover type (Bich et al. 1991).

Lacustrine and Riverine

The lacustrine and riverine cover types are recognized by water flow characteristics. If water flow is not evident as in lakes and ponds, the system is lacustrine (Figure 7). Conversely, if water is flowing like in streams, rivers, irrigation canals, and drains, the system is classified riverine (Figure 6). Although these cover types are differentiated only by water flow characteristics, several HEP species' models used to evaluate these cover types include evaluation of adjacent plant community features (Bich et al. 1991).

Figure 6. An example of sand/gravel/cobble/mud and riverine cover types on the Yakima River.

Figure 7. Lacustrine cover type example.

Emergent Wetland

The emergent wetland cover type occurs on hydric soils characterized by native emergent and aquatic plant species such as cattail (*Typha latifolia)*, bulrush (*Scirpus spp.)*, wapato (*Sagittaria latifolia*), bur-reed (*Sparganium emersum*), and pondweed (*Potamogeton* spp.). Non-native plant species introduced by former waterfowl gun club members may also be present (T. Hames, pers. comm.). Emergent wetlands may be open as shown in Figure 8, or closed exhibiting little to no open water (Figure 9).

Emergent wetlands provide extremely valuable wildlife habitat such as waterfowl pairing and brood-rearing cover (Bich et al. 1991) and are utilized for cultural activities by the Yakama Nation (T. Hames, pers. comm.). In addition, wetlands provide recreational opportunities for hunters and wildlife enthusiasts alike (YSPB 2004).

Figure 8. An example of an "open" emergent wetland.

Figure 9. A "closed" emergent wetland.

Shrubsteppe/Grassland

This cover type is the most widespread habitat in the mitigation study area. The shrub-steppe/grassland cover type is an aggregate complex that includes the majority of native uplands and idle field plant communities. Historically, flood plain grasslands were dominated by Great Basin wildrye (*Elymus cinereus*), salt grass, and greasewood (*Sarcobatus vermiculatus*). Uplands range from remnant shrubsteppe sites that still support native plant communities to areas comprised almost entirely of introduced vegetation (P. Ashley, unpublished data). Big sagebrush (*Artemisia tridentata*) /bluebunch wheatgrass (*Pseudoroegneria spicatum*) plant communities (Figure 10), idle croplands, pastures, and grasslands (Figure 11) characterize these relatively xeric sites (Bich et al. 1991).

In addition to big sagebrush, native shrub species include green rabbitbrush *(Chrysothamnus viscidiflorus,* stiff sagebrush (*Artemisia rigida*), gray rabbitbrush (*Chrysothamnus nauseosus*), hop sage (*Atriplex spinosa*), greasewood and occasionally currant (*Ribes* sp.). Introduced Russian olive shrubs/trees also occur and may dominate some sites (P. Ashley, unpublished data).

As with most non-farmed areas, upland sites support various amounts of introduced vegetation including knapweed (*Centaurea* spp.), mullein (*Verbascum thapsus*), Russian thistle (*Salsola iberica*), pepperweed (*Lepidium* spp.), and cheatgrass (*Bromus tectorum*) to name a few (P. Ashley, unpublished data). Upland sites were generally used for livestock grazing, wildlife habitat, and tribal cultural activities (YSPB 2004).

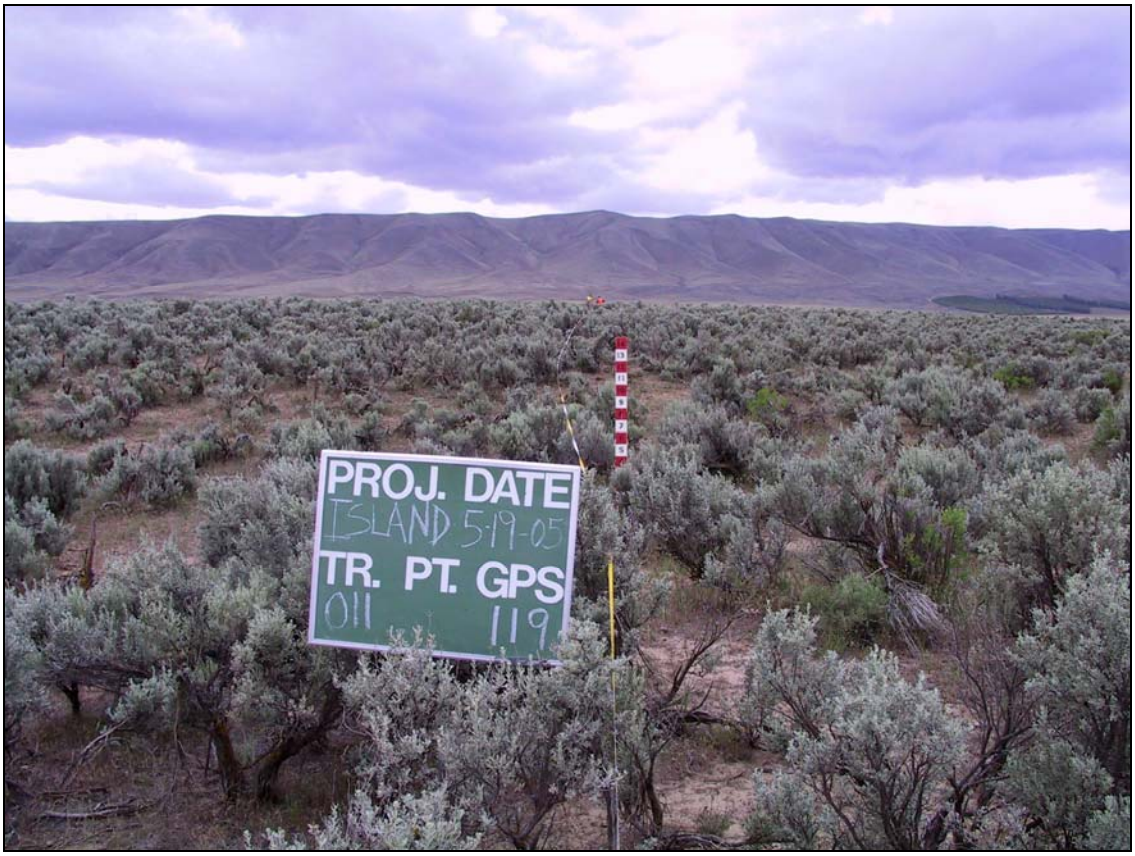

Figure 10. Shrubsteppe cover type dominated by big sagebrush.

Figure 11. Upland grassland site located on the South Lateral A parcel.

Site Specific Cover Types/Acres

Cover types and acres for protected sites are listed in Table 2 through Table 7 for each project year. Cover type acre numbers were obtained from HEP survey files, or from YN Wildlife Department GIS staff. HEP surveys were not conducted in 2000 and 2001. Therefore, tables were not developed for those years.

Table 2. Project site cover types and acres evaluated with HEP in 1999.

PROJECT SITE	Cover Type/Acres										Total Acres
	Riparian Forest	Riparian Shrub	Riparian Herb	Shrubsteppe Grassland	Agricultural	Lacustrine -Lake	Riverine	Open Water	Emergent Wetland	Sand/Gravel/ Cobble/Mud	
Lower Satus Creek	168.00	203.00	31.00	2,252.00	954.00		59.00		6.00	21.00	**3,694.00**
Mosebar Pond	41.00	53.00	109.00	121.00	63.00	21.00			24.00		**432.00**
Satus Creek	493.00	864.00	463.00	1,682.00	216.00		83.00	285.00	214.00	174.00	**4,474.00**
Toppenish Creek	10.00	190.00	66.00	329.00	503.00	1.00	14.00		123.00		**1,236.00**
Wanity Slough		34.00	38.00	270.00	8.00		11.00				**361.00**
Wapato	207.00	51.00	31.00	194.00	223.00	1.00	30.00		3.00	30.00	**770.00**
South Lateral A	4.00	1.00	4.00	257.00	1.00		8.00		139.00		**414.00**
North Satus Creek	106.60	115.70	129.70	256.40	3.70	29.30	43.60		20.60	16.70	**722.30**
TOTAL	**1,029.60**	**1,511.70**	**871.70**	**5,361.40**	**1,971.70**	**52.30**	**248.60**	**285.00**	**529.60**	**241.70**	**12,103.30**

Table 3. Project site cover types and acres evaluated with HEP in 2002.

PROJECT SITE	Cover Type/Acres								Total Acres
	Riparian	Riparian	Riparian	Shrub/Steppe-	Agricultural	Emergent	Riverine	Sand/Gravel/Cobble/Mud	

	Forest	Shrub	Herb	Grassland		Wetland			
Satus Corridor	457.70	224.70	85.10	1,938.80		0.90		10.80	2,718.00
Lawrence II (Gary Lawrence)	9.10		4.50	26.40					40.00
Sunnyside Dam	5.00			13.00			2.00	2.00	22.00
Plank Road		35.00	2.00	67.00	36.00	28.00			168.00
Parker		12.00	11.00	13.00					36.00
Tillman		7.80		71.60					79.00
Dry Creek		10.00	20.00	119.00			6.00	5.00	160.00
Campbell		55.00	21.00	141.00	124.00	4.00	15.00		360.00
Old Goldendale			19.00	116.00		30.00	19.00		184.00
South Barker	1.00		34.00	38.00		2.00			75.00
Lawrence I (Jim Lawrence)	8.00			21.70	30.50		0.60		61.00
TOTAL	480.80	344.50	196.60	2,565.50	190.50	64.90	42.60	17.80	3,903.00

Table 4. Project site cover types and acres evaluated with HEP in 2003.

PROJECT SITE	Cover Type/Acres						Total Acres
	Riparian Forest	Riparian Shrub	Riparian Herb	Emergent Wetland	Shrubsteppe-Grassland	Agricultural	
Meninick North	433.00	50.00	40.00	3.00	526.00		1,052.00
Shuster Road	113.00	146.00	180.00	8.00	150.00	70.00	667.00
TOTAL	546.00	196.00	220.00	11.00	676.00	70.00	1,719.00

Table 5. Project site cover types evaluated with HEP in 2004.

PROJECT SITE	Cover Type/Acres				Total Acres
	Riparian Forest	Rip Shrub/Riverine/Cobble	Riparian Herb/Wetland	Shrubsteppe-Grassland	
Buena	24.00	39.00		94.00	**157.00**
Garcia		1.00		81.00	**82.00**
Lawrence (Lawrence 1 west)	10.20	0.40		70.40	**81.00**
Plank		6.00		679.00	**685.00**
T2126			39.94	54.56	**94.50**
T3669				116.00	**116.00**
T4433			17.90	26.40	**44.30**
T565		8.00	18.00	54.00	**80.00**
T570		3.00	28.00	42.00	**73.00**
TOTAL	**34.20**	**57.40**	**103.84**	**1,217.36**	**1,412.80**

Table 6. Project site cover types and acres evaluated with HEP in 2005.

PROJECT SITE	Cover Type/Acres						Total Acres
	Riparian Forest	Riparian Shrub	Riparian Herb	Emergent Wetland	Shrubsteppe-Grassland	Agricultural	
Meninick	86.00	1.00	1.00	1.00	279.00	61.00	**429.00**
Meninick South	38.00	2.00	2.00	4.00	22.00		**68.00**
South Lateral A[5]		0		0	0		**0**
Island Road		8.00	62.00	2.00	171.00		**243.00**
E 80 Pumphouse	17.00	2.00	48.00	11.00			**78.00**
Lower Satus Creek	22.00	27.00			360.00		**409.00**
TOTAL	**163.00**	**40.00**	**113.00**	**18.00**	**832.00**	**61.00**	**1227.00**

[5] South Lateral A acreage was accounted for in Table 2. This was a repeat HEP analysis.

Table 7. Project site cover types and acres evaluated with HEP in 2006.

PROJECT SITE	Cover Type/Acres							Total Acres
	Riparian Forest	Riparian Shrub	Riparian Herb	Riverine	Emergent Wetland	Shrubsteppe-Grassland	Agriculture	
Bailey			1.10			38.80		39.90
Mill Creek North		3.50	59.90	2.00		92.40	0.80	158.60
Mill Creek South			100.10			65.40		165.50
Olney Drain		9.70		6.60		432.20	2.90	451.40
TOTAL	0.00	13.20	161.10	8.60	0.00	628.80	3.70	815.40

Methods

Habitat Evaluation Procedures

From 1990 through 2006, Habitat Evaluation Procedures (HEP) analyses were conducted on 39 individual parcels located on the Yakama Reservation (P. Ashley and T. Hames, pers. comm.). HEP was utilized to document baseline habitat conditions and to determine how many protection habitat units (HUs) to credit BPA for providing funds to acquire/protect project lands as partial mitigation for habitat losses associated with construction of dams on the lower Columbia River

Prior to 1999, Yakama Nation Wildlife Department biologists estimated the number of habitat units derived from the protection of project sites based on professional judgment and/or ocular HEP evaluations (T. Hames, and P. Ashley pers. comm.). In 1999, the Yakama Nation contracted with Raedeke Associates, Inc. (RAI) to conduct formal HEP evaluations on all project sites acquired from 1990 through 1999. RAI, in conjunction with YN wildlife biologists and others, conducted detailed ocular HEP evaluations on all mitigation sites and documented the results in *Habitat Evaluation Procedures Wildlife Management Areas Yakama Nation, Washington* (K. Raedeke and D. Raedeke 2000).

Similarly, the Regional HEP Team (RHT) and staff from the Yakama Nation Wildlife Department completed HEP evaluations from 2000 through 2006 using robust field transects and a minimum number of ocular surveys. Habitat Evaluation Procedures concepts are summarized in the following paragraphs.

Habitat Evaluation Procedures Summary

HEP, developed by the U.S. Fish and Wildlife Service (USFWS), is used to quantify the impacts of development, protection, and restoration projects/measures on terrestrial and aquatic habitats by assessing changes, both negative and positive, in habitat quality and quantity (USFWS 1980), (USFWS 1980a). HEP is a habitat based approach to impact assessment that documents change through use of a Habitat Suitability Index (HSI). The HSI value is derived from an evaluation of the ability of key habitat components to provide the life requisites of selected wildlife and fish species.

The HSI value is an index to habitat carrying capacity for a specific species or guild of species based on a performance measure (e.g. number of deer per square mile) described in HEP species models. The index ranges from 0.0 to 1.0. A HSI of 0.3 indicates that habitat quality/carrying capacity is marginal while a HSI of 0.7 suggests that habitat quality/carrying capacity is relatively good (Table 8).

Table 8. Habitat suitability index verbal equivalency table.

Habitat Suitability Index	Verbal Equivalent
0.0 < 0.2	Poor
0.2 < 0.4	Marginal
0.4 < 0.6	Fair
0.6 < 0.9	Good
0.9 < 1.0	Optimum

Each increment of change is identical. For example, a change in HSI from 0.1 to 0.2 represents the same magnitude of change as a change from 0.2 to 0.3, and so forth. Habitat variables, suggested mensuration techniques, and mathematical aggregations of assessment results are included in HEP evaluation species models.

Habitat units are determined by multiplying the habitat suitability index by the number of acres of habitat (cover type) protected. For example, if the HSI output for a mule deer HEP model is 0.5 and the amount of acres of shrubsteppe habitat protected is 100, BPA is credited with 50 habitat units (0.5 HSI x 100 acres = 50 HUs).

HEP Model Selection

Yakama Nation HEP model selection was based on the cover type/species matrices found in loss assessments for the lower four Columbia River Dams as shown in Table 9 through Table 12 (Rasmussen and Wright 1990). Unlike state, federal, and other tribal entities, the Yakama Nation did not link specific mitigation acquisitions and leases to individual lower Columbia River Dams. Instead, the YN considered all wildlife habitat losses resulting from construction and subsequent inundation from McNary, John Day, The Dalles, and Bonneville Dams as a single landscape level HU aggregation (T. Hames, pers. comm.).

Table 9. McNary Dam cover type/species matrix.

HEP MODEL	McNARY DAM COVER TYPE/SPECIES MATRIX								
	Rip. Tree	Rip. Shrub	Rip. Herb	Sa/Gr/ Co/Mud[1]	Emergent Wetland	Shrub-steppe/ Grassland	Agricultural	Islands	Open Water - Riverine[2]
California Quail		X	X			X	X		
Canada Goose			X	X		X	X	X	
Mallard			X		X	X	X	X	X
Spotted Sandpiper				X					
Mink	X	X	X	X	X				
Western Meadowlark						X			
Yellow Warbler		X							
Downy Woodpecker	X								
TOTAL	2	3	4	3	2	4	3	2	1

[1] Sand, gravel, cobble, and mud cover type.

[2] The open water cover type (reservoir) also includes 10,955 mallard HU gains (80% of 13,744 HUs). This matrix, however, includes only loss assessment species.

Table 10. John Day Dam cover type species matrix.

HEP MODEL	JOHN DAY DAM COVER TYPE/SPECIES MATRIX								
	Rip. Tree	Rip. Shrub	Rip. Herb	Sa/Gr/ Co/Mud[1]	Emergent Wetland	Shrub-steppe/ Grassland	Agricultural	Islands	Open Water[2]
California Quail						X			
Canada Goose			X				X	X	
Mallard			X		X			X	
Spotted Sandpiper				X					
Mink		X			X				
Western Meadowlark						X			
Black-capped Chickadee	X								
Yellow Warbler		X							
Great Blue Heron				X					
TOTAL	1	2	2	2	2	2	1	2	0

[1] Sand, gravel, cobble, and mud cover type.

[2] The open water cover type includes 7,199 scaup HU gains (50% of 14,398 HUs). HU gains are not included in this matrix.

Table 11. The Dalles Dam cover type/species matrix.

HEP MODEL	THE DALLES DAM COVER TYPE/SPECIES MATRIX					
	Rip. Tree	Rip. Shrub	Sa/Gr/ Co/Mud[1]	Shrub-steppe/ Grassland	Islands	Open Water[2]
Canada Goose					X	
Spotted Sandpiper			X			
Mink	X	X				
Western Meadowlark				X		
Black-capped Chickadee	X					
Yellow Warbler		X				
Great Blue Heron			X			
TOTAL	2	2	2	1	1	0

[1] Sand, gravel, cobble, and mud cover type.

[2] The open water cover type includes 289 scaup HU gains (50% of 578 HUs). HU gains are not included in this matrix.

Table 12. Bonneville Dam cover type species matrix.

HEP MODEL	BONNEVILLE DAM COVER TYPE/SPECIES MATRIX							
	Rip. Tree	Rip. Shrub	Wetlands, Lakes, and Ponds	Sa/Gr/ Co/Mud[1]	Open Water, Reservoir, River[2]	Islands	Conifer-Hardwood Forest	Shrub-steppe/ Grassland[3]
Canada Goose			X	X		X		X
Spotted Sandpiper			X	X				
Mink			X	X	X			
Black-capped Chickadee	X						X	
Yellow Warbler		X						
Great Blue Heron	X		X	X	X			X
TOTAL	2	1	4	4	2	1	1	2

[1] Sand, gravel, cobble, and mud cover type

[2] The open water cover type includes 1,336 scaup HU gains (50% of 2,671 (HUs). HU gains are not included in this matrix.

[3] Includes pasture

The ten HEP models used to evaluate YN wildlife mitigation sites are identified in Table 13 and are the same models found in *The Yakima Indian Nation Wildlife Mitigation Plan for Bonneville, The Dalles, John Day, and McNary Dams* (Bich et al. 1991). Scanned copies of the models are included in Appendix A while model selection rationale and model references are listed in Table 13. Yakama Nation wildlife biologists modified and/or developed several models to meet habitat conditions found on the Yakama Reservation.

Table 13. Yakima Nation HEP species models and selection rationale.

Species	Rationale
California quail (Bich et al. 1991)	A species commonly associated with brushy thickets, riparian shrubs, agricultural lands, and shrub-steppe/grasslands. This game bird feeds mostly on seeds and forbs in open brush and grassland areas.
Canada goose (Bich et al. 1991)	A migratory bird of national significance, sensitive to island nesting habitat and associated shoreline brooding areas. Cultural significance.
Mallard (Bich et al. 1991)	The mallard utilizes a broad range of shrub-steppe/grassland, riparian herb, and island nesting habitats to some degree for nesting. Wetlands are necessary for brood rearing while open water and agricultural areas provide winter rearing and feeding.
Spotted sandpiper (Bich et al. 1991)	A representative of migratory shorebirds which utilizes sparsely vegetated islands, mudflats, shorelines and sand and gravel bars.
Mink (Allen 1986)	Carnivorous furbearer, feeds on a wide range of vertebrates. Uses shoreline and adjacent shallow water habitats. HEP model available. Cultural significance.
Western meadowlark (Bich et al. 1991)	A species common to shrub-steppe/grassland habitat. This bird is well known for its melodious song and feeds primarily on insects and seeds. This model is an adaptation of the Eastern Meadowlark model by Schroeder and Sousa (1982).
Black-capped chickadee (Schroeder 1982)	Representative of species utilizing mature forest canopies and forest cavity nesters. HEP model available.
Yellow warbler (Shroeder and Sousa 1982)	Represents species which reproduce in riparian shrub habitat and make extensive use of adjacent wetlands. HEP model which is sensitive to riparian shrub and wetland habitats. HEP model available.
Great blue heron (Bich et al. 1991)	Carnivore which forages on a variety of vertebrates in shallow water. The sand/gravel/cobble/mud shorelines of the Columbia River reservoirs are commonly used as foraging areas. HEP model available. Cultural significance.
Downy woodpecker (Shroeder 1983)	This woodpecker represents a species which feeds and reproduces in a tree environment. Its diet is primarily insects with some seeds and fruits. The downy woodpecker HEP model was selected to measure the riparian tree cover type. HEP model available.

The YN HEP model/cover type matrix is displayed in Table 14 (Bich et al. 1991).
In most cases, YN project biologists combined all species for individual cover types identified in the four lower Columbia River Dam loss assessments to evaluate each cover type. This resulted in more species used per cover type than were used in HEP analyses for individual dams (Table 15). For example, five species were utilized to evaluate the riparian forest cover type, whereas not more than two species were used to evaluate the same cover type in individual hydro project loss assessments.

Although the Yakama Nation agreed to conduct HEP analyses, the Yakama Nation has maintained that the current wildlife mitigation program will not compensate for habitat/wildlife losses due to hydro development on the lower Columbia River. The Yakama Nation requested that BPA fund the protection and maintenance of up to 27,000 acres of wildlife habitat on the Yakama Reservation in perpetuity. Furthermore, the YN does not consider the habitat unit concept as a legitimate method for determining when BPA has met its wildlife mitigation

obligation. Because of this unique perspective, the YN has elected not to take a position on or be involved in the disbursement of habitat units generated from project lands (T. Hames, pers. comm.). The assignment of habitat unit gains to specific dams in this report were developed by Regional HEP Team staff and are not necessarily endorsed by the Yakama Nation (P. Ashley and T. Hames pers.comm.).

Table 14. Yakama Nation HEP model/cover type matrix.

HEP MODEL	YAKAMA NATION COVER TYPE/SPECIES MATRIX								
	Rip. Forest	Rip. Shrub	Rip. Herb	Riverine	Lacustrine (Open Water)	Sa/Gr/ Co/Mud[1]	Emergent Wetland	Shrub-steppe/ Grassland	Agricultural
California Quail		X	X					X	X
Canada Goose	X[2]		X		X	X		X	
Mallard			X	X	X		X	X	X
Spotted Sandpiper						X			
Mink	X	X		X		X	X		
Western Meadowlark								X	
Black-capped Chickadee	X								
Yellow Warbler		X							
Downy Woodpecker	X								
Great Blue Heron	X			X	X	X		X	
TOTAL	5	3	3	3	3	4	2	5	2

[1] Sand, gravel, cobble, and mud cover type.
[2] Canada goose was used to evaluate the riparian forest (RF) cover type in the 1990 and subsequent HEP analyses , but was not listed for the RF cover type in the 1991 YN Wildlife Mitigation Plan HEP species matrix (Page 17, Table 5).

Table 15. Comparison between HEP model stacking by the YN and what is listed in loss assessments for the lower four Columbia River Dams.

Entity/Hydro Project	YN/LOWER COLUMBIA RIVER HYDRO PROJECT COVER TYPES/NUMBER OF SPECIES PER COVER TYPE SUMMARY										
	Rip.[a] Tree # Species	Rip.[a] Shrub # Species	Rip.[a] Herb # Species	Riverine # Species	Lacustrine Palustrine # Species	Sa/Gr/[b] Co/Mud # Species	Emergent Wetland # Species	Shrub-steppe/ Grassland # Species	Agricultural # Species	Islands # Species	Conifer-Hardwood Forest # Species
Yakama Nation	5	3	3	3	3	4	2	5	2	0	0
McNary Dam	2	3	4	1	0	3	2	4	3	2	0
John Day Dam	1	2	2	0	0	2	2	2	1	2	0
The Dalles Dam	2	2	0	0	0	2	0	1	0	1	0
Bonneville Dam	2	1	0	2	4	4	0	2	0	1	1

[a] Riparian communities

[b] **Sand/Gravel/Cobble/Mud**

[c] **Includes pasture**

Sampling Design and Measurement Protocols

Three HEP "methods" have been employed since 1990 to quantify habitat unit gains generated on Yakama Nation mitigation project sites. Methods include the Yakama HEP study method (T. Hames, pers. comm.), the Delphi method (K. Raedeke and D. Raedeke 2000), and the Transect method (P. Ashley, pers.comm.). Raedeke and Raedeke (2000) described the Yakama Nation and Delphi techniques in detail and compared the results of the all three methods (Attachment 2).

Raedeke and Raedeke (2000) concluded that the Yakama, Delphi, and Transect methods produced similar results with experienced field staff. Raedeke and Raedeke (2000) further stated that more area could be evaluated in a given amount of time with less individual training using the Yakama and Delphi techniques when compared to the Transect method.

Even though the methods produced similar results, the Delphi method was largely subjective lacking objective, quantifiable data and may be difficult to compare to future estimates as field participants change over time (P. Ashley, pers. comm.). Raedeke and Raedeke (2000) argued, however, that the lack of repeatability may be somewhat compensated for by the increased sample size possible with the Delphi method considering like temporal constraints for all methods. Due to the subjective nature of this method, the Delphi technique was rejected as a monitoring tool for this project (T. Hames, pers. comm.).

Yakama Method

The Yakama method did not require direct measurement of field variables. Instead, Yakama wildlife department staff, with assistance from other participants, estimated model variable scores through group consensus during visits to representative sample sites in each management area and cover type (T. Hames and P. Ashley, pers. comm.). The parameter values for each species model were estimated species by species at each sample plot (HEP models and model stacking for each cover type followed Bich et al. [1991] as shown in Table 14). The estimated (ocular) habitat variable scores were used to calculate HEP model habitat suitability indices and associated habitat units (K. Raedeke and D. Raedeke 2000).

Delphi Method

The Delphi technique, developed to provide a quick, cost effective method to rate habitat quality, relied on verbal interpretation of HEP models, reference material, and professional experience to describe ideal and intermediate habitat conditions for individual wildlife species (K. Raedeke and D. Raedeke 2000). Similar to the Yakama method, the Delphi technique relied on ocular estimation of habitat quality. In contrast, this method provides a comprehensive model HSI score rather than ratings for individual HEP model variable suitability indices (SI).

HEP teams comprised of three to five individuals were assigned cover types/locations to sample. At each sample plot, the HEP team would review the word models for each species, discuss habitat conditions observed at the site, and then assign a HSI score. The HSI scores for each species were recorded on a data sheet that included all information that was to be recorded at each plot (see K. Raedeke and D. Raedeke 2000 for further detail).

Transect Method

In most cases, the Regional HEP team used measurement techniques and protocols described in HEP models to evaluate habitat variables; however, the Yakama Method was used when direct measurements could not be taken. Measured techniques were occasionally modified to meet unique habitat and/or physiographic conditions. Metrics generally followed those described by Hays et al. (1981) and/or Avery (1994).

Stratified (by cover type), random transects were established and documented using global positioning system (GPS) coordinates and, in many cases, rebar stakes. Ashley (2006) described the methods and protocols used by Regional HEP Team staff to collect HEP model variable data and additional floristic information (Appendix B). Collected field data was summarized and applied to HEP model variables to determine habitat suitability for each HEP species model and subsequent habitat units. Field data collection and processing procedures are illustrated in Figure 12 and summarized as follows.

HEP model variable field data was entered onto Allegro CE® data logger spreadsheets (1), or recorded on paper data sheets (2). The raw field data (3) was downloaded from the data loggers or manually entered from paper data sheets onto computers (transect photos were also downloaded and stored on field computers). The raw data and photos were compiled for each transect into three basic products/files (4) that are provided to project managers as report appendices and/or separate CD files.

Product files included raw field data downloaded from the data loggers (5), data summary spreadsheets (6) which are the results of compiling/processing the raw data, and transect photo files (7). Summarized/processed data from each transect was applied to appropriate HEP model variables to determine suitability index (SI) ratings that were combined on habitat suitability index (HSI) spreadsheets (8) to determine the HSI for a particular HEP species model/cover type. The habitat suitability index was then multiplied by the number of cover type acres to determine the number of habitat units (9).

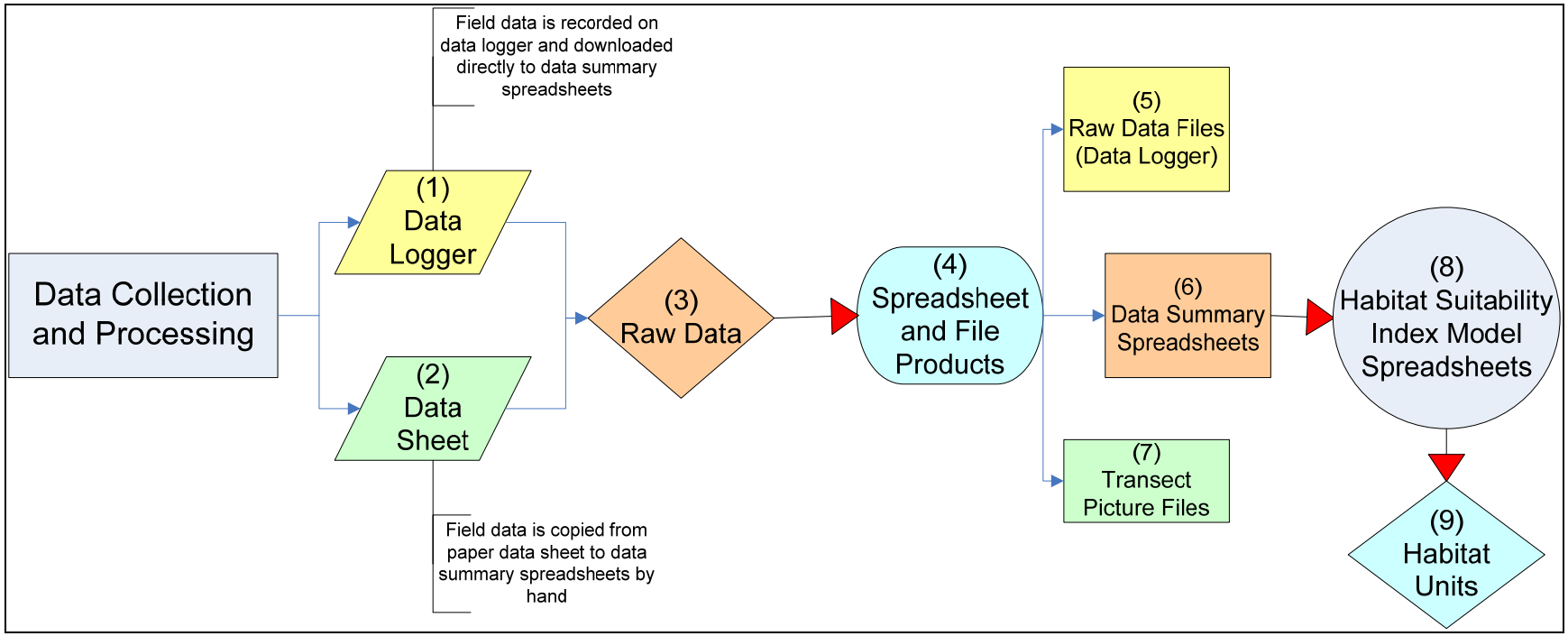

Figure 12. Transect method HEP data collection and processing flow chart.

Transect Locations

Transect locations were determined differently for each HEP method. The Yakama and Delphi techniques relied heavily on best professional judgment to select evaluation sites, whereas the Transect method relied on a proportional allocation strategy (Husch et al. 2003) to determine transect start points.

Specific transect point location coordinates are not available for transects established prior to 1999. Transect point coordinates were recorded in 1999 (Raedeke and Raedeke 2000) and documented for years 2002, 2003, 2004, 2005, and 2006 (P. Ashley, pers.comm.).

Yakama Method

Hames (pers. comm.) stated that the pre-project Yakama HEP (early 1990s) evaluations were designed to provide project managers and BPA with a sense of the habitat potential of the project area rather than a definitive number of habitat units to credit BPA. The following criteria were the key determinants in deciding where to locate evaluation plots.

1. Was a specific location representative of the cover type in question?
2. Was the site easily accessible?

HEP evaluators relied on their best professional judgment to locate evaluation sites and estimate habitat quality. Specific evaluation site locations are documented in YN Wildlife Department archives (T. Hames, pers. comm.).

Delphi Method

Raedeke and Raedeke (2000) indicated that prior to field sampling, HEP staff reviewed aerial photographs, cover type maps, and estimated numbers of samples needed for each area. They then marked candidate sample locations on both the aerial and cover type maps based primarily on whether sample plot locations were reasonably accessible by foot from access roads.

The number of samples in each cover type and in each management area was entered on a tally sheet at the end of each field day and candidate sample sites for the following day were then selected based on the anticipated size of the field crew. Sample site locations were numbered to correspond to latitude/longitude coordinates and are included in Raedeke and Raedeke (2000).

Transect Method

Transect initial points (IPs) were established based on stratified random sampling protocols with cover types defining the strata. In addition, the number of samples initially allocated per cover type strata were determined based on a proportional allocation strategy (Husch et al. 2003). Specific IP locations were identified by overlaying a 100m x 100m grid over cover types and selecting random numbers to identify "XY" point coordinates (P. Ashley, pers. comm.).

The proportional allocation strategy was modified in the field as needed to compensate for the relative homogeneity of a particular cover type, or to account for unanticipated access issues and/or physiographic restrictions. In addition, initial points were moved when they did not fall within the cover type(s) of interest, or were in inaccessible areas such as the middle of a pond or dense grove of Russian olive trees (additional transect information is located in Appendix B).

Transect UTM coordinates (NAD 27) for start, turn, and end points were recorded in the field on a Garmin IIIA ® GPS unit. IP/transect UTM coordinates, transect magnetic azimuths, transect

length information is listed in Appendix C while transect coordinate maps from 2002 through 2006 are included in Attachment 1 (as with all other maps, transect coordinate maps were developed by Tom Elliot – Yakama Nation Wildlife Department).

Transect Photo Documentation

Transects were photographed in 2002, 2003, 2004, 2005, and 2006 with a Canon G1® 3.3 mega pixal digital camera (with and without magnification). Transect photographs recorded in 2003, 2004, 2005, and 2006 are included in Attachment 3 (2002 transect photographs were not available for inclusion into this document).

Photo Methods

Photo points were established at the start point of each transect to document extant habitat conditions. Digital photographs were recorded from a height of three feet at the beginning of each transect facing the same direction as the transect azimuth. A transect reference board (included transect number, project name, date, GPS reference number) was placed at the 15 foot interval while a cover board was placed at the 30 foot mark on each transect. Occasionally, panoramic photographs were also recorded e.g., dense vegetation, linear/narrow cover types. An example of a photo documentation point is illustrated in Figure 13.

Figure 13. Photo point example.

Results

From 1990 through 2006, acquisition/protection of 21,631.10 acres of wildlife habitat on the Yakama Reservation yielded 33,860.18 habitat units for a habitat unit to acre ratio of 1.57:1.

Habitat unit gains resulting from the Yakama Nation's Wetlands and Riparian Restoration Project are summarized by target species for all four lower Columbia River Dams in Table 16 and for individual hydro projects in Table 17 through Table 20. Habitat unit gains for each applicable project year are located in Appendix D while mitigation site habitat units for each cover type are displayed in Appendix E.

Table 16. Combined habitat unit gains for McNary, John Day, The Dalles, and Bonneville Dams.

Project/Tract	YAKAMA NATION HABITAT UNIT GAINS FOR McNARY, JOHN DAY, THE DALLES, AND BONNEVILLE DAMS											Project Acres	HUs Per Acre
	Canada Goose	Mink	B.C. Chickadee	G.B. Heron	Cal. Quail	Yellow Warbler	Western Meadowlark	Mallard	Spotted Sandpiper	Downy Woodpecker	Total		
Total	7,325.55	2,549.98	656.43	165.33	12,838.77	1,150.82	2,995.20	5,034.51	171.86	971.73	33,860.18	21,631.10	1.57

Table 17. McNary Dam habitat unit gains.

Hydro Project	MCNARY HABITAT UNIT GAINS										
	Canada Goose	Mink	Downy Woodpecker	Cal. Quail	Yellow Warbler	Western Meadowlark	Mallard	Spotted Sandpiper	Total	Project Acres	HUs per Acre
McNary											
	6,613.58	1,502.88	971.73	9,292.93	849.90	969.10	4,081.26	164.10	24,445.48	12,123.30	2.02

Table 18. John Day Dam habitat unit gains.

Project/Tract	JOHN DAY HABITAT UNIT GAINS										Project Acres	HUs Per Acre
	Canada Goose	Mink	B.C. Chickadee	G.B. Heron	Cal. Quail	Yellow Warbler	Western Meadowlark	Mallard	Spotted Sandpiper	Total		
John Day												
Total	711.97	890.79	500.77	151.90	3,545.84	300.92	2,026.10	953.25	7.76	9,089.30	9,507.80	0.95

Table 19. The Dalles Dam habitat unit gains.

Hydro Project	THE DALLES HABITAT UNIT GAINS								Project Acres[1]	HUs Per Acre[1]
	Canada Goose	Mink	B.C. Chickadee	G.B. Heron	Yellow Warbler	Western Meadowlark	Spotted Sandpiper	Total		
The Dalles										
Total	0.00	140.66	146.60	0.00	0.00	0.00	0.00	287.26		#DIV/0!

Table 20. Bonneville Dam habitat unit gains.

Hydro Project	BONNEVILLE HABITAT UNITS GAINS							Project Acres[1]	HUs Per Acre[1]
	Canada Goose	Mink	B.C. Chickadee	G.B. Heron	Yellow Warbler	Spotted Sandpiper	Total		
Bonneville									
Total	0.00	15.65	9.06	13.43	0.00	0.00	38.14		

[1] Project acres/HUs per acre are calculated only if hydro project is the primary credited facility.

Discussion

Acquiring/protecting wildlife habitat and determining the types and numbers of habitat units to credit BPA is a challenge for all mitigation project managers/entities. Although individual loss assessments provide the framework for mitigating habitat losses by listing specific cover types, HEP model species, and associated numbers of habitat units, acquired/protected wildlife mitigation sites seldom if ever exactly match the cover types and relative number/ratio of HUs described in specific loss assessments.

Although Yakama Nation wildlife biologists used the same HEP species models described in loss assessments for the lower four Columbia River dams, they did not select HEP models for individual projects or apply habitat unit stacking based on a specific hydro facility's loss assessment matrix as done elsewhere in the Columbia River Basin Region (P. Ashley, pers. comm.). Instead, YN wildlife biologists constructed composite HEP species lists for each cover type based on the HEP species identified in all four lower Columbia River loss assessments (T. Hames, pers. comm.).

For example, four different HEP species models were identified as target species to evaluate the riparian forest (riparian tree) cover type in the original loss assessments for the lower four Columbia River dams (Rasmussen and Wright 1990). Only one or two species models, however, were chosen to represent this cover type in any given hydro project loss assessment (review Tables 9 through 12).

Rather than use one or two species to evaluate the riparian forest cover type as described within individual loss assessments, Yakama Nation wildlife biologists selected all four target HEP model species and added a fifth model (blue heron) to evaluate the riparian forest cover type (Table 14). As a result, the number of habitat units initially reported to BPA was excessive relative to the amount required to meet habitat unit stacking described in specific hydro project loss assessments.

YN wildlife biologists also elected not to provide BPA input regarding how to distribute HU gains, generated on specific mitigation sites, against HU losses at individual dams (T. Hames, pers. comm.). BPA responded by applying all HU gains to individual lower Columbia River hydro projects using all HU data provided by Yakama Nation wildlife biologists (J. DeHerrera, pers. comm.).

Regional HEP Team staff was tasked with reconciling YN HEP survey data with how other state, federal, and tribal entities credited BPA for acquisition and protection of wildlife mitigation lands across the Columbia Basin. To accomplish this task in a consistent and equitable manner, RHT staff assigned each YN mitigation project site to a "primary"[6] hydro facility and credited HUs generated from that specific project site based on species "stacking" identified in the loss assessment of the assigned "primary" hydro facility. This resulted in a reduction in the number of species used to credit some individual cover types/mitigation sites

[6] A "primary" hydro facility refers to the specific hydro project and loss assessment used to guide habitat unit stacking for each mitigation project site.

while increasing the number of species applied to others (P. Ashley, pers. comm.).

HUs associated with cover types and/or HEP species models different from those identified in primary facility loss assessments were assigned to a "secondary" [7] credited facility (P. Ashley, pers. comm.). An example of how crediting was applied for each project year at primary and associated secondary hydro facilities is shown in Table 21 and Table 22 respectively.

[7] A "secondary" credited facility refers to the specific hydro project credited with HUs generated from cover types not included in the "primary" loss assessment.

Table 21. An example of habitat unit crediting at a "primary" hydro facility.

Hydro Project	Project/Tract	MCNARY HABITAT UNITS GAINS										
		Canada Goose	Mink	Downy Woodpecker	Cal. Quail	Yellow Warbler	Western Meadowlark	Mallard	Spotted Sandpiper	Total	Project Acres	HUs per Acre
McNary	Yakama Nation											
Year-1999	Lower Satus	2,564.00	140.10	168.00	3,440.00	91.00	338.00	1,859.75	15.00	**8,615.85**	**3,694.00**	**2.33**
	Mosebar Pond	211.00	74.90	28.00	325.00	21.00	27.00	103.50	0.00	**790.40**	**432.00**	**1.83**
	Satus	2,032.00	758.30	261.00	3,186.00	518.00	301.00	1,054.75	122.00	**8,233.05**	**4,474.00**	**1.84**
	Toppenish Creek	521.00	263.60	8.00	974.00	152.00	36.00	442.00	0.00	**2,396.60**	**1,236.00**	**1.94**
	Wanity Slough	305.00	25.80	0.00	350.00	15.00	41.00	156.75	0.00	**893.55**	**361.00**	**2.48**
	Wapato	349.00	56.10	104.00	499.00	26.00	68.00	213.50	21.00	**1,336.60**	**770.00**	**1.74**
	Zimmerman (S. Lat. A)	237.00	73.40	3.00	237.00	1.00	44.00	86.50	0.00	**681.90**	**434.00**	**1.57**
	North Satus	394.58	110.68	53.30	281.93	25.90	114.10	164.51	6.10	**1,151.10**	**722.30**	**1.59**
	Subtotal	**6,613.58**	**1,502.88**	**625.30**	**9,292.93**	**849.90**	**969.10**	**4,081.26**	**164.10**	**24,099.05**	**12,123.30**	**1.99**

Table 22. An example of HU crediting at an associated "secondary" hydro facility.

Hydro Project	Project/Tract	JOHN DAY HABITAT UNITS LOSSES/GAINS										Project Acres[1]	HUs Per Acre[1]
		Canada Goose	Mink	B.C. Chickadee	G.B. Heron	California Quail	Yellow Warbler	Western Meadowlark	Mallard	Spotted Sandpiper	Total		
John Day	**Yakama Nation**												
Year - 1999	**Lower Satus**	0.00	0.00	0.00	21.00	0.00	0.00	0.00	0.00	0.00	**21.00**		**#DIV/0!**
	Satus	0.00	0.00	0.00	96.00	0.00	0.00	0.00	0.00	0.00	**96.00**		**#DIV/0!**
	Wapato	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	**15.00**		**#DIV/0!**
	North Satus	0.00	0.00	0.00	14.80	0.00	0.00	0.00	0.00	0.00	**14.80**		**#DIV/0!**
	Subtotal	**0.00**	**0.00**	**0.00**	**146.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**146.80**		

[1] Project acres/HUs per acre are calculated only if hydro project is the primary credited facility.

Conclusion

To date, YN wildlife mitigation projects account for the largest share (72%) of habitat unit gains associated with lower Columbia River wildlife mitigation. The number of habitat unit gains credited against lower Columbia River dams by the Washington Department of Fish and Wildlife (WDFW), Umatilla Tribe, Steigerwald National Wildlife Refuge, and Yakama Nation are summarized in Table 23 and listed for individual hydro projects in Table 24 through Table 27.

Table 23. The number of habitat units credited against lower Columbia River dams.

Entity	WDFW	Umatilla Tribe	Steigerwald NWR	Yakama Nation	Total HUs
HUs	11,166.00	1,729.00	201.00	33,860.18	46,956.18
Percent	23.78%	3.68%	0.43%	72.11%	100.00%

While several HEP species identified in lower Columbia River hydro project loss assessments have not been fully mitigated, the total number of habitat units gained through BPA funded mitigation projects exceed the number lost by more than 2,500 habitat units (Table 28). As a result, BPA proposes that lower Columbia River wildlife mitigation (Washington State) is complete; due largely to the success of the Yakama Nation's wildlife mitigation program (J. DeHerrera, pers. comm.).

This report describes a consistent approach regarding the distribution and crediting of habitat units generated by Yakama Nation wildlife mitigation projects. Bonneville Power Administration and/or the Yakama Nation, however, could elect to develop/adopt another crediting method.

Although not specifically addressed in this report-by not resolving over/under crediting of individual species associated with lower Columbia River hydro projects (Table 28), the Yakama Nation and other wildlife management entities could lose opportunities to acquire/protect additional critical habitat. The following six suggestions could be used as listed or combined to possibly resolve crediting issues relative to lower Columbia River wildlife mitigation and elsewhere if adopted:

1. Leave as is - do nothing.
2. Apply lower Columbia River habitat unit overages against lower Columbia River non-mitigated HUs i.e., the "HU is a HU" concept.
3. Apply over-mitigated HUs against undefined "operational" losses.
4. Credit a portion of lower Columbia River HU gains against Lower Snake River losses.
5. Credit Washington State lower Columbia River HU gains against Oregon State lower Columbia River HU losses. This precedent has already been established. Habitat unit gains have already been moved from one area to another and/or credited across state boundaries e. g., credited out of state/off reservation (Umatilla Tribe's Rainwater Project), credited beyond ceded boundaries (Burns-Paiute Tribe's Denny Jones Project), credited beyond sub-basin/hydro project boundaries (WDFW's Schlee acquisition and Oregon Willamette Valley mitigation sites).

6. Mitigation Banking – Rather than lose opportunities to acquire/protect valuable wildlife habitat because of crediting issues, BPA could elect to deposit habitat units resulting from over-mitigation, out of kind HUs, etc., into a mitigation bank for future mitigation. These habitat units could be utilized to offset habitat losses resulting from hydro facility operations, wind power generation, and power-line transmission corridors. This would allow, *through coordination with BPA, wildlife managers, and the Council*, project proponents to acquire/protect critical core habitats, key habitat links, etc., as opportunities arise without being stymied by crediting issues.

Table 24. Habitat unit summary for McNary Dam[8].

Project/Tract	McNARY HABITAT UNITS LOSSES/GAINS								
	Canada Goose	Mink	Downy Woodpecker	Cal. Quail	Yellow Warbler	Western Meadowlark	Mallard	Spotted Sandpiper	Total
	2,787.00	**1,000.00**	**301.00**	**5,051.00**	**263.00**	**2,775.00**	**5,567.00**	**1,090.00**	**18,834.00**
WDFW									
Desert WA	0.00	0.00	0.00	0.00	0.00	155.00	388.00	0.00	**543.00**
Sunnyside WA	106.00	411.00	88.00	687.00	125.00	576.00	603.00	0.00	**2,596.00**
Wenas WA	0.00	17.00	0.00	2,000.00	0.00	400.00	0.00	0.00	**2,417.00**
Umatilla Tribe									
Rainwater Ranch	0.00	447.00	1,100.00	0.00	28.00	154.00	0.00	0.00	**1,729.00**
Remaining HUs	**2,681.00**	**125.00**	**(887.00)**	**2,364.00**	**110.00**	**1,490.00**	**4,576.00**	**1,090.00**	**11,549.00**
Yakama Nation	**6,613.58**	**1,502.88**	**971.73**	**9,292.93**	**849.90**	**969.10**	**4,081.26**	**164.10**	**24,445.48**
Remaining HUs	**(3,932.58)**	**(1,377.88)**	**(1,858.73)**	**(6,928.93)**	**(739.90)**	**520.90**	**494.74**	**925.90**	**(12,896.48)**

Table 25. Habitat unit summary for John Day Dam[8].

Project/Tract	JOHN DAY HABITAT UNITS LOSSES/GAINS

[8] Bracketed numbers in red font indicate the number of habitat unit gains that exceed HU losses.

	Canada Goose	Mink	B.C. Chickadee	G.B. Heron	Cal. Quail	Yellow Warbler	Western Meadowlark	Mallard	Spotted Sandpiper	Total
	4,005.00	**719.00**	**435.00**	**1,593.00**	**3,162.00**	**543.00**	**2,530.00**	**3,700.00**	**1,593.00**	**18,280.00**
WDFW										
Desert WA	0.00	193.00	0.00	0.00	0.00	0.00	0.00	224.00	0.00	**417.00**
Sunnyside WA	0.00	0.00	48.00	120.00	0.00	117.00	0.00	0.00	0.00	**285.00**
Shillapoo WA	52.00	0.00	5.00	0.00	0.00	11.00	116.00	279.00	0.00	**463.00**
Wenas	0.00	84.00	189.00	0.00	1,400.00	0.00	1,000.00	0.00	0.00	**2,673.00**
Remaining HUs	**3,953.00**	**442.00**	**193.00**	**1,473.00**	**1,762.00**	**415.00**	**1,414.00**	**3,197.00**	**1,593.00**	**14,442.00**
Yakama Nation	**711.97**	**890.79**	**500.77**	**151.9**	**3,545.84**	**300.92**	**2,026.10**	**953.25**	**7.76**	**9,089.30**
Remaining HUs	**3,241.03**	**(448.79)**	**(307.77)**	**1,321.10**	**(1,783.84)**	**114.08**	**(612.10)**	**2,243.75**	**1,585.24**	**5,352.70**

Table 26. Habitat unit summary for The Dalles Dam[8].

Project/Tract	THE DALLES HABITAT UNITS LOSSES/GAINS							
	Canada Goose	Mink	B.C. Chickadee	G.B. Heron	Yellow Warbler	Western Meadowlark	Spotted Sandpiper	Total
	220.00	**165.00**	**91.00**	**213.00**	**85.00**	**124.00**	**267.00**	**1,165.00**
WDFW								
Desert WA	0.00	33.00	0.00	0.00	0.00	0.00	0.00	**33.00**
Shillapoo WA	103.00	1.00	13.00	0.00	40.00	58.00	0.00	**215.00**
Remaining HUs	**117.00**	**131.00**	**78.00**	**213.00**	**45.00**	**66.00**	**267.00**	**917.00**
Yakama Nation	**0.00**	**140.66**	**146.60**	**0.00**	**0.00**	**0.00**	**0.00**	**287.26**
Remaining HUs	**117.00**	**(9.66)**	**(68.60)**	**213.00**	**45.00**	**66.00**	**267.00**	**629.74**

Table 27. Habitat unit summary for Bonneville Dam.

Project/Tract	BONNEVILLE HABITAT UNITS LOSSES/GAINS						
	Canada Goose	Mink	B.C. Chickadee	G.B. Heron	Yellow Warbler	Spotted Sandpiper	Total

	1,222.00	**811.00**	**511.00**	**2,150.00**	**82.00**	**1,383.00**	**6,159.00**
Steigerwald NWR							
Bliss	1.00	1.00	5.00	1.00	0.00	0.00	8.00
Burlington Northern	3.00	2.00	7.00	6.00	0.00	0.00	18.00
James	17.00	3.00	3.00	33.00	0.00	0.00	56.00
Straub	33.00	7.00	12.00	66.00	1.00	0.00	119.00
WDFW							
Shillapoo	574.00	381.00	240.00	290.00	39.00	0.00	1,524.00
Remaining HUs	**595.00**	**418.00**	**249.00**	**1,755.00**	**42.00**	**1,383.00**	**4,442.00**
Yakama Nation	**0.00**	**15.65**	**9.06**	**13.43**	**0.00**	**0.00**	**38.14**
Remaining HUs	**595.00**	**402.35**	**239.94**	**1,741.57**	**42.00**	**1,383.00**	**4,403.86**

Table 28. HEP species models and number of habitat units credited against McNary, John Day, The Dalles, and Bonneville Dams[8].

LOWER COLUMBIA HABITAT UNIT LOSS/GAIN SUMMARY											
HEP Species	**Canada Goose**	**Mink**	**B.C. Chickadee**	**G.B. Heron**	**Cal. Quail**	**Yellow Warbler**	**Western Meadowlark**	**Mallard**	**Spotted Sandpiper**	**Downy Woodpecker**	**Total**
Remaining HUs	**20.45**	**(1,433.98)**	**(136.43)**	**3,275.67**	**(8,712.77)**	**(538.82)**	**(25.20)**	**2,738.49**	**4,161.14**	**(1,858.73)**	**(2,510.18)**

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Appendix D

Ecological Characterization of Yakama Nation Riparian Restoration Sites on the Wapato Floodplain of the Yakima River Basin, Washington
Phase I Final Report Summary

BY

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Introduction

Future land acquisitions by the Yakama Nation within the Wapato floodplain of the Yakima River require the development and implementation of a scientifically based restoration and management plan. This project was initiated with the intention to provide a series of steps or guidelines that could be used by the Yakama Nation Wildlife Resource Management Program to prioritize and monitor restoration efforts on Yakama River and surrounding floodplain reaches on Toppenish and Satus Creeks. The purpose of this study was to conduct a baseline inventory of abiotic, biological and constructed landscape conditions of 53 existing riparian restoration sites comprising the Yakama Nation Wetlands and Riparian Restoration Project (see Appendix Fig. 1; Table 1). This characterization will help Yakama Nation Wildlife identify existing conditions, determine functions and values of resources, and explore opportunities for conservation and restoration of ecological functions within each restoration site.

Crucial to the development of effective riparian and wetland restoration projects is an inventory and assessment of critical physical processes, biological features, and land use alterations. However, conservation planners are often overwhelmed by the sheer mass of information available, confounded by the inconsistent formats and spatial scales of the data, and uncertain of the appropriate analytical approaches to employ. Characterization of ecological restoration sites and development of restoration strategies involve two distinct phases: inventory and assessment. This proposed project seeks to supplement initial Habitat Evaluation Procedure surveys already undertaken by Yakama Nation Wildlife on their restoration sites, and is the next logical step following the ecological monitoring currently being completed by the Geo-Ecology Research Group on two restoration sites on the Yakima River floodplain.

Methodology

Assessment

The information gathered for this project folio was principally mapped and analyzed using a hybrid of the Sensitive Shoreline Assessment (SSA) methodology (Gabriel et al. 2001; Hu et al. 2003), which was developed to designate lake shorelines in Wisconsin, and functional, checklist-based approaches such as the Bureau of Land Management's Proper Functioning Condition (PFC) assessment methodology (USDI 1999). SSA combines use of rapid assessment criteria and the ABC method, a spatial overlay technique which incorporates **Abiotic** (e.g. hydrology/geomorphology), **Biotic** (e.g. flora and fauna), and **Constructed landscape** information (e.g. land uses) to identify areas of environmental significance (essential to maintaining ecological processes) as well as environmental constraints (biophysical stresses, risks and sensitivity). The PFC method provides a qualitative, checklist-based method to assess the condition of riparian wetland areas, including interactions between hydrology, vegetation, and erosion/deposition attributes and processes. The method focuses on how well physical processes are functioning, distinguishing between the potential (i.e. highest ecological status) and capability (i.e. highest ecological status given political, social, economic constraints/limiting factors).

In this study, we combined the rapid assessment and spatial overlay components of the SSA method with the functional assessment typified by the PFC method and other wetland assessment methods to assess both ecological structure and function in a restoration site inventory. Each site inventory included consideration of the following:

1) ***land use patterns***, including existing structures, transportation and utility facilities, impervious surfaces, and vegetation/shoreline modifications;
2) ***critical areas***, including wetlands, aquifer recharge areas, fish and wildlife conservation areas, geologically hazardous areas, frequently flooded areas;
3) ***degraded and potential restoration sites*** (i.e. functional-at risk and nonfunctional sites)
4) ***areas of special interest***, including priority habitats and hazardous waste sites;
5) ***public access sites***; and
6) ***significant archaeologic, historic, or cultural resources.***

Additional pilot field site assessments were conducted at three restoration sites nominated by the Yakama Nation Wildlife Resource Management Program: North Meninick, Lower Satus Creek, and Wanity Slough. Each restoration site was assessed using a rapid assessment methodology based on the SSA method, with site-specific modifications based on consultation with Yakama Nation Wildlife staff and other conservation area evaluation studies in the literature, including rapid habitat assessment methods developed by agencies in Washington, California, and Wisconsin (e.g. Wisconsin Department of Natural Resources, 1992) (see Appendix, Table 2 for a complete list of sources).

The resulting site assessments included both a field and office component (see Appendix, Table 3). Two user interface forms were created in a Microsoft Access database for entering the Site Assessment Form data into a geodatabase (Fig. 2). Both the Field Site Assessment and Office/GIS Assessment database forms have sections that correspond to the sections of the Site Assessment Form: Hydrology, Water Quality, Habitat and Wildlife Use, Land Use, and Cultural/Historical Significance.

Spatial Overlays

The restoration site inventory and analysis integrated findings in an accessible manner through narrative and associated maps to inform restoration planning decisions and to provide a baseline for adaptive management and cumulative impact assessment. The approach used by this study has been developed to conduct shoreline inventories and analyses in Washington State (Donoghue et al., 2006; Gabriel et al. 2005). The resulting ecological characterization indicates management opportunities for protection of ecological functions and restoration of degraded habitat.

Assessment of the ecological function of each restoration site began with overlaying biological features and critical physical areas, including fish and conservation areas, wetlands, riparian and aquatic vegetation, frequently flooded areas, and geologically hazardous areas, such as areas of slope instability or erosion. Next, possible impacts to ecological functions were determined by overlaying constructed modifications, including structures (e.g. revetments and levees), facilities cutting across the management unit (e.g. roads and bridges), and land uses (e.g. agriculture, impervious surfaces). The results of these overlays are provided in narrative summary and tables for each restoration site, describing existing ecological functions as evidenced by the mapped physical, biological and constructed/modified features. Ecological protection and restoration opportunities may be identified through these narratives and tables, as well as the associated abiotic, biological and constructed modification synthesis map overlays.

The inventory also conducted an ecological characterization of ecosystem-wide processes that are influencing the ecological functions within the restoration site, focusing on upland and adjacent land uses within a mile of each site that affect the flow of water, sediment, nutrients and materials. This characterization used aerial photo interpretation, field assessment data, and existing data to identify management issues and determine the relationship of ecosystem-wide processes to ecological functions at each restoration site.

Principal Data Sources

A number of Yakama Nation, Yakima County, State, and federal agency data sources were reviewed to characterize and assess the ecological function of Yakama Nation riparian and wetland restoration sites. Sources included the following:

Yakama Nation

- Current and historic aerial photography between 1947 and 2005
- Habitat Evaluation Procedure maps
- Yakama Nation road layer
- BIA soils layer
- Maps of water diversion structures

Yakima County

- Geohazards

- Channel migration zones
- Aquic soils developed from Natural Resources Conservation Services Yakima County Soil Survey
- Riparian areas
- Revetments and floodgates

Federal and State

- Washington State Department of Natural Resources. (2000). Digital 1:100,000-scale Geology of Washington.
- United States Department of Agriculture, Natural Resources Conservation Services. (2004). Soil Survey Geographic (SSURGO) Database (used to develop soil erosion, permeability, runoff, characteristic vegetation maps)
- Federal Emergency Management Agency Flood Insurance Program Maps.
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ArcReader Digital Map Portfolio

Over the last 20 years, there has been increasing interest in utilizing multimedia in the form of text, photographs, digital video, sound in a geographic information system (Openshaw and Mounsey, 1987; Rhind et al., 1988; Lewis and Rhind, 1991; Shiffer and Wiggins, 1993; Hughes, 1996; Hu, 1999). Multiple data sources such as maps, aerial photographs, ground photographs, text, digital video and sound can be incorporated in a GIS to help planners and managers better understand the physical environment of the study area and the spatial problems of interest (Hu, 1999; Hu et al. 2003).

To provide final synthesis maps at appropriate viewing scales to inform the analysis report and illustrate findings, we used an electronic map portfolio accessed through ESRI ArcReader, a free, easy-to-use mapping application that allows users to view, explore, and print

maps. ArcReader © is a great way to deliver interactive mapping capabilities that access a wide variety of dynamic geographic information. Using ArcReader ©, anyone can view high-quality maps created using the ArcGIS© software (ESRI 2005).

The electronic map portfolio is divided into four DVD disks, labeled by sub-region (Upper and Lower Yakima River, Toppenish Creek, and Satus Creek). Each DVD includes three published map files (pmfs), a copy of ESRI ArcReader, a copy of Yakama Wildlife ArcReader, a geodatabase containing all of the vector data used to complete the maps, and raster images of elevation and current and most historic aerial photographs. The data themes for each subregions are divided into 3 main folders:

- Abiotic (e.g. *Upper_Yakima_A.pmf*)
- Biological (e.g. *Upper_Yakima_B.pmf*)
- Constructed modifications (e.g. *Upper_Yakima_C.pmf*)

In some cases these DVDs also include photos that were taken as part of the fieldwork and hyperlinked in the pmf files (see below). While each DVD contains ALL of the vector data, aerial photographs had to be broken up into these four sub-regions.

Abiotic data layers include:
Basedata (sites, roads, streams, lakes) , springs, alluvial soils, greater than 15 degree slopes, historic channels, channel migration zones, soil erosion potential and permeability, aquic soils, surficial geology, and floodplains.

*Biotic data layers include***:**
Basedata (sites, roads, streams, lakes), fish distribution, Natural Heritage sites, wetland types and hydroperiods, priority habitats and species points, riparian areas, HEP data.

Constructed data layers include:
Basedata (sites, roads, streams, lakes), dams, cultural sites (very limited), dairies, facilities, revetments, grade control structures, ditches, railroads and abandoned railroads, zoning, land use within half-mile of sites.

Site assessment data were also included for the three pilot field assessment sites. These pilot data include field notes, roads, fences, vegetation polygons and ground photos; these data are included with their pertinent theme.

Yakama Wildlife ArcReader

In order to render ArcReader more easily usable by those unfamiliar with modern cartographic software, several customized ArcReader programs were developed specifically for this project. The first of these, intended for use with the 4 DVD set described above, was termed YakReader and is included on each of the 4 DVDs. YakReader attempts to make map navigation, printing and exporting more intuitive by removing a number of more obscure commands and menus and adding several useful features.

Once YakReader has been successfully installed, users are able to navigate to one of the data/map folders within one of the four map folder disks labeled by subbasin. Each of the map files opens to the full extent of the map. In order to quickly access a certain restoration site of interest, a bookmark-list-box was created. Selecting a site in this list-box will zoom the user to the site chosen (Fig. 3). The legend on the left side of the screen is 'dynamic' in that it will reflect changes to the map made in the 'table-of-contents'. The checkbox in the toolbar turns the table of contents on and off.

The navigation controls of YakReader are limited to zoom-in, zoom-out, pan, undo, and full extent. In case of a loss of focus on the map frame, "layout" tools are included and appear similarly to the map navigation tools but with a white page behind them. Use these "layout" tools to zoom in or out on the frame of the map rather than the map itself. Additional tools include a ruler, an identify tool and a photo tool. The ruler tool enables one to measure distances on the map and can be changed to a variety of units. The identify tool will identify components of the map that might not be labeled or can display additional information about a certain feature. The photo tool is used to access photopoints marked on the map. When the photo tool is active, any point that has a photo linked to it will turn blue. Clicking on the point will open a basic HTML page displaying the photo and indicating the photo-monitoring data as well.

A help file is also included with the program and can be accessed by clicking help. In addition, one can print, print setup and export to BMP with the tools at the top right of the toolbar. Oftentimes it is necessary to setup the print margins by clicking the print setup tool, and selecting 'fit-to-page'.

It should be noted that running the pmf files off of a DVD can be much slower than running them off of a local harddrive. However, while copying the contents of the DVD can increase the speed, the directory structure must be exactly the same as that of the DVD. For example, the data on the DVDs is under a folder called Maps. Therefore, if you copy the data to your computer, you must place the pmf files in the root directory of your local hard drive and create the associated directories (\Maps, \Photos, etc.) there as well.

The data used for the pmf files on these discs is re-usable data; with GIS software, one can add these layers to other projects. The bulk of the vector data is stored in a geodatabase and is accessible via ArcGIS and Microsoft Access. The bulk of the raster data is stored as .tif files and is accessible via ArcGIS or other imaging programs.

SyncMap

A customized aerial photo viewer (SyncMap) was developed within ArcReader to view historical and current photography in a geo-synchronized manner, including scale bars, coordinates, and zoom and pan functions (Fig. 4). SyncMap enables the user to easily navigate and compare aerial photography from four different years, divided into eight DVDs, each containing aerial photos for different subregions (Fig. 5), most commonly for the years 1947,

1949, 1992, 1996, 2002, and 2005. Navigational changes in one map panel are reflected in all the panels creating a dynamic interface. Each map panel includes all available years of photography allowing one to 'customize' the order, position and years visible in the map frame. Changes in the table of contents are reflected in the legends at the top left corner of each map panel.

Basic tools, similar to those of YakReader, are included with this program as well as a list-box with bookmarks to restoration sites. Printing and exporting images from SyncMap is available to the user as well; oftentimes it is necessary to setup the print margins by clicking the print setup tool, and selecting 'fit-to-page'. While SyncMap will only function with specially made pmf files, these files are easily re-generated when new aerial photography becomes available and merely require four data frames of the same spatial reference.

A help file and README document is included on each SyncMap DVD. As noted above, due to very large raster images, performance may be very slow unless the data are copied to the local computer, with the same constraints.

Geodatabases

A final DVD disk includes the geodatabases included with the YakReader maps along with the special Microsoft Access form created to facilitate data entry from each site assessment form. The data entered into these forms may be automatically linked to the attribute tables of the Yakreader maps via the CWU ID numbers for each site. This allows the site characteristics to be easily referenced and compared in tables as well as visually in a GIS. For example, users can find sites with the opportunity to improve water quality either by searching the geodatabase table or by symbolizing sites in the GIS based on the corresponding water quality field in the attribute table.

Also included on this DVD are several html photo pages designed to assist in the identification of the various plant species one may encounter while in the field (Fig. 6). These pages were developed for Wanity Slough and North Meninick and while they do not include complete identification data, may be easily developed into a working tool for training fieldworkers.

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Appendices

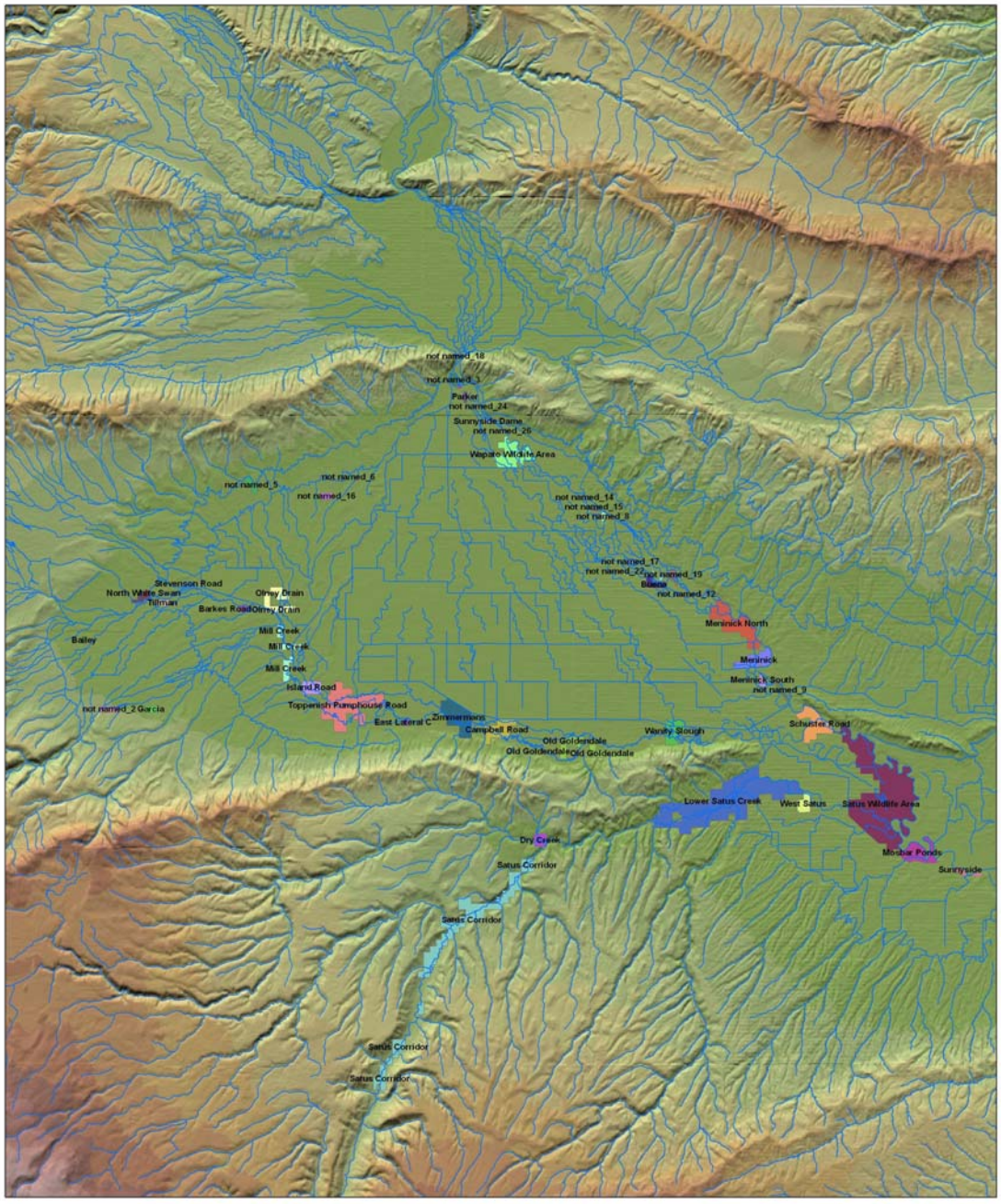


Fig. 1 Yakama Nation Wildlife Wetlands and Riparian Restoration Project Sites

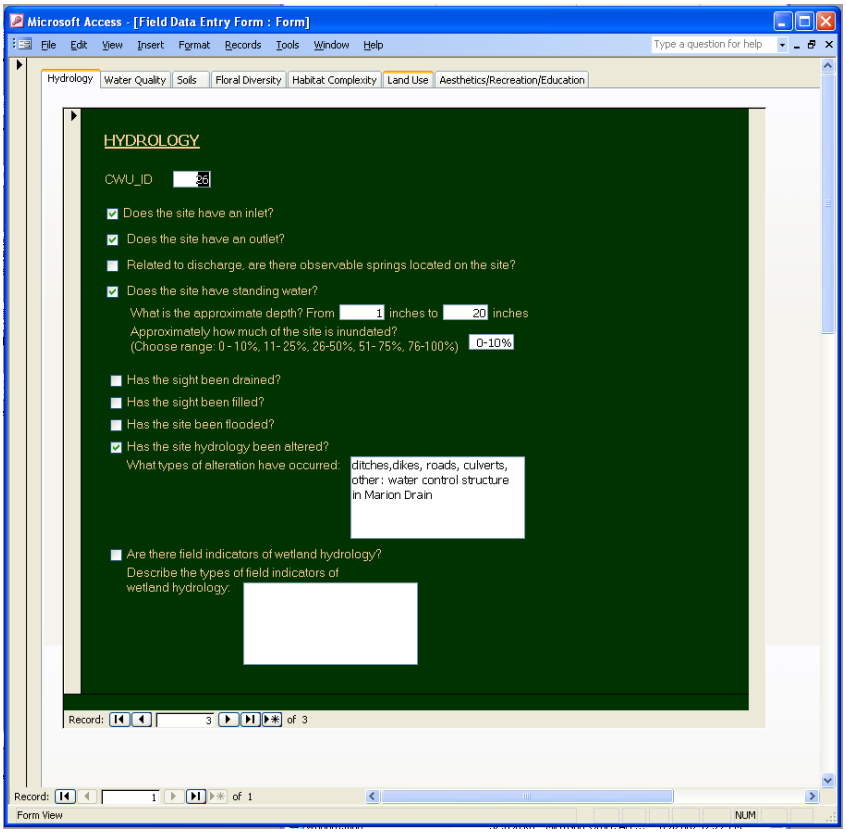


Figure 2. Data Entry Form Example.

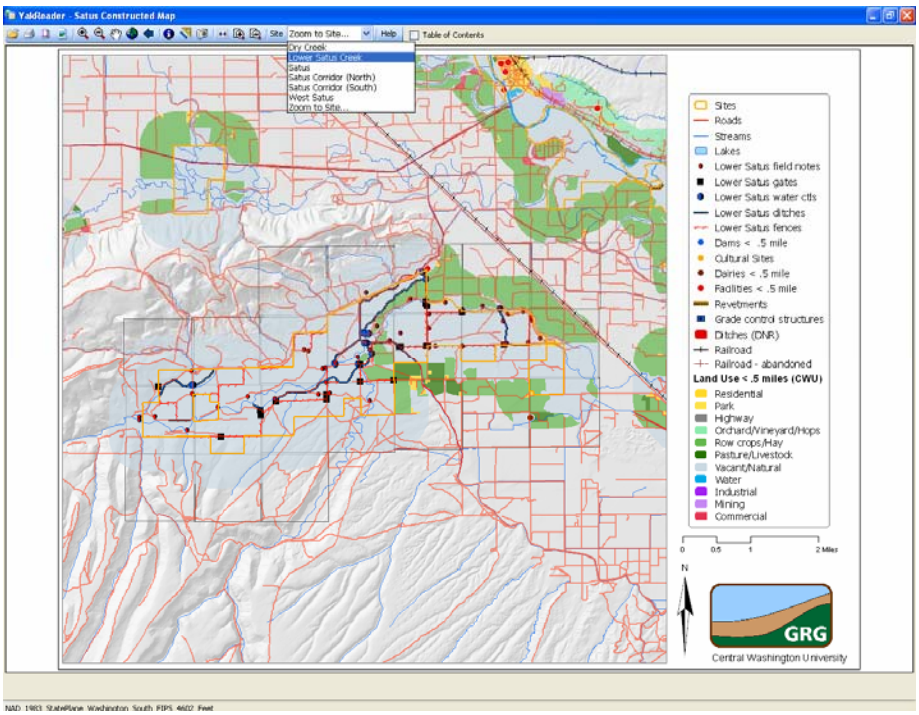


Figure 3. Yakima Wildlife ArcReader example.

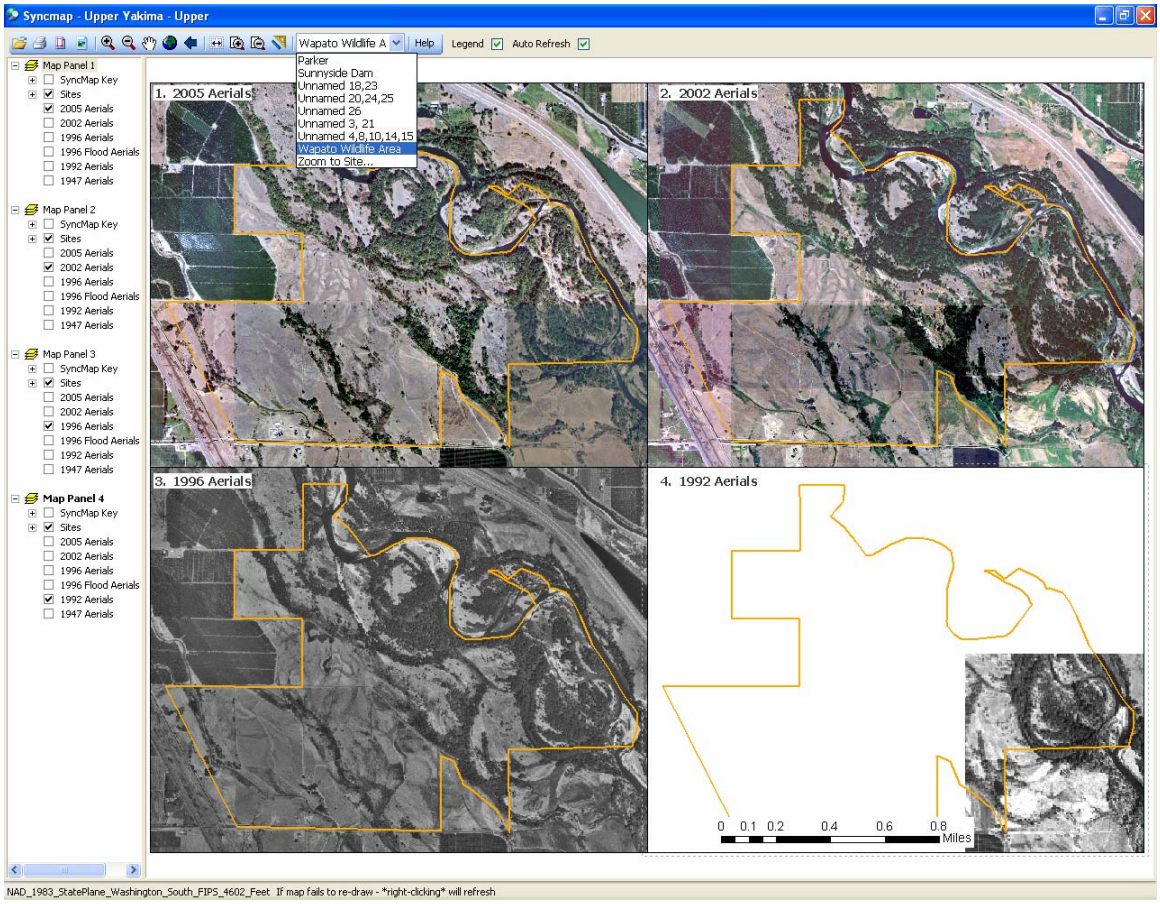
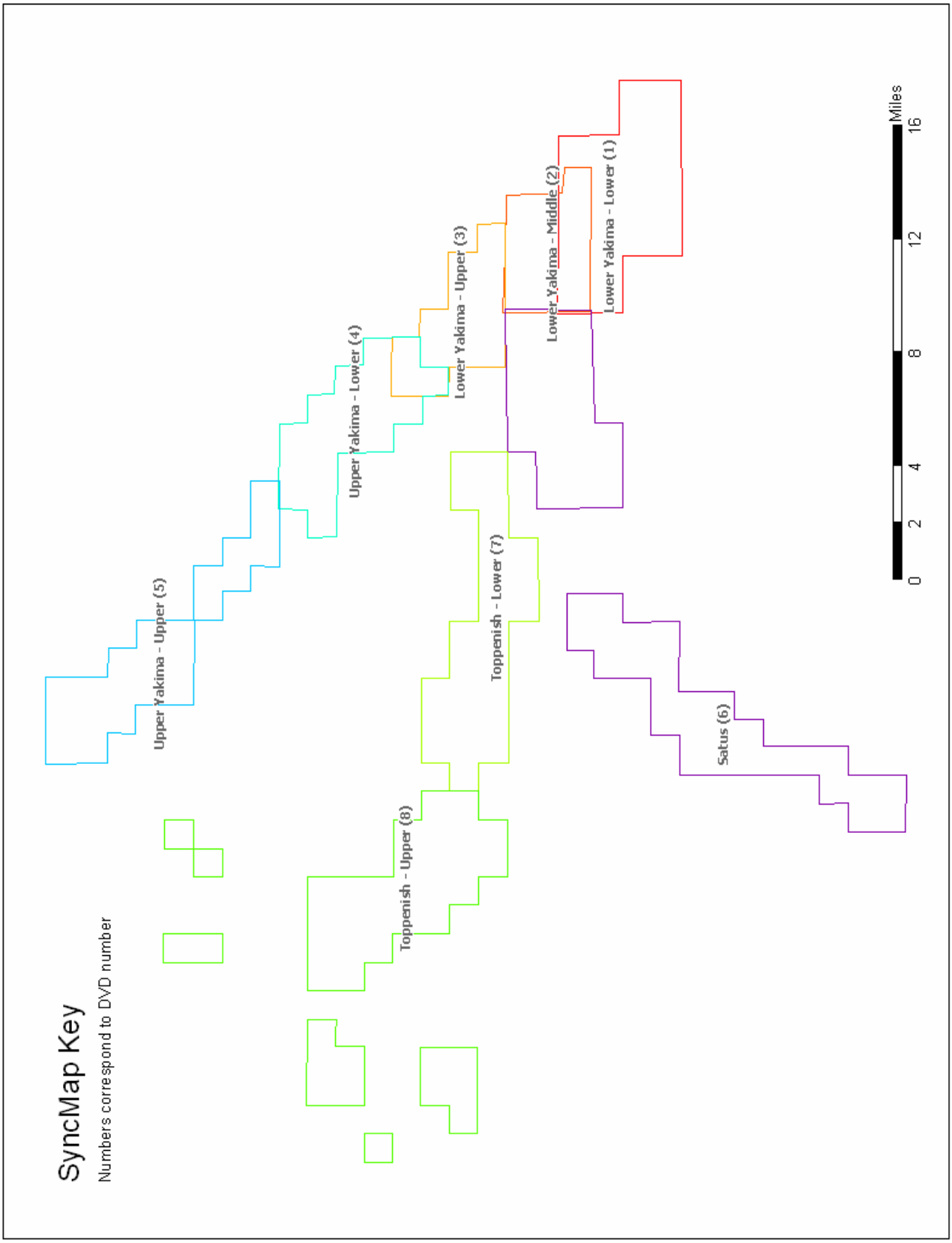


Figure 4. SyncMap Example.


SyncMap Key
Numbers correspond to DVD number
Upper Yakima - Upper (5)
Upper Yakima - Lower (4)
Lower Yakima - Upper (3)
Lower Yakima - Middle (2)
Lower Yakima - Lower (1)
Toppenish - Lower (7)
Toppenish - Upper (8)
Satus (6)
Miles
0
2
4
8
12
16

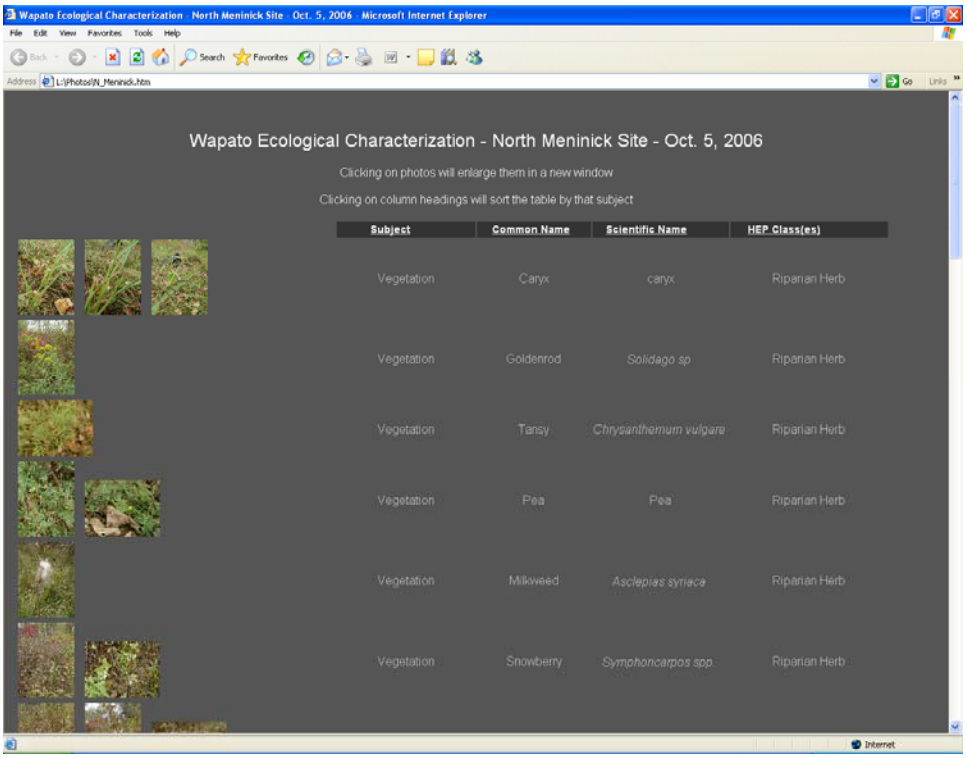


Figure 6. Photo Identification Page

Table 1. Yakama Nation Riparian Restoration Sites

Site	Name	Size (Acres)	Along Stream
1	Bailey	39.9	Agency Cr
3	Buena	156.5	Yakima Rv
4	Campbell Road	484.6	Toppenish Cr
5	Dry Creek	158.6	Satus Cr
52	East Lateral C	40.1	Toppenish Cr
6	Garcia	80.9	Toppenish Cr
7	Island Road	246.7	Toppenish Cr
8	Lower Satus Creek	3838.6	Satus Cr
9	Meninick	424.6	Yakima Rv
10	Meninick North	1006.2	Yakima Rv
11	Meninick South	68.5	Yakima Rv
12	Mill Creek	404.5	Toppenish Cr
13	Mosbar Ponds	519.6	Yakima Rv
14	North White Swan	141.1	Simcoe Cr
15	Old Goldendale	406.6	Toppenish Cr
16	Olney Drain	451.4	Simcoe Cr
17	Parker	36.0	Yakima Rv
18	Satus Corridor	2560.7	Ahtanum Cr
19	Satus Wildlife Area	4557.7	Yakima Rv
20	Schuster Road	675.0	Yakima Rv
2	South Barkes Road	81.3	Simcoe Cr
29	South Lateral A	763.2	Toppenish Cr
21	Stevenson Road	81.3	Simcoe Cr
22	Sunnyside	79.7	Yakima Rv
23	Sunnyside Dam	22.2	Yakima Rv
24	Tillman	81.1	Simcoe Cr
25	Toppenish Pumphouse Rd	1589.3	Toppenish Cr
26	Wanity Slough	406.9	Toppenish Cr
27	Wapato Wildlife Area	752.5	Yakima Rv
28	West Satus	204.4	Satus Cr
40	Not Named #2	120.3	Toppenish Cr
48	Not Named #3	64.6	Yakima Rv
49	Not Named #4	0.6	Yakima Rv
50	Not Named #5	123.0	None
51	Not Named #6	35.1	None
53	Not Named #8	37.4	Yakima Rv
54	Not Named #9	87.9	Yakima Rv
30	Not Named #10	9.5	Yakima Rv
31	Not Named #11	9.7	Yakima Rv
32	Not Named #12	10.7	Yakima Rv
33	Not Named #13	14.0	Yakima Rv
34	Not Named #14	14.1	Yakima Rv
35	Not Named #15	16.5	Yakima Rv
36	Not Named #16	79.8	None
37	Not Named #17	32.5	Yakima Rv
38	Not Named #18	18.1	Yakima Rv
39	Not Named #19	84.6	Yakima Rv
41	Not Named #20	8.4	Yakima Rv
42	Not Named #21	10.9	Yakima Rv
43	Not Named #22	31.7	Yakima Rv
44	Not Named #23	0.7	Ahtanum Cr
45	Not Named #24	1.0	Yakima Rv
46	Not Named #25	0.5	Yakima Rv
47	Not Named #26	5.3	Yakima Rv

Table 2. Additional Sources Reviewed for the CWU's Site Evaluation of Wetland Restoration Sites.

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Table 3.
SITE EVALUATION OF WETLAND RESTORATION SITES

Property Name:	
Subsite Name:	
Owner:	County:
TRS or GPS Coord:	Parcel #:
Size (acres):	

SUMMARY OF FUNCTIONAL VALUES

Function	Value				Comments
	Low	Med.	High	Excep.	
Hydrology					
Water Quality					
Soils					
Floral Diversity					
Habitat Complexity					
Wildlife Use					
Land Use					
Cultural/Historical Significance					
Aesthetics/Recreation/Education					

Overall Qualitative Assessment:

OFFICE & GIS EVALUATION

Evaluator(s):
Date(s) of Analysis:

Y N Has the site been documented (in the appropriate state or federal database) as a habitat for any Federally-listed Threatened or Endangered animal or plant species?

Y N Has the site been documented (in the appropriate state database) as habitat for any State-listed Threatened, Endangered, Sensitive, Candidate, Species of Concern, or Monitored animal species?

Y N Does the site contain individuals of Priority species listed by the WDFW for the state?

Y N Does the site have a local significance in addition to its functions?

Y N Critical Areas Ordinance

Y N Shoreline Master Program

Y N Local management plan (Name_____)

Y N Other _____

Describe Historic Land Use, including type and duration:

Describe Hydrologic Restoration Activities (such as irrigation or dike removal), including dates completed and projects planned:

Describe Habitat Restoration Activities (such as revegetation or placement of habitat structures), including dates completed and projects planned:

HYDROLOGY

Y N Is there a stream running through or adjacent to the site?

Y N What is the primary water supply for the site? surface water inflow, seep, spring,

precipitation, other _____

Y N Is there a natural feature or human-made structure impeding drainage from the site that causes backwater conditions?

Y N Is there a floodgate on site or within a 1-mile buffer?

Y N Does the site receive overland flow or direct discharge of stormwater as a primary source of water? (Circle all that apply.)

Y N Related to discharge, are there reported springs on the site?

Y N Related to discharge, might the site contribute to the maintenance of base flow in a stream?

Y N Is the site in (or partially in) a 100-year floodplain? How much? _____%

WATER QUALITY

Length/Distance ratio of the stream _____.

Y N Does the site have potential to significantly reduce run-off velocity due to its size, configuration, or braided flow patterns? (Circle all that apply.)

Y N Is the position of the site in the landscape such that run-off is held or filtered before entering a surface water?
Describe:

Y N Does the site have sufficient vegetative density to decrease water energy and allow settling of suspended materials?

Y N Do the surrounding land uses have the potential to deliver significant nutrient and/or sediment loads to the site?
Describe:

Y N Are there potential pollution sources nearby?
Circle all that apply: mine, feed lot, dairy with high runoff, storage tank in permeable soil, leaking storage tank, sewer treatment plant, landfill, highway, industry (type _____), other _____.

HABITAT and WILDLIFE USE

Distance to closest other site _____m

Perimeter:Area ratio _____

Y N Is there a natural buffer around the site (ie wooded upland buffer)?
Describe:

Y N Is the site contiguous with a permanent waterbody or periodically connected for sufficient periods of time to provide spawning/nursery for fish?

Y N Are there oxbow lakes, gravel pits, or other surface water bodies on the site?

Y N Are the above features permanently or seasonally connected to the stream?

Y N Is the site part of a relatively undisturbed and unbroken, > 30-ft wide, vegetated corridor at least ¼ mile long, connected to surface water or flowing water? (Dams, heavily-used gravel roads, paved roads, fields tilled to edge of stream, or pasture to edge of stream are considered breaks in the corridor.)

Y N Is the site part of a relatively undisturbed and unbroken, > 30-ft wide, vegetated corridor, at least ¼ mile long along an intermittent stream or a riverine wetland without a surface channel connecting to the stream?

Y N Is the site within ½ mile of any permanent stream, seasonal stream, or lake? (not including man-made ditches)

Y N Is the estimated ratio of open water to cover between 30 and 70 percent?
Estimated ratio_____

Y N Have there been any endangered or threatened animal species observed on or near the site? List, and describe activity (nesting, foraging, etc.):

LAND USE

Y N Does the public have direct access to the site?
via Public roads via Waterways

CULTURAL/HISTORICAL SIGNIFICANCE

Y N Is the site or surrounding area known to have cultural resources?
Describe:

GIS QUERIES

Attach the following tables, based on GIS analysis:

Abiotic

- Geology and Geomorphology
  - Surficial Geology
  - Slope
  - Inside 100-year floodplain
  - Channel migration zone
- Soil Types
- Soil Characteristics
  - Permeability
  - Runoff
  - Hazard of erosion
  - Aquic soils

Biotic

- Habitat Characteristics
  - Wetlands, percent area
  - Riparian areas
  - Priority habitats and species
  - Wildlife heritage locations
- NWI wetlands
- Hydroperiod
- HEP data
- GAP analysis data
- Fish data

Constructed Landscape

- Structures
  - Department of Ecology 303(d) facilities
  - Leaking storage tanks
  - Storage tanks in permeable soil
  - Dairies with high runoff hazard
  - Floodgates
- Land Use (Zoning)
- Land Cover
- Ownership of adjacent lands (federal, tribal, state, local, private)

MATERIALS FOR SITE VISIT

- Aerial photo with HEP boundary overlays.

FIELD SITE EVALUATION

Evaluator(s):
Date(s) of Site Visit(s):

HYDROLOGY

Y N Does the site have an: Inlet Outlet

Y N Related to discharge, are there observable springs located on the site?

Y N Does the site have standing water?
What is the approximate depth? From _____inches to _____feet.
Approximately how much of the site is inundated?
0-10% 11-25% 26-50% 51-75% 76-100%

Y N Has the site been: Drained Filled Flooded

Y N Has the site hydrology been altered?
Circle all that apply: ditches, tiles, well pumping, dikes, roads, railroads, dams, weirs, culverts, floodgates, stream channelization, diversion of surface water flow, changes to runoff in watershed, other _____

Y N Are there field indicators of wetland hydrology?
Circle all that apply: buttressed tree trunks, adventitious roots, oxidized rhizospheres, drift lines, water marks, silt lines on trees, sediment deposits on plants, water-stained leaves, organic soils layer, other _____

WATER QUALITY

Y N Are the ponds and stream banks well vegetated?
Describe type (including species) and density:

Y N Are there signs of poor water quality?
Circle all that apply: extensive algae, murkiness, odors, oil sheen,
other _____

Y N Does the site have the opportunity to improve water quality?

- **Y N** Grazing in the site or within 150 ft
- **Y N** Untreated stormwater discharges to site
- **Y N** Tilled fields or orchards within 150 ft of site
- **Y N** A stream or culvert discharges into site that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging
- **Y N** Residential, urban areas, golf courses are within 150 ft of site
- **Y N** Site is fed by groundwater high in phosphorus or nitrogen
- **Y N** Other _____

SOILS

Y N **Has the soil been disturbed or modified (ie tilled)?**
Describe:

FLORAL DIVERSITY

Identify the vegetation communities present and the dominant species:

HEP Class	Vegetation Community	Condition	Dominant Species

HEP Classes: Riparian Shrub; Riparian Scrub/Russian Olive; Agricultural/Pasture; Agricultural; Riparian Forest; Riparian Forest/Russian Olive; Riparian Herb; Riparian Herb/Russian Olive; Sand, Gravel, Mud, Cobble; Lacustrine; Riverine; Emergent Wetland; Shrub-Steppe/Grassland; Shrub-Steppe/Grassland/Russian Olive; Buildings

Vegetation Communities: Submerged aquatic; Floating-leaved; Emergent; Grass/Forb; Shrub-scrub; Forested-deciduous; Forested-coniferous; Bare ground.

Condition: poor, fair, good

 Update vegetation community boundaries on the aerial photo with HEP boundaries.

Y N Does the site support a variety of native plant species? (i.e. not a monotypic stand of cattail or giant reed grass, and not dominated by exotic species such as reed canary grass, brome grass, buckthorn, purple loosestrife, etc)

Y N Are there endangered plant species at the site?
List and describe location:

List the invasive species on and adjacent to the site:

Species	Location	Map Key*

*Mark locations on photo with the corresponding Map Key.

Y N Is there potential for prescribed fire use to control weeds? (based on factors below)

- **Y N** Does the dominant vegetation have the potential to carry fire?
- **Y N** Are there domestic structures nearby?
- **Y N** Are there firebreaks present? Roads Water Sparse vegetation

Y N Is there potential for grazing use to control weeds? (based on factors below)

- **Y N** Are the dominant weeds palatable?
- **Y N** Are the present native species sensitive to grazing?
- **Y N** Are there fences in place for grazing?
- **Y N** Are there water sources present or potential to install them?
  Location:

Y N Is there potential for cover crops to control weeds? (based on factors below)

- **Y N** Are there irrigation ditches or systems present?
- **Y N** Does the property have water rights?
- **Y N** Is non-native vegetation dominant (>75%)?
- **Y N** Is there access for farm equipment?

List the plant species observed at the site:

Species	Indicator Status	Native, Non-native, or Invasive?

Indicator Status: OBL, FACW, FAC, FACU

HABITAT COMPLEXITY

Y N Does the site contain a number of diverse vegetative cover types and a high degree of interspersion of those vegetation types?

Y N Is there a high degree of interspersion of vegetation with water?

Y N Is there a difference in height between shrub and tree layers?

Y N Are there habitat structures?
Snags
Large trees suitable for raptor nests
Root wads, logs, or other woody debris (terrestrial)
Woody debris in lakes or streams
Other:

WILDLIFE USE

List bird species observed using the site:

List mammal species observed using the site:

List amphibian and reptile species observed using the site:

List fish and other aquatic species observed using the site:

List evidence of animal species using the site:
Tracks:

Scat:

Nest/Burrow:

Other (describe):

LAND USE

Y N Is there evidence of livestock on site? Browse Tracks Scat Damage
Y N Is there livestock in the surrounding areas?

Y N Are there crops on site? 0-10% 11-25% 26-50% 51-75% 76-100%

Y N Are there crops in the surrounding areas?
Location and Type:

Y N Are there obvious human influences on the site?

	Type	Location	Description
Y	Buildings		
N			
Y	Roads		
N			
Y	Trash		
N			

Y Pollution
N
Y Other
N

Y N Are there <u>interior</u> fences on the site?
Type and condition:

Y N Are there <u>exterior</u> fences on the site?
Type and condition:

AESTHETICS/RECREATION/EDUCATION

Y N Is the surrounding viewshed relatively free of obvious human influences?
Circle all that apply: Buildings Roads Other structures

Y N Is the site currently being used for (or does it have the potential to be used for) the following activities? Check all that apply.

ACTIVITY	CURRENT USE	POTENTIAL USE
Nature study/photography		
Hiking		
Hunting/fishing/trapping		
Boating/canoeing		
Food/fiber harvesting		
Education/outreach		
Others (list)		

Comments: