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Yakama Nation's Wetlands and Riparian Restoration Project

Project Number 1992-06200

Fiscal Year 2007 Annual Report Part 1

Submitted to:
Bonneville Power Administration

Tracy Hames
Katrina Strathmann
Nathan Burkepile
Jon Shellenberger

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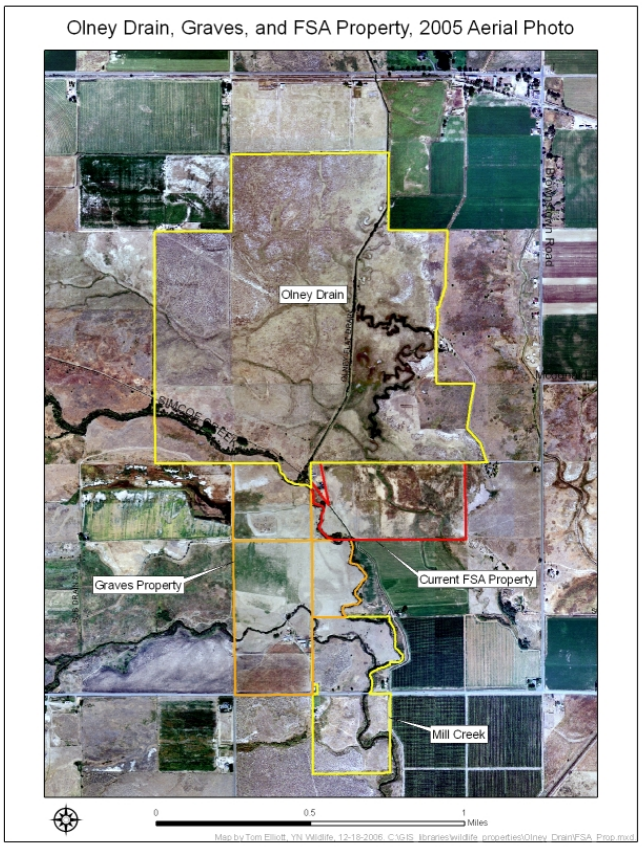
Part 1

Land Securing Activities

Fiscal year 2007 found the project without land acquisition funding. Because of this, the only parcel acquired was the result of a land donation from the U. S. Farm Services Agency (FSA).

Graves Property This 120 acre parcel was purchased by the Yakama Nation for inclusion into this project in February of 2006. Negotiations between the Yakama Nation and Bonneville Power Administration were ongoing during FY2007 to reimburse the purchase of this property. Successful negotiations will result in the reimbursement of this purchase in FY2008.

Davis Parcel This 75 acre parcel, located adjacent to the Olney Drain Wildlife Area, was declared surplus by the U. S. Farm Services Agency. Under their guidelines, surplus land with wildlife habitat potential can be donated to the appropriate land management agency for protection, restoration and management. Project staff worked with the Farm Services staff to meet their criteria and the land was included into this project. It is located in Section 6 of T10 R18. This property will be included in the management of the Olney Drain Wildlife Area. It currently consists of hay and pasture land, with a disconnected side channel running through it. Nearly a quarter mile of the left bank of Simcoe Creek is also being protected on this property.



Davis Property outlined in red. Graves Property outlined in orange.

Restoration Activities

In Fiscal Year 2006 funding was secured through the North American Wetlands Conservation Act (NAWCA) for restoration activities on Project lands and on the adjacent Toppenish National Wildlife Refuge (US Fish and Wildlife Service) and Sunnyside Wildlife Area (Washington Department of Fish and Wildlife). Restoration activities began in Fiscal Year 2007. A report summarizing these activities is included at the end of this annual report.

Planning activities began for the Teal Lake repairs at the Satus Wildlife Area. This project will be funded by the Natural Resources Conservation Service (NRCS) under the Environmental Quality Incentives Program (EQIP). Repairs will occur in Fiscal Year 2008.

Biological Opinion Negotiations

Negotiations between the Yakama Nation and the Bonneville Power Administration occurred in Fiscal Year 2007. One result of these negotiations was to return funding to the land securing portion of this project for the 10 year period of the agreement. The planned Operations and Maintenance analysis was discontinued due to these negotiations.

Property Management Plans

Management plans were submitted for the following properties: Lower Satus, Satus, South Lateral A, Wanity Slough, and Wapato Wildlife Areas. These plans have been attached as downloadable documents in the Pisces database.

Outreach and Education

April 21, 2007 Audubon Society Tour of South Lateral A Wildlife Area. 15 adults.

May 19, 2007 Pheasants Forever State Leaders Meeting and Tour of Project. 20 adults.

May 22, 2007 Central Washington University Wetlands Class Tour of Project. 10 students, 2 teachers.

May 23, 2007 Mabton High School Tour of Project. 4 students, 1 teacher.

May 29, 2007 NRCS Mid-Toppenish Creek Project interview. Article about restoration project was published on NRCS website. It is included in this report below.

June 5, 2007 Richland Rod and Gun Club Project presentation, Richland, Washington. 40 attendees.

June 23, 2007 Eastern Washington University Wetlands Class tour of Project. 3 students, 1 teacher.

June 30 – July 1, 2007 Washington Waterfowl Association work weekend. 17 adults 4 youth. Preparing trapping areas for summer duck banding.

July 9 – August 31, 2007 Waterfowl Banding Activities at South Lateral A and Satus Wildlife Areas. Many uncounted volunteers participate in this activity each year

July 14-15, 2007 Washington Waterfowl Work Weekend. This is the second work weekend of the summer. 10 adults 3 youth.

August 7 and 14, 2007 Yakama Nation Wildlife Wilderness Camp duck banding and tour of Project. 50 students, 10 adults.

August 11, 2007 Quail Forever duck banding and Project our. 13 adults.

August 20, 2007 University of Washington student tour of Project. 1 student.

September 25 and 28, 2007 Society For Ecological Restoration Northwest Annual Conference, Yakima, Washington. Presentation and tour of Project, 75 adults.

October 18, 2007 Earth Conservation Corps tour of Project. 16 students, 3 teachers.

November 9, 2007 Bureau of Reclamation tour of Project. 6 adults.

January 24, 2008 Yakima School District student tour. 1 student.

February 21, 2007. Northwest Wetlands and Riparian Conference, Spokane, Washington Project presentation. 45 adults.

March 19, 2007. Ducks Unlimited tour of Project. 15 adults.

Earth Conservation Corps

Wildlife Surveys

The Yakama Nation Wildlife Resource Management Program (YNWRMP) conducts 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 YNWRMP 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 14 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 6). This increase has been evident in teal (Figure 2) and Gadwall (Figure 3). Wood Ducks (Figure 1) and Mallard (Figure 5) numbers have remained relatively constant.

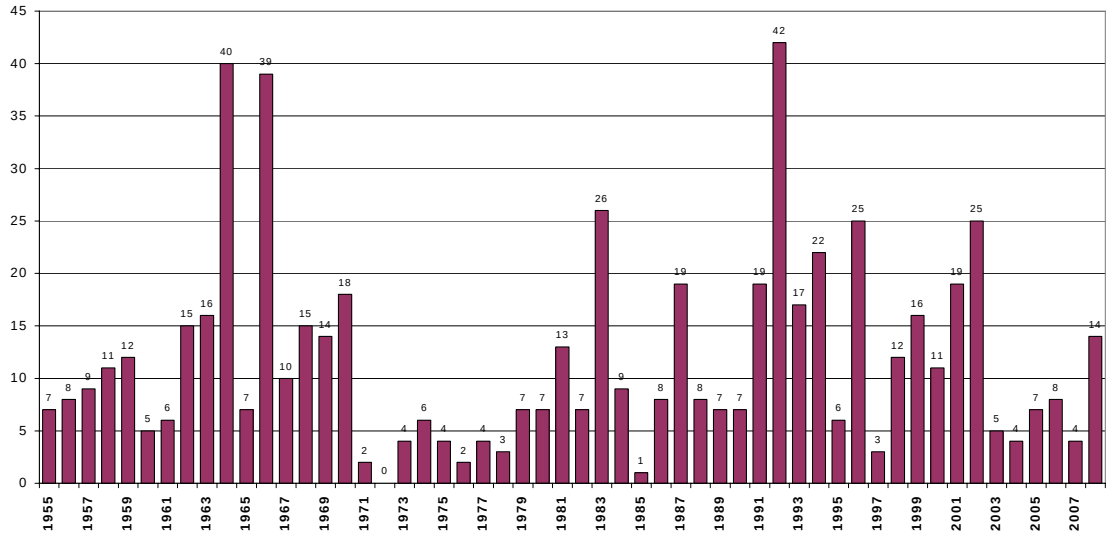


Figure 1: Number of breeding pairs of Wood Duck observed during counts conducted from 1955-2008 on the Yakama Reservation.

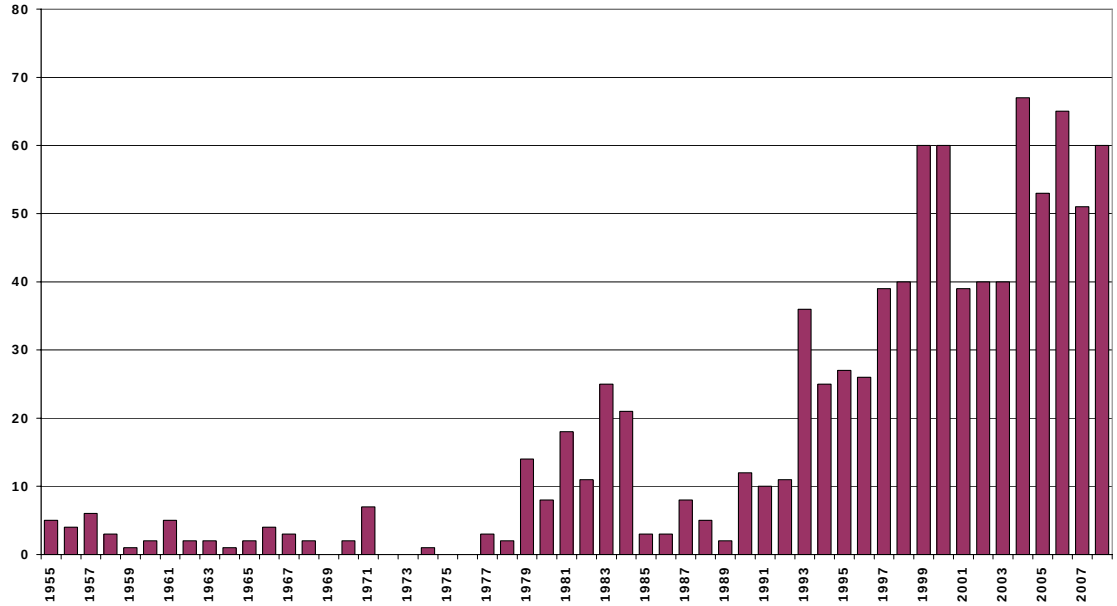


Figure 2: Number of breeding pairs of Gadwall observed during counts conducted from 1955-2008 on the Yakama Reservation

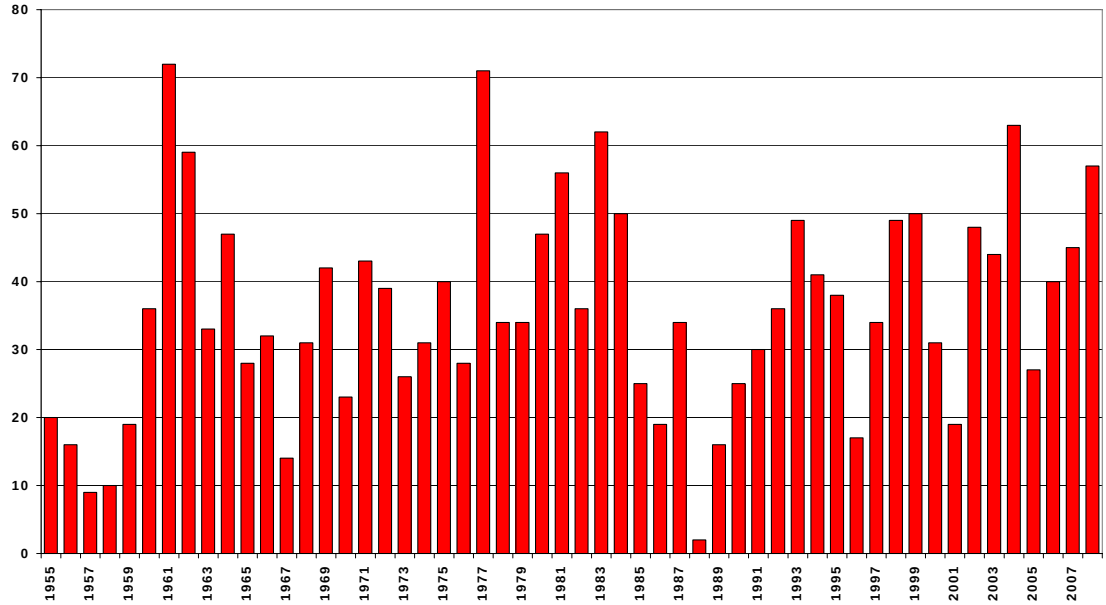


Figure 3: Number of breeding pairs of BW/Cinn. Teal observed during counts conducted from 1955-2008 on the Yakama Reservation

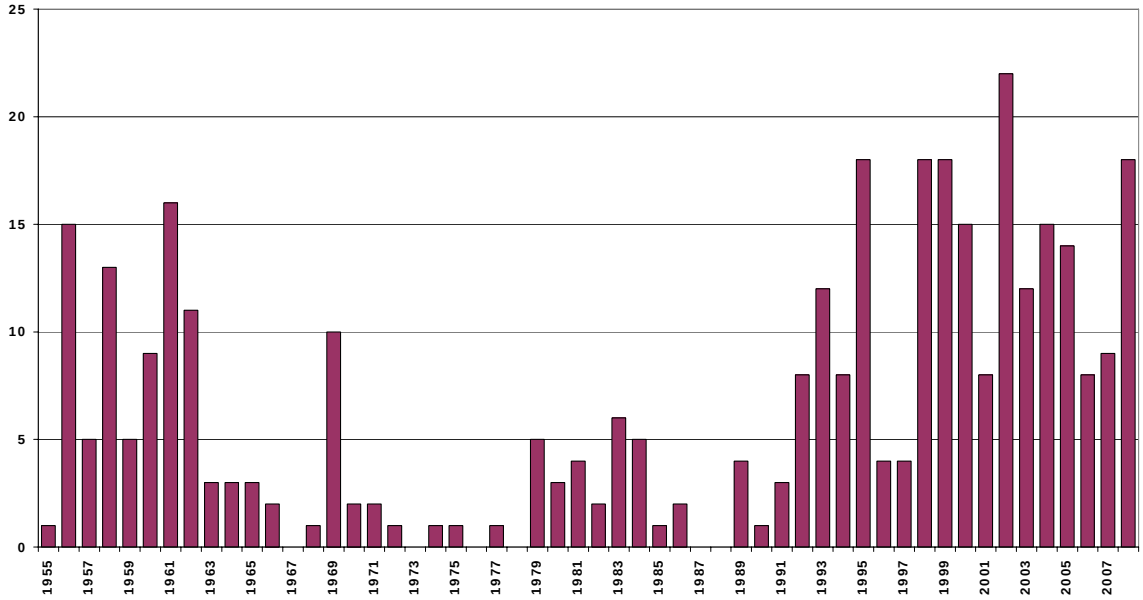


Figure 4: Number of breeding pairs of Shovelers observed during counts conducted from 1955-2008 on the Yakama Reservation

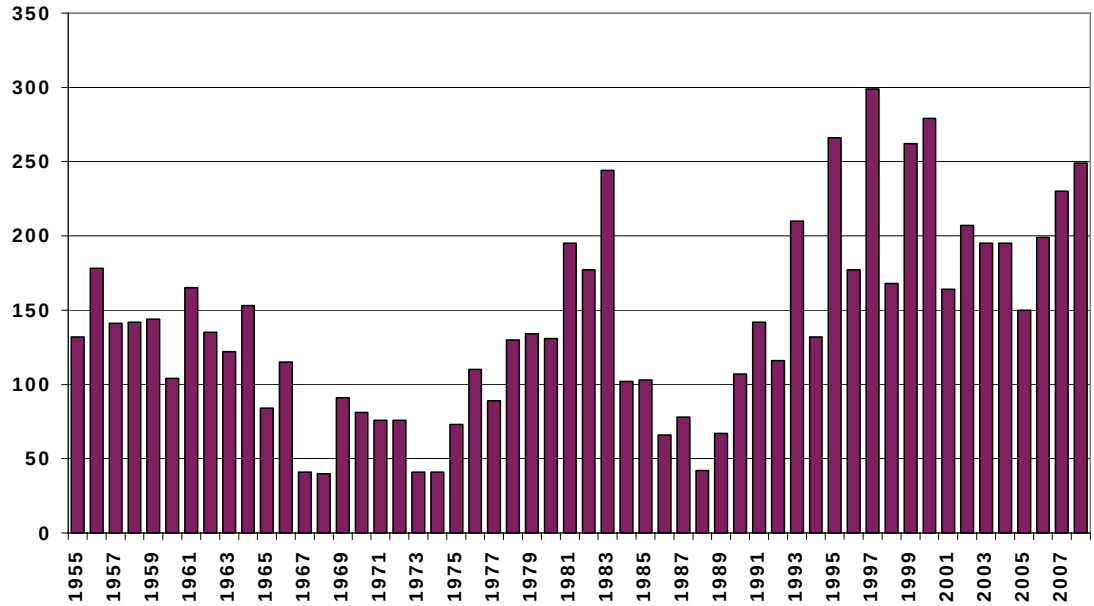


Figure 5: Number of breeding pairs of Mallards observed during counts conducted from 1955-2008 on the Yakama Reservation

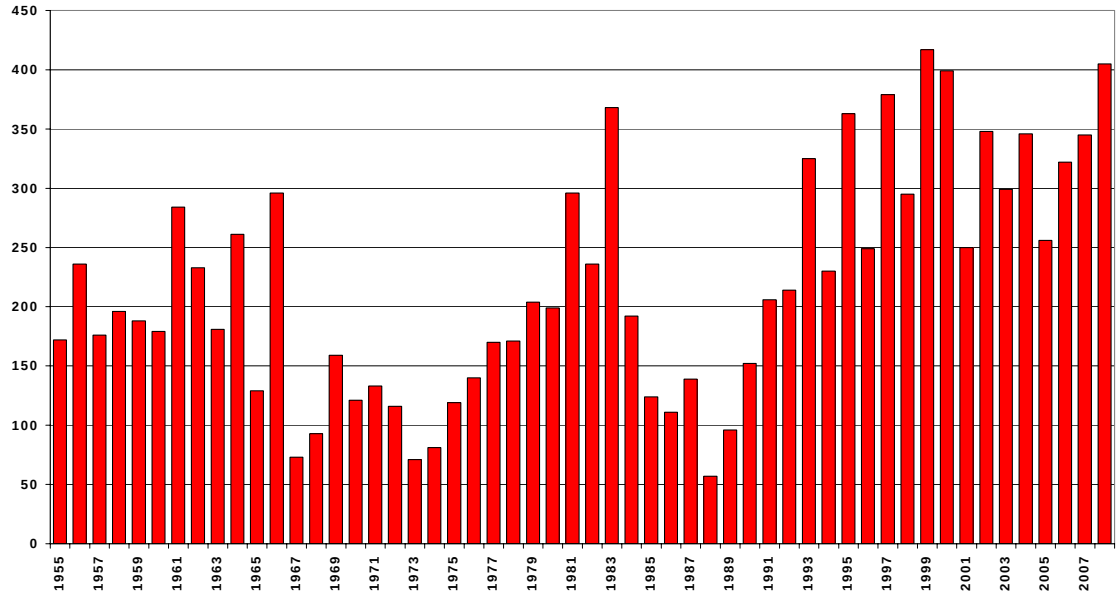


Figure 6: Number of breeding pairs of dabbling ducks observed during counts conducted from 1955-2008 on the Yakama Reservation

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 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% (Figure 7 & 8). 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.

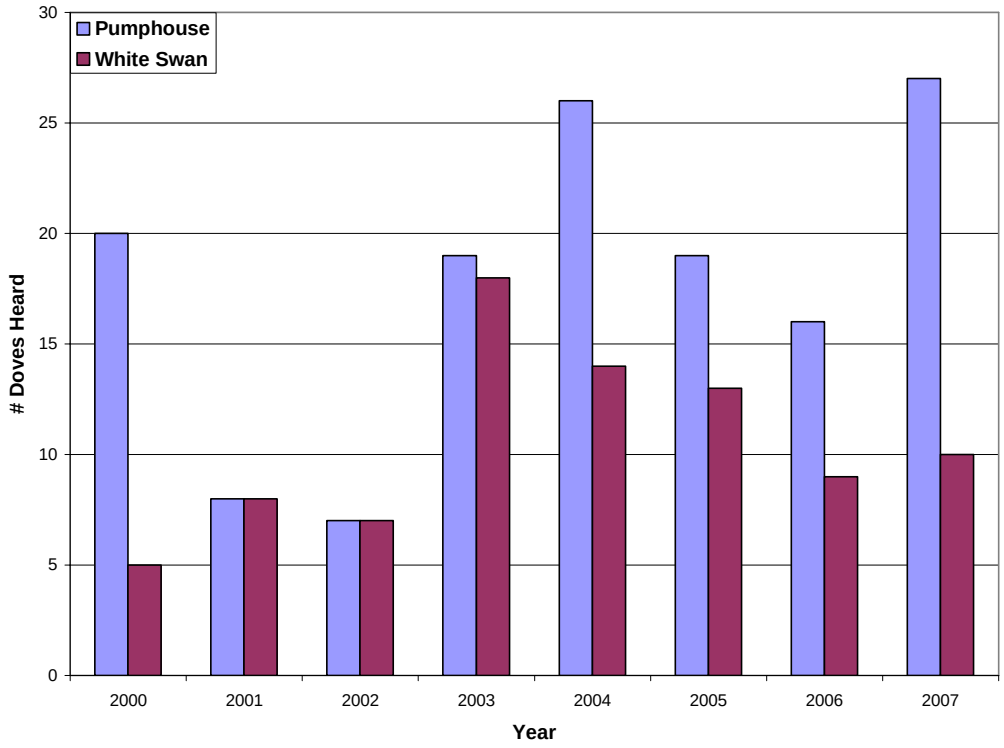


Figure 7: Number of calling doves heard on dove call count routes on the Yakama Reservation.

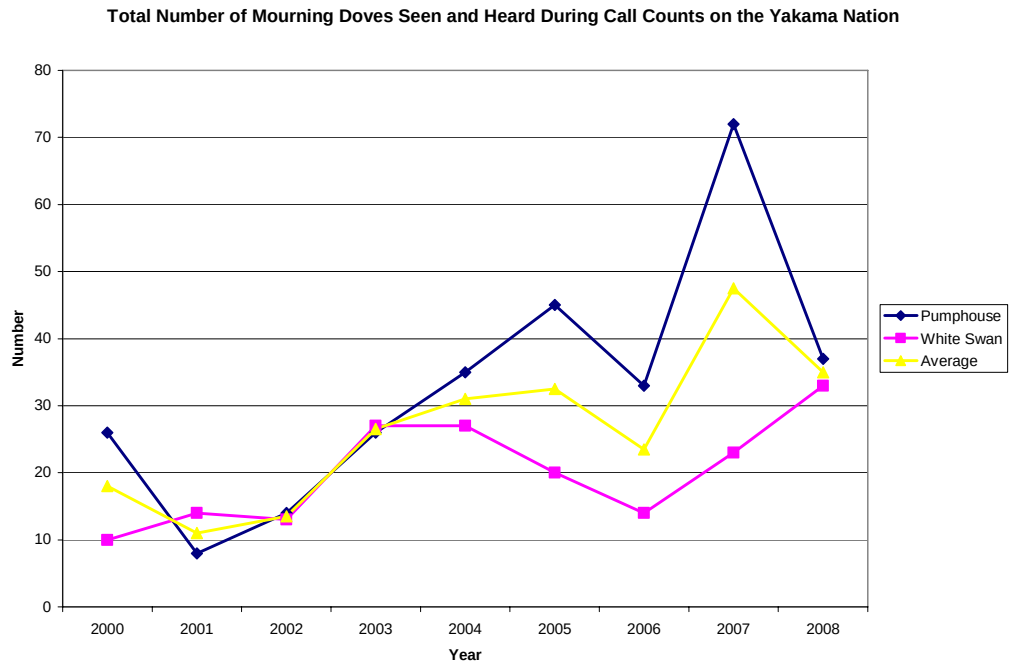


Figure 8: Total number of mourning doves seen and heard on the Pumphouse and White Swan dove call count routes on the Yakama Reservation from 2000 through 2008.

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 4 standardized routes once a week. Quail counts indicate that populations dropped from the highs of the previous 4 years; however the population estimate is still higher than the 1990's (Figure 9). The number of doves seen per mile also dropped from the previous year but still numbers are relatively high (Figure 10). The number of pheasants seen per mile showed a slight increase, however numbers are low compared to the early 1990's (Figure 11). Pheasant 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.

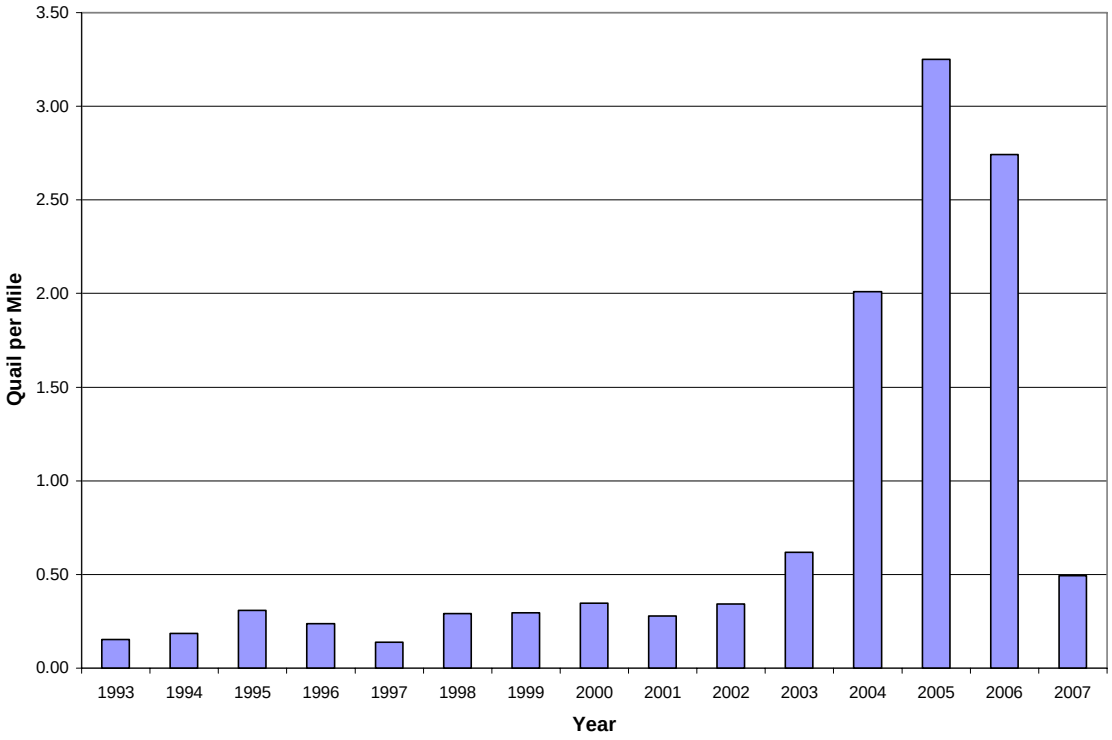


Figure 9: Average number of California Quail seen per mile on the Yakama Reservation in Washington from 1993 through 2007.

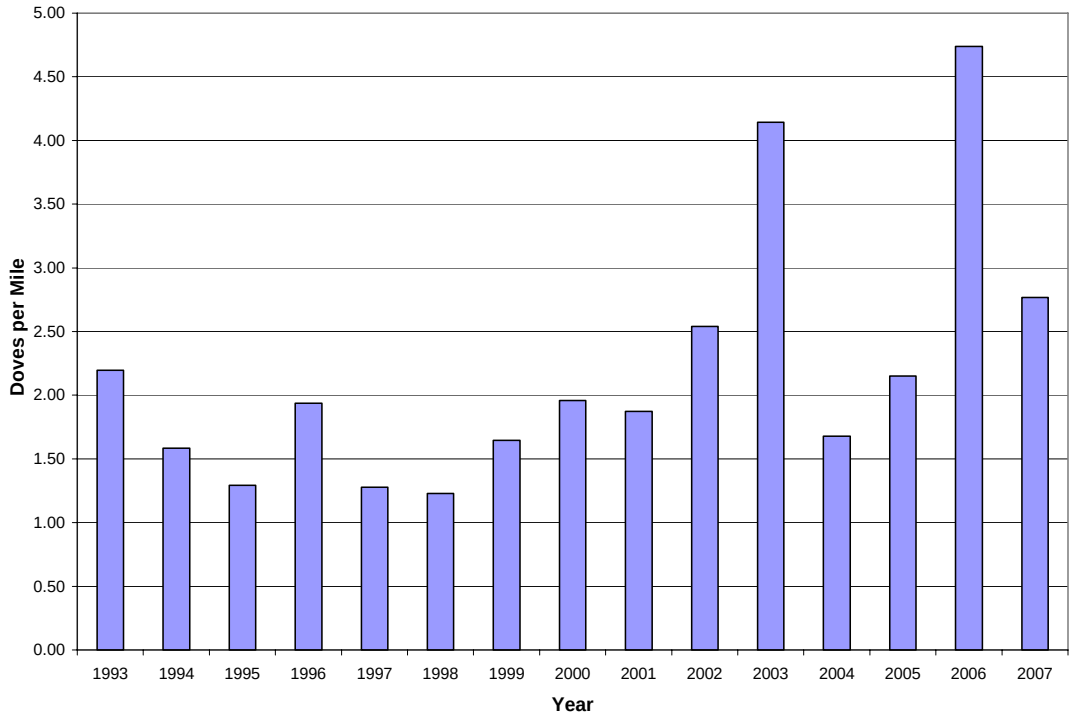


Figure 10: Average number of mourning doves seen per mile on the Yakama Reservation in Washington from 1993 through 2007.

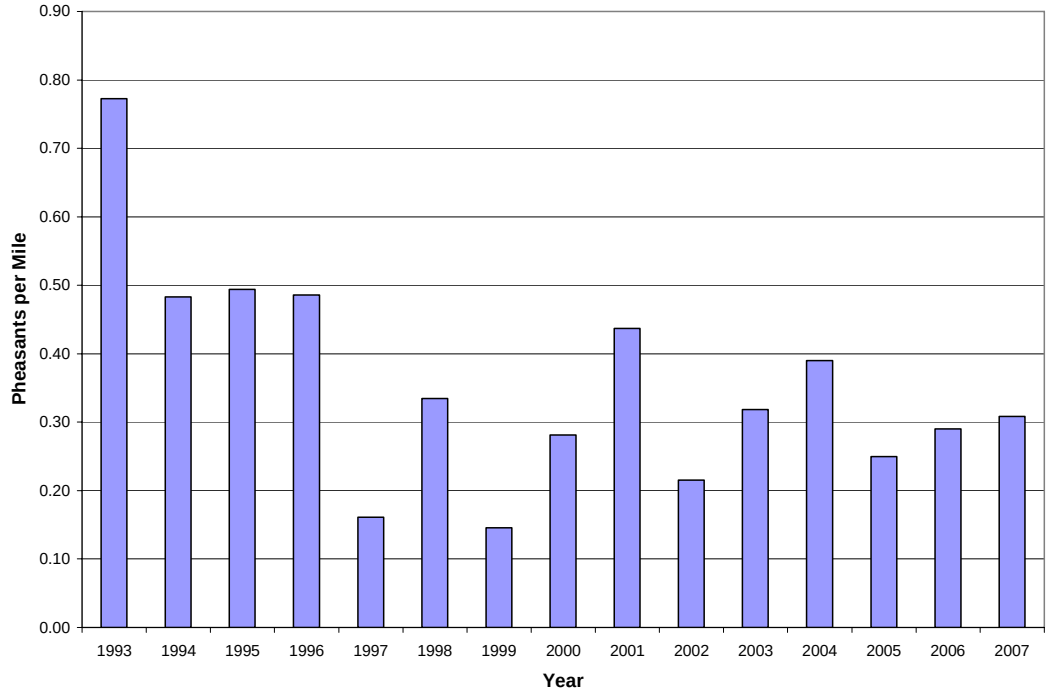


Figure11: Average number of pheasants seen per mile on the Yakama Reservation in Washington from 1993 through 2007.

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 hunters and birds harvested. Opening weekend harvest of pheasants was higher than it has been since 1988 with the hunters averaging 0.7 birds/day (Figure 12). On Satus Wildlife Management Area, opening weekend harvest of waterfowl was lower than previous years with the average of 2.8 ducks/hunter/day (Figure 13). The dominant species harvested opening day were mallards (41%), green-winged teal (23%) and wood ducks (16%, Figure 15). The percentage of mallard harvested (Figure 16) has been increasing on the Satus Wildlife Area. On the South Lateral A Property, we monitor harvest through the whole season. Results from this monitoring show mallards (59%), green-winged teal (15%), and northern pintails (12%) are the largest percentage of the harvest during the 2007 hunting season (Figure 16). These counts allow us to monitor our restoration efforts and allow us to make proper management decisions.

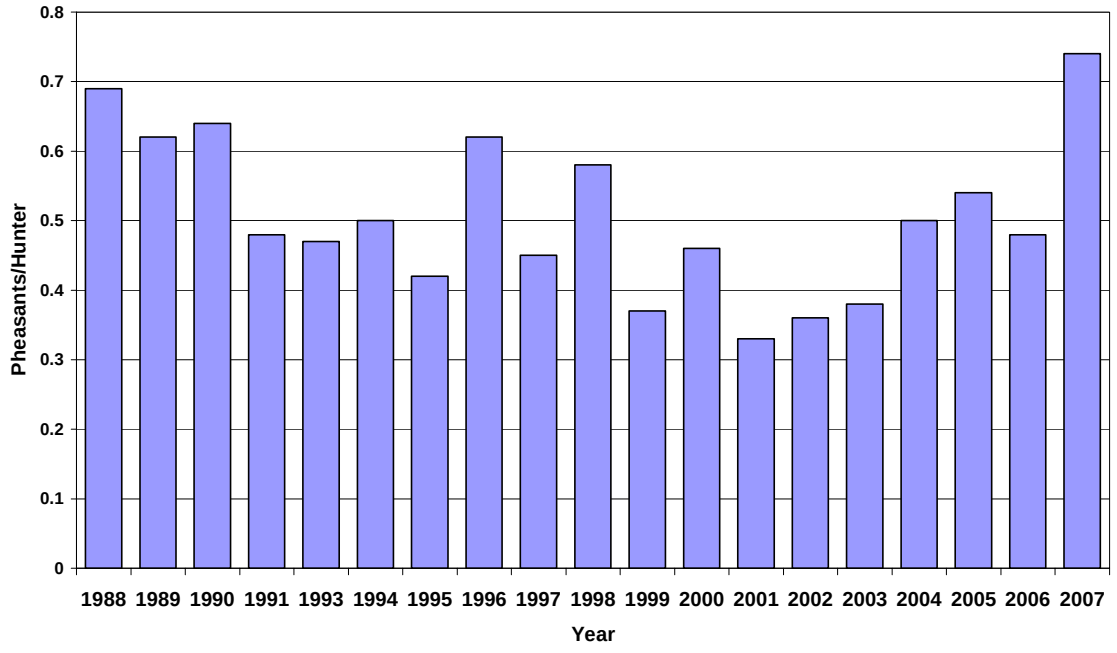


Figure12: Daily number of pheasants harvested per hunter opening weekend on the Yakima Reservation from 1993 through 2007.

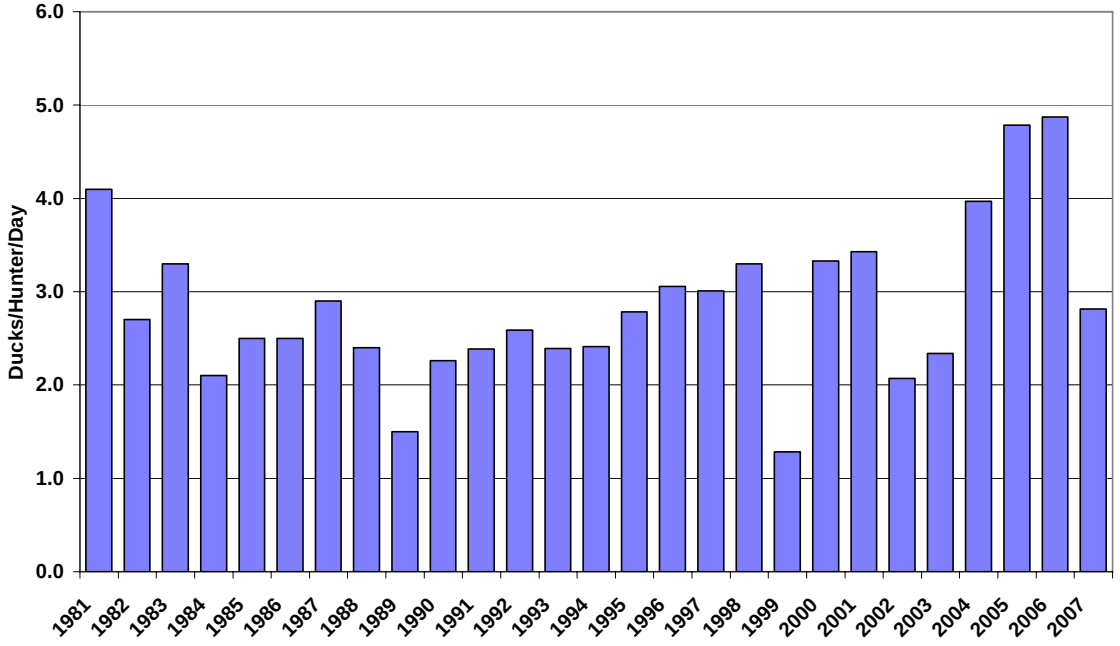


Figure13: The number of ducks harvested per hunter on the Satus Wildlife Area from 1981 through 2007.

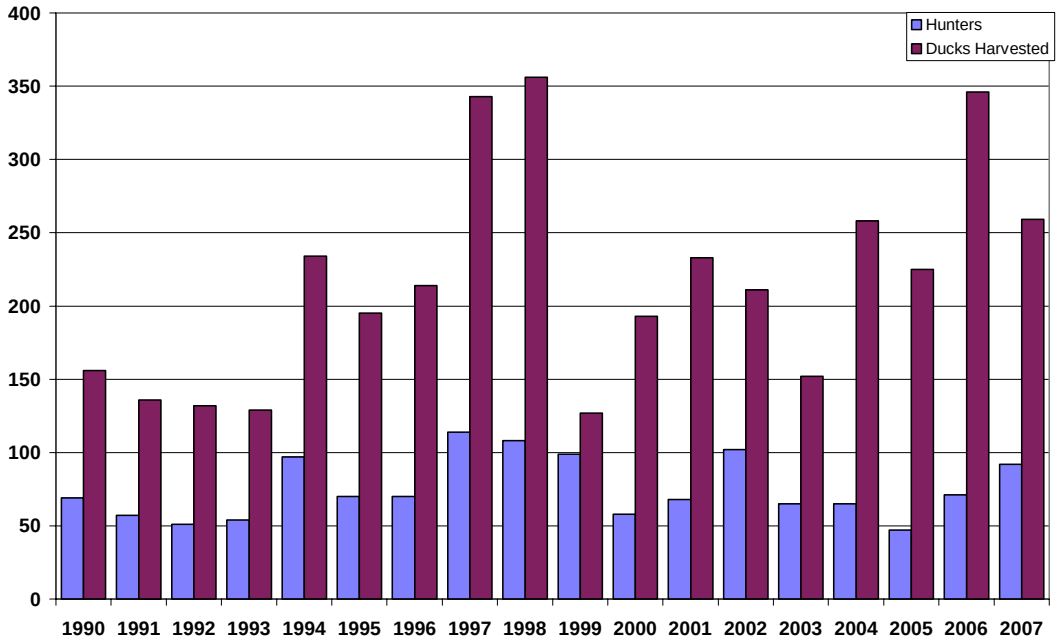


Figure14: The total number of ducks harvested and number of hunters opening day on the Satus Wildlife Area from 1990 through 2007.

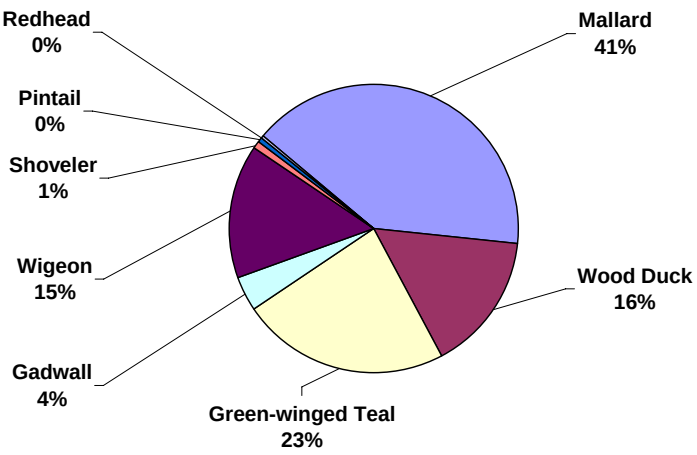


Figure15: Species composition of Waterfowl Harvested on Opening Day on the Satus Wildlife Area during the 2007 Hunting Season

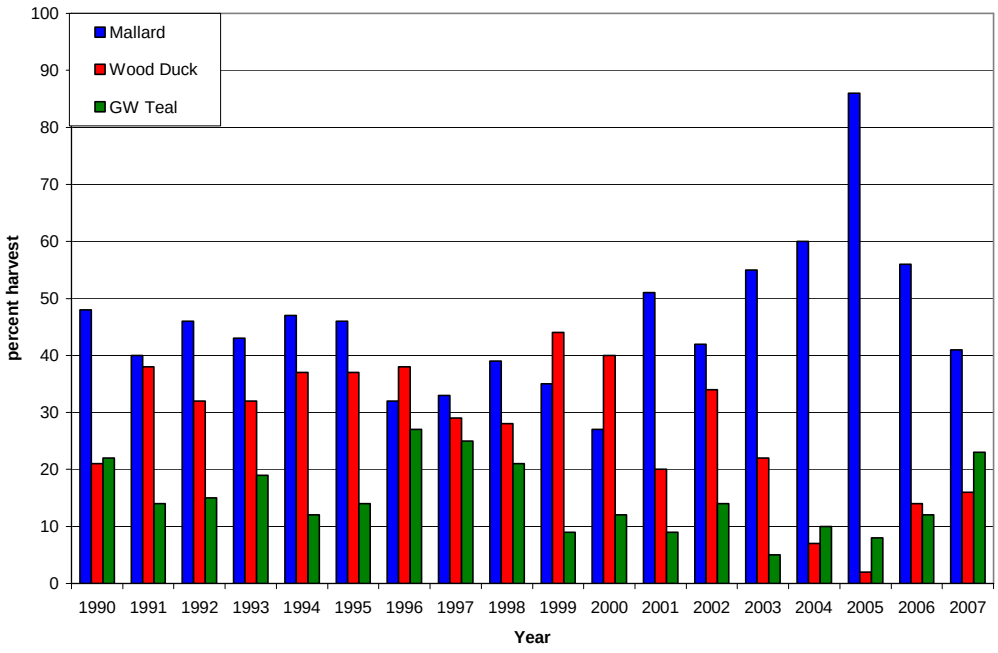


Figure16: The percent harvest of mallards, wood ducks, and green-winged teal on opening day at the Satus Wildlife Area from 1990 through 2007.

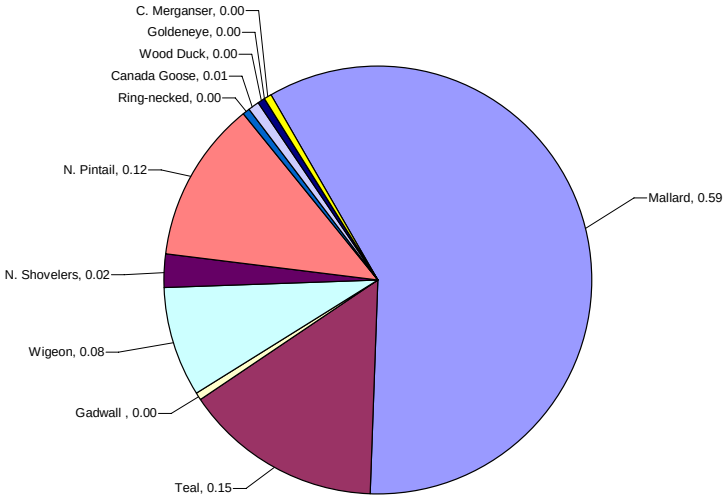


Figure17: The composition of waterfowl harvested on South Lateral A during the 2007 hunting season.

Inventorying Birds

With the help of the Yakima Audubon Society, we began inventorying birds found on 5 properties managed by the Yakama Nation Wildlife Resource Management Program. 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 seen ranged between 6 and 66 per visit. The highest total number of species observed is found on the South Lateral A property (Figure 18) on the Satus property. This is probably a result of the diverse habitat found on this property and this property has had more restoration efforts than the other properties. The lowest number of species observed occurred on Campbell Road property. 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.

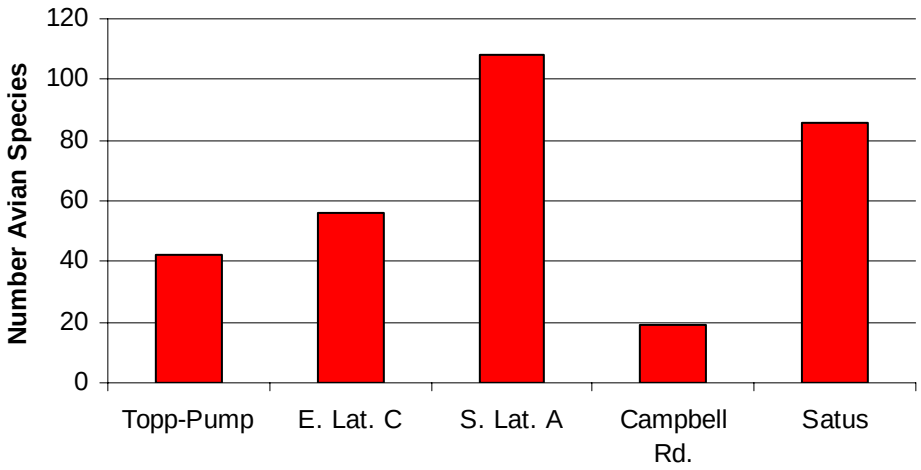


Figure 18: Number of species found on Toppenish-Pumphouse (Topp-Pump), East Lateral C (E. Lat. C), South Lateral A (S. Lat. A), Campbell Road (Campbell Rd.) and Satus Wildlife Area (Satus) properties

Appendix A: List of the species observed on the Toppenish-Pumphouse Management unit on the Yakama Reservation by Yakima Audubon Society volunteers.

Species	Scientific Name
Mallard	*Anas platyrhynchos*
Ring-necked Pheasant	*Phasianus colchicus*
California Quail	*Callipepla californica*
Great Blue Heron	*Ardea herodias*
Turkey Vulture	*Cathartes aura*
Northern Harrier	*Circus cyaneus*
Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Sora	*Porzana carolina*
Killdeer	*Charadrius vociferus*
Wilson's Snipe	*Gallinago delicata*
Rock Pigeon	*Columba livia*
Mourning Dove	*Zenaida macroura*
Barn Owl	*Tyto alba*
Belted Kingfisher	*Ceryle alcyon*
Northern Flicker	*Colaptes auratus*
Say's Phoebe	
Western Kingbird	*Tyrannus verticalis*
Black-billed magpie	*Pica pica*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Tree Swallow	*Tachycineta bicolor*
Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*

Black-capped Chickadee	*Poecile atricapillus*
House Wren	*Thryomanes*
Bewick's Wren	*Thryomanes*
Ruby-crowned Kinglet	*Regulus calendula*
American Robin	*Turdus migratorius*
European Starling	*Sturnus vulgaris*
Yellow Warbler	
Yellow-rumped Warbler	*Dendroica coronata*
Common Yellowthroat	*Geothlypis trichas*
Savannah Sparrow	*Passerculus sandwichensis*
Song Sparrow	*Melospiza melodia*
White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Red-winged Blackbird	*Agelaius phoeniceus*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
House Finch	*Carpodacus mexicanus*
American Goldfinch	*Carduelis tristis*

Appendix B: List of the species observed on the East Lateral C Management unit on the Yakama Reservation by Yakima Audubon Society volunteers.

Species	Scientific Name
Wood Duck	*Aix sponsa*
Mallard	*Anas platyrhynchos*
Cinnamon Teal	*Anas cyanoptera*
Northern Pintail	*Anas acuta*
Ring-necked Pheasant	*Phasianus colchicus*
California Quail	*Callipepla californica*
Great Blue Heron	*Ardea herodias*
Turkey Vulture	*Cathartes aura*
Cooper's Hawk	*Accipiter cooperii*
Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
Killdeer	*Charadrius vociferus*
Wilson's Snipe	*Gallinago delicata*
Mourning Dove	*Zenaida macroura*
Great Horned Owl	*Bubo virginianus*
Belted Kingfisher	*Ceryle alcyon*
Downy Woodpecker	*Picoides pubescens*
Northern Flicker	*Colaptes auratus*
Western Wood-Pewee	
Pacific-slope Flycatcher	
Eastern Kingbird	*Tyrannus tyrannus*
Black-billed magpie	*Pica pica*
Common Raven	*Corvus corax*
Tree Swallow	*Tachycineta bicolor*
Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*
Black-capped Chickadee	*Poecile atricapillus*
House Wren	
Bewick's Wren	*Thryomanes bewickii*
Marsh Wren	*Cistothorus palustris*
Ruby-crowned Kinglet	*Regulus calendula*
American Robin	*Turdus migratorius*
European Starling	*Sturnus vulgaris*
Orange-crowned Warbler	*Vermivora celata*
Townsend's Warbler	
Spotted Towee	*Pipilo maculatus*
Chipping Sparrow	
Lark Sparrow	
Savannah Sparrow	*Passerculus sandwichensis*
Fox Sparrow	

Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	
White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Dark-eyed Junco	*Junco hyemalis*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Lazuli Bunting	
Red-winged Blackbird	*Agelaius phoeniceus*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Brown-headed Cowbird	*Molothrus alter*
Bullock's Oriole	
House Finch	*Carpodacus mexicanus*
American Goldfinch	*Carduelis tristis*

Appendix C: List of the species observed on the South Lateral A Management unit on the Yakama Reservation by Yakima Audubon Society volunteers.
116 species

Species	Scientific Name
Greater-White Fronted	*Anser albifrons*
Snow Goose	*Chen caerulescens*
Canada Goose	*Branta canadensis*
Cackling Canada Goose	
Mute Swan	*Cygnus Olor*
Trumpeter Swans	*Cygnus buccinator*
Tundra Swan	*Cygnus columbianus*
Wood Duck	*Aix sponsa*
Gadwall	*Anas strepa*
American Wigeon	*Anas americanus*
Mallard	*Anas platyrhynchos*
Blue-winged Teal	*Anas discors*
Cinnamon Teal	*Anas cyanoptera*
Northern Shovler	*Anas clypeata*
Northern Pintail	*Anas acuta*
Green-winged Teal	*Anas crecca*
Ring-necked Duck	*Aythya collaris*
Greater Scaup	*Aythya marila*
Lesser Scaup	*Aythya affinis*
Bufflehead	*Bucephala albeola*
Common Goldeneye	*Bucephala clangula*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Ruddy Duck	*Oxyura jamaicensis*
Ring-necked Pheasant	*Phasianus colchicus*
California Quail	*Callipepla californica*
Pied-billed Grebe	*Podilymbus podiceps*
Horned Grebe	*Podiceps auritus*
American White Pelican	*Pelecanus erythrorhynchos*
Double-crested Cormorant	*Phalacrocorax auritus*
American Bittern	*Botaurus lentiginosus*
Great Blue Heron	*Ardea herodias*
Great Egret	*Ardea alba*
Black-Crowned Night-heron	*Nycticorax nycticorax*
White-faced Ibis	*Plegadis chihi*
Turkey Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*

Cooper's Hawk	*Accipiter cooperii*
Red-tailed Hawk	*Buteo jamaicensis*
Rough-legged Hawk	*Buteo lagopus*
American Kestrel	*Falco sparverius*
Peregrin Falcon	*Falco peregrinus*
Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
American Coot	*Fulica Americana*
Sandhill Crane	*Grus canadensis*
Killdeer	*Charadrius vociferus*
Black-necked Stilt	*Himantopus mexicanus*
American Avocet	*Recurvirostra americana*
Spotted Sandpiper	*Actitis macularia*
Dunlin	*Calidris alpina*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Wilson's Snipe	*Gallinago delicata*
Ring-billed Gull	*Larus delawarensis*
Black Tern	*Chlidonias niger*
Rock Pigeon	*Columba livia*
Mourning Dove	*Zenaida macroura*
Barn Owl	*Tyto alba*
Great Horned Owl	*Bubo virginianus*
Long-eared Owl	*Asio otus*
Short-eared Owl	*Asio flammeus*
Common Nighthawk	*Chordeiles minor*
Belted Kingfisher	*Ceryle alcyon*
Downy Woodpecker	*Picoides pubescens*
Northern Flicker	*Colaptes auratus*
Western Kingbird	*Tyrannus verticalis*
Eastern Kingbird	*Tyrannus tyrannus*
Loggerhead Shrike	*Lanius ludovicianus*
Black-billed magpie	*Pica pica*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallows	*Tachycineta thalassina*
Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*
Black-capped Chickadee	*Poecile atricapillus*
Bewick's Wren	*Thryomanes bewickii*
Marsh Wren	*Cistothorus palustris*
Ruby-crowned Kinglet	*Regulus calendula*
American Robin	*Turdus migratorius*
European Starling	*Sturnus vulgaris*
American Pipit	*Anthus rubescens*

Orange-crowned Warbler	*Vermivora celata*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Yellow-rumped Warbler	*Dendroica coronata*
Common Yellowthroat	*Geothlypis trichas*
Western Tanager	*Piranga ludoviciana*
Spotted Towee	*Pipilo maculatus*
Savannah Sparrow	*Passerculus sandwichensis*
Song Sparrow	*Melospiza melodia*
White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Dark-eyed Junco	*Junco hyemalis*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Bobolink	*Dolichonyx oryzivorus*
Red-winged Blackbird	*Agelaius phoeniceus*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Brewer's Blackbird	*Euphagus carolinus*
Brown-headed Cowbird	*Molothrus alter*
House Finch	*Carpodacus mexicanus*
American Goldfinch	*Carduelis tristis*
House Sparrow	*Passer domesticus*

Appendix D: List of the species observed on the Campbell Road Management unit on the Yakama Reservation by Yakima Audubon Society volunteers.

Species	Scientific Name
Gadwall	*Anas strepa*
Mallard	*Anas platyrhynchos*
Northern Harrier	*Circus cyaneus*
Red-tailed Hawk	*Buteo jamaicensis*
Rock Pigeon	*Columba livia*
Mourning Dove	*Zenaida macroura*
Vaux's Swift	
Black-billed magpie	*Pica pica*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
N. Rough-winged Swallow	*Tachycineta*
Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*
Black-capped Chickadee	*Poecile atricapillus*
American Robin	*Turdus migratorius*
European Starling	*Sturnus vulgaris*
Common Yellowthroat	*Geothlypis trichas*
Red-winged Blackbird	*Agelaius phoeniceus*
Brown-headed Cowbird	*Molothrus alter*

Appendix E: List of the species observed on the Satus Management unit on the Yakama Reservation by Yakima Audubon Society volunteers.

Species	Scientific Name
Canada Goose	*Branta canadensis*
Wood Duck	*Aix sponsa*
Gadwall	*Anas strepa*
Mallard	*Anas platyrhynchos*
Cinnamon Teal	*Anas cyanoptera*
Northern Shovler	*Anas clypeata*
Green-winged Teal	*Anas crecca*
Ring-necked Pheasant	*Phasianus colchicus*
California Quail	*Callipepla californica*
Pied-billed Grebe	*Podilymbus podiceps*
American White Pelican	*Pelecanus erythrorhynchos*
Double-crested Cormorant	*Phalacrocorax auritus*
American Bittern	*Botaurus lentiginosus*
Great Blue Heron	*Ardea herodias*
Great Egret	*Ardea alba*
Black-Crowned Night-heron	*Nycticorax nycticorax*
Turkey Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Virginia Rail	*Rallus limicola*
American Coot	*Fulica Americana*
Sandhill Crane	*Grus canadensis*
Killdeer	*Charadrius vociferus*
Black-necked Stilt	*Himantopus mexicanus*
American Avocet	*Recurvirostra americana*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Spotted Sandpiper	*Actitis macularia*
Least Sandpiper	*Calidris minutilla*
Wilson's Snipe	*Gallinago delicata*
Mourning Dove	*Zenaida macroura*
Great Horned Owl	*Bubo virginianus*
Vaux's Swift	*Chaetura vauxi*
Belted Kingfisher	*Ceryle alcyon*
Downy Woodpecker	*Picoides pubescens*

Northern Flicker	*Colaptes auratus*
Western Wood-pewee	*Contopus sordidulus*
Willow Flycatcher	*Empidonax traillii*
Western Kingbird	*Tyrannus verticalis*
Eastern Kingbird	*Tyrannus tyrannus*
Loggerhead Shrike	*Lanius ludovicianus*
Cassin's Vireo	*Vireo cassinii*
Warbling Vireo	*Vireo gilvus*
Black-billed magpie	*Pica pica*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Tree Swallow	*Tachycineta bicolor*
N. Rough-winged Swallow	*Stelgidopteryx serripennis*
Bank Swallow	*Riparia riparia*
Barn Swallow	*Hirundo rustica*
Black-capped Chickadee	*Poecile atricapillus*
Red-breasted Nuthatch	*Sitta canadensis*
Bewick's Wren	*Thryomanes bewickii*
House Wren	*Troglodytes aedon*
Marsh Wren	*Cistothorus palustris*
Ruby-crowned Kinglet	*Regulus calendula*
American Robin	*Turdus migratorius*
Gray Catbird	*Dumetella carolinensis*
European Starling	*Sturnus vulgaris*
Cedar Waxwing	*Bombycilla cedrorum*
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped Warbler	*Dendroica coronata*
Townsend's Warbler	*Dendroica townsendi*
MacGillivray's Warbler	*Oporomis tolniei*
Common Yellowthroat	*Geothlypis trichas*
Western Tanager	*Piranga ludoviciana*
Savannah Sparrow	*Passerculus sandwichensis*
Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	*Melospiza lincolnii*
White-throated Sparrow	*Zonotrichia albicollis*
White-crowned Sparrow	*Zonotrichia leucophrys*
Red-winged Blackbird	*Agelaius phoeniceus*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Brown-headed Cowbird	*Molothrus alter*
House Finch	*Carpodacus mexicanus*
American Goldfinch	*Carduelis tristis*

Cultural and Archaeological Resources Report
By
Jon D. Shellenberger
YN Wildlife Archaeologist

The Yakama Nation Wetlands and Riparian Restoration Project in FY 2008 continued to acquire new land holdings. In order to achieve the required ecological benefits of wetlands restoration on these land holdings all ground disturbing project activities utilizing federal funding require Section 106 compliance under the National Historic Preservation Act of 1966 (NHPA) as amended and the National Environmental Policy Act (NEPA) of 1971. The Yakama Nation has passed similar Tribal resolutions (T-66-84 & T-92-87) for the protection of its archaeological and cultural resources within the Yakama Nation's Reservation boundaries. The primary goal 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 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 protection and preservation of this type of cultural resource through enhancement of its natural resources. Cultural resource use continues to have priority over all other types of use on Reservation lands. This compliance requires a professional archaeologist meeting the qualifications of the Secretary of the Interior's professional standards. This fiscal year marks the start of Jon D. Shellenberger as the new Wetlands and Riparian Restoration Archaeologist as of August 2007.

Archaeological field investigations and monitoring in FY 2007 were conducted on the Lionel Graves Property, Carl Property, Davis, and Meninick Properties. In addition, to

better acquaint Mr. Shellenberger with our managed lands, as well as update the current system, he has begun to build upon the GIS database of cultural sites, for previously and recently recorded sites, as well as a register for sites on our project properties. Site forms are also being created for new sites and for those without a site form. The goals for compiling this database are specific to not only site inventory and mitigation, but also contribute to the understanding of historical human land use patterns within the context of wetland and riparian restoration.

Lionel Graves Property

Stone Pestle

The cultural resource inventory and survey of the Lionel Graves Property was completed this year. We performed an extensive pedestrian survey of the property using a professional survey methodology that included transect intervals of three meters or ten feet between crew members over 100% percent of the property. All exposed ground was carefully examined for evidence of past human modification and included all areas of ground disturbance and wherever visibility afforded us an unobstructed view of the ground. This includes animal burrows, and cutbank surfaces. In all of the areas that we examined there is an abundance of the noxious weeds and weed control methods should be taken immediately to prevent further expansion of this weed. Erosion as a result of the massive head cutting by Toppenish Creek and flooding as a result of an undersized culvert will be remedied this next fiscal year with the Mid Toppenish Creek

Undersized culvert

Restoration Project. This project, led by YN Fisheries, will include the removal of the culvert to be replaced by four grade control structures which will promote fish passage during low flow and additionally heighten the level of the creek to near historic levels. The goal is to return this property's water level to its historic condition in order to promote growth of native plant species and prevent further erosion that could possibly disturb cultural properties. As a result of this cultural resource inventory and survey we have found a precontact stone tool, lithic flake and a historic homestead. According to the YN Atlas of Cultural Places there are two additional sites including a village and burial. Due to the frequent flooding that has occurred throughout time, the sites were most likely submerged in within the depositional layers. This property has been used for agricultural activities since at least the 1920s and has been subject to frequent plowing and animal grazing. We therefore recommend that wildlife restoration activities continue on the property with cultural resource monitoring as directed by the Yakama Nation's Natural Resource Management Plan.

Carl Property

Historic house

The cultural resource inventory and survey of the Carl Property was completed in January. We performed an extensive pedestrian survey of the property using a professional survey methodology that included transect intervals of three meters or ten feet between crew members over 60 percent of the 160 acre property. All exposed ground was carefully examined for evidence of past human modification and included all areas of ground disturbance and wherever visibility afforded us an unobstructed view of the ground. As a result of this cultural resource inventory and survey we have found no evidence of prehistoric utilization of the property but did locate an historic farmstead. We note that the property has been used for agricultural purposes since at least the 1920s and has been subject to irrigation and plowing over the past century. The historic farmstead (barn and house) was surveyed using the Historic

American Buildings survey (HABS) and was found as ineligible for inclusion in the National Register of Historic Places. Furthermore, due to its condition and potential hazard to YN employees, the structures were torn down; the parts of which were used to meet the restoration goals of the program. We therefore recommend that the wildlife restoration program continue to utilize the Carl property for wetland restoration activities as directed by the Yakama Nation's Natural Resource Management Plan and the Yakama Nation's Wildlife Resource program.

Historic barn

Meninick Property

Blown-out dike

Restoration work continued on the Meninick Propery with the implementation of the Meninick Property Restoration Project. This project was funded through a North American Wetlands Conservation Act grant awarded this past fiscal year. The goal of the project was to connect an old side channel of the Yakima River that had been disconnected by an old US Army Corps of Engineers dike that had blown out during the last major floodseason. The dike was recconnected to permit vehicle access but would allow the free flow of water during floods. We conducted a pedestrian survey over 100% of project area and encountered no evidence of prehistoric use within the Area of Potential Affect (APE). We reccommended that the activities commence as directed by the Yakama Nation's Natural Resource Management Plan and the Yakama Nation's Wildlife Resource program.

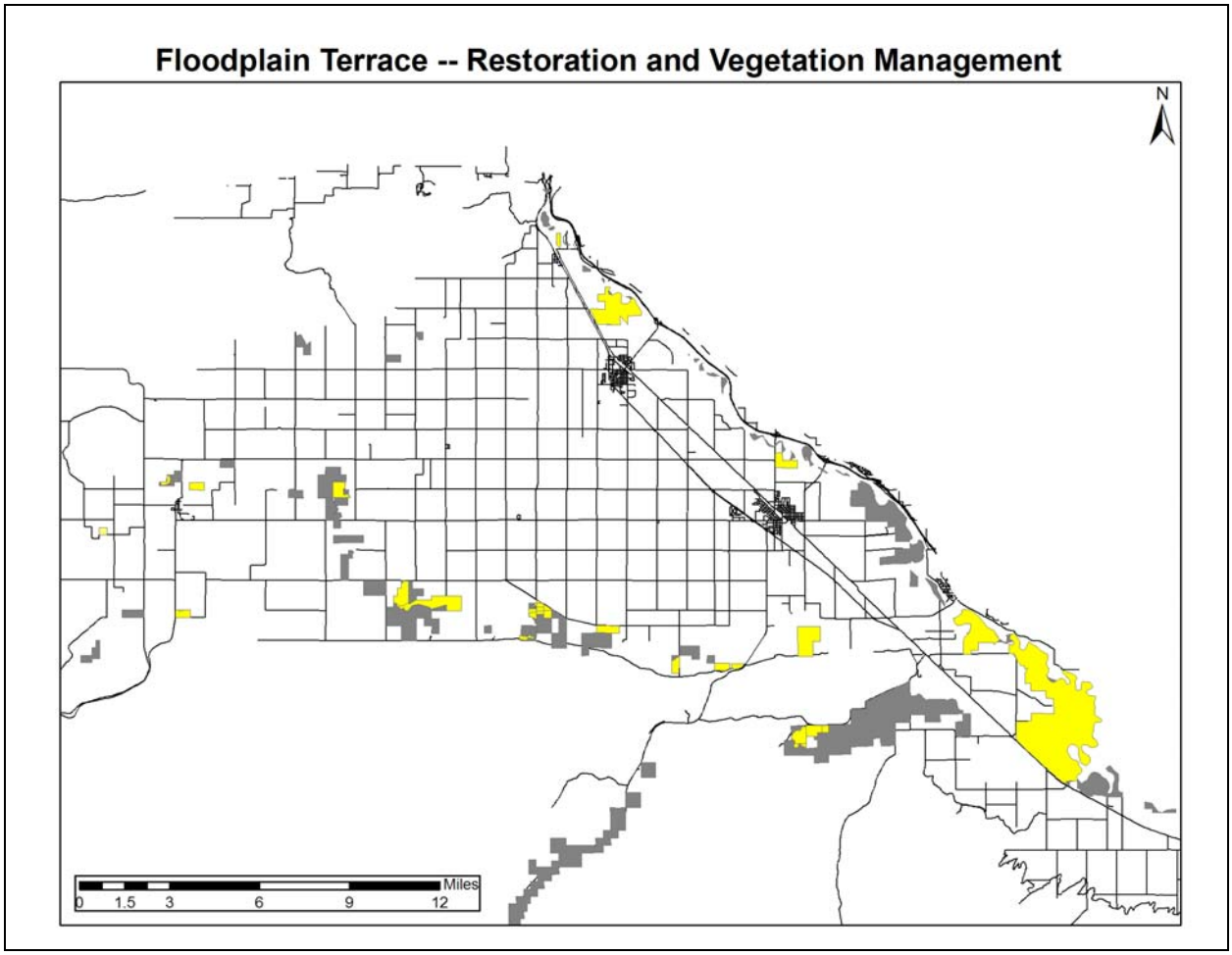
Drill seeder

Lower Satus Wildlife Area

Plant restoration continued this fiscal year with the Tule Road Restoration Project, led by Katrina Strathmann. This project included the drill seeding of 112 acres on the Tule Rd. portion of the Lower Satus Wildlife Area. While this property had been farmed since at least the 1920s, the APE is in a high prbability area for inadvertant finds. According to the YN Atlas of Cultural Places, a previsouly recorded site (slide burial) is located on the property. We conducted a pedestrian survey over 100% of the project area. As a result of our survey we did not encounter evidence of prehistoric use. We reccommended a 100 ft buffer for the previously recorded site and that the project activities commence as directed by the Yakama Nation's Natural Resource Management Plan and the Yakama Nation's Wildlife Resource program.

Floodplain Terrace Restoration and Vegetation Management

Vegetation management in the project area includes (1) floodplain terrace restoration activities and (2) project-wide weed management activities. This portion of the report covers both types of vegetation management activities.



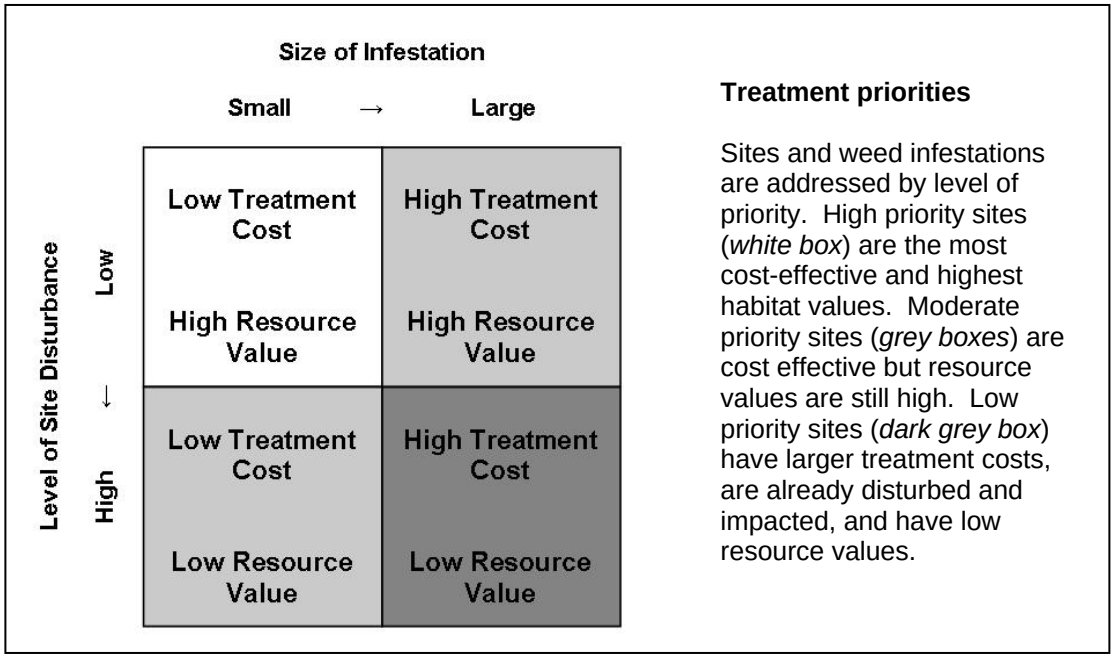
Yellow areas on the map indicate sites where terrestrial vegetation management (project-wide weed control, site preparation or revegetation) activities occurred during the April 2007 - March 2008 project year. Grey areas indicate all properties currently managed under the project.

Invasive Plant Control

Noxious weeds are one of the primary threats to terrestrial habitats under this project, and thus weed management is a focal maintenance activity. General noxious weed control is one of the most cost-effective methods of protecting habitats from degradation. Weed management is a broad approach to protecting and restoring habitats for wildlife. In remote areas or relatively undisturbed areas, weed management includes treatment of noxious weed populations as they are located, or as they occur, and preventing weed

populations from expanding into uninfested areas. Where habitats have high resource values, such as riparian corridors and wildlife movement corridors, but where the habitats are moderately to severely degraded, weed management is achieved through habitat restoration to native species that assist with long-term suppression of noxious weeds.

Our approach to prioritizing weed management is summarized by the chart below.



Weed treatments are selected based on site conditions and weed species' biology. Weed treatments include the following activities.

Chemical treatment – Herbicide treatments (used in accordance with BPA policies on herbicides and adjuvants) are generally highly effective and more cost-effective than mechanical or manual methods for many species. Weed suppression may require 1-5 years of treatment to eliminate weed infestations. Due to the location of floodplain and riparian habitats of the current 21,000 project acres within a larger agricultural setting, ongoing surveys and weed treatment of new infestations is required.

Habitat restoration – Restoration includes reintroduction of native species that assist with suppression of noxious weed species. Restoration requires a higher short-term cost input than chemical treatment, but results in lower long-term maintenance costs. Restoration typically requires a minimum five-year investment to reach weed suppression. Restoration is addressed in detail under the heading "Vegetation Restoration for Weed Suppression".

Grazing management – Grazing includes weed suppression using domestic livestock in areas where habitat restoration in the short-term is not feasible. For example, a property infested with noxious weeds that requires hydrologic

restoration is a good candidate for grazing management. When hydrologic features are improved, resulting in higher water table, habitat restoration is feasible. In the interim, grazing management is a very cost-effective tool to prevent noxious weeds from expanding. Grazing management prescriptions are developed and local ranchers selected to implement prescriptions at no cost.

In 2007, project-wide invasive plant control took place on approximately 4,097 acres. This included use of herbicide spray, mowing and use of domestic livestock to suppress invasive plants. All herbicide spraying was approved and reported through the BPA herbicide reporting process.

Habitat Restoration Approach

The Yakama Nation Wildlife Program focuses on creating sustainable native habitat that provides a variety of wildlife, cultural and natural resource values. Terrestrial vegetation restoration occurs on an estimated 500-1,000 acres per year within the project area. Intensive restoration activities require approximately five years of higher labor and materials costs, followed by smaller maintenance costs needed to prevent reinfestation of noxious weeds.

Sites vary widely in their hydrology and vegetation. Properties also vary in their use history; some properties were homesteads, others were farmed and still others were grazed or used as stockyards. The broad steps involved are site preparation, weed control, revegetation with grasses, and reintroduction of forbs and shrubs. The methods used are selected to reduce initial construction costs as well as long-term maintenance costs.

Pre-planting weed control typically occurs for 1-3 years to control or suppress weed species required to allow native plant establishment. Native grasses adapted to particular site conditions are seeded using rangeland drills in the fall prior to rains. Genetically local seed sources of Basin wildrye (*Elymus cinereus*), bluebunch wheatgrass (*Pseudoregneria spicata*), and squirreltail (*Elymus elymoides*) are available; these species were collected from the Reservation and are propagated as a seed crop by a regional seed producer. Pheasants Forever provides funding for purchase of native grass seed. Post-planting weed control generally is required for 1-2 years 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.

Site preparation

- removal of structures, debris and interior fences
- construction of interior or exterior fences to exclude trespass cattle
- removal of invasive trees that prevent restoration

Weed control

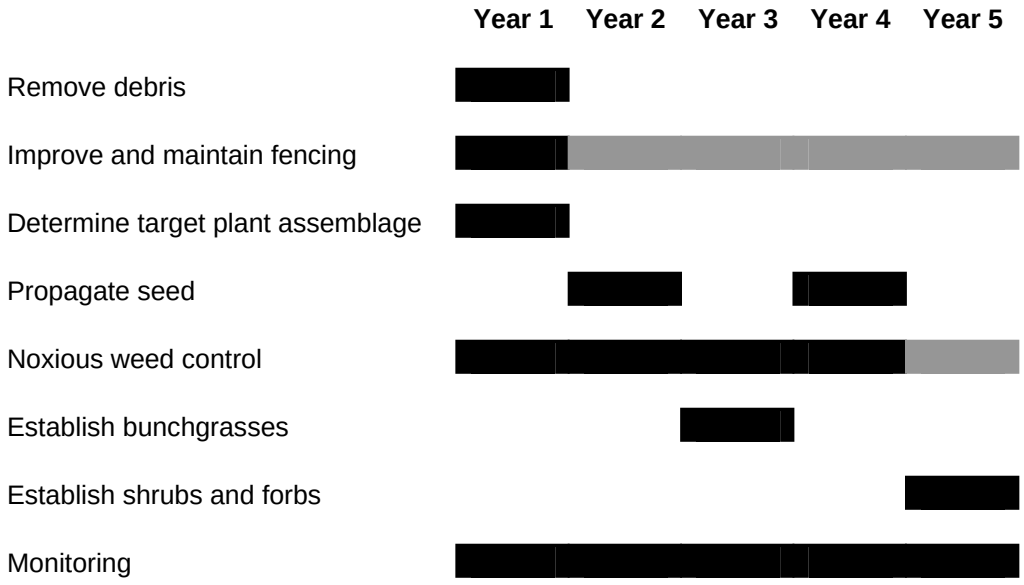
- weed control prior to revegetation
  1-3 years pre-treatment for perennial/difficult to control weeds
  1 year treatment for annual weeds
- weed control after revegetation
  1-3 years treatment during grass establishment to control broadleaf weeds.
- includes mowing, disking, broadcast spray of herbicides and hand spray of herbicides.

Revegetation

- native bunchgrasses are introduced after weeds are successfully suppressed
- native forbs and shrubs are introduced after grass establishment is successful
- grasses and shrubs grow very slowly in our region (6-9" average precipitation), especially with deeper water tables'

The table below illustrates the average timeline for floodplain terrace restoration projects:

RESTORATION TIMELINE



Terrestrial vegetation restoration activities occurred on approximately 1,078 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 (seeding and planting native bunchgrasses and shrubs).

Bailey
Buena
Carl
Garcia
North Buck Little
North White Swan
Pumphouse Road
South Lateral A

Tilman
Tule Road (2006 site)
Tule Road (2007 site)

Debris removal occurred on approximately 230 acres of the project area, including removing old homesites, structures and non-native trees. A contractor was employed to complete this site preparation work. Properties treated during the 2007 year are:

Garcia
Tilman
Carl

Site-specific weed treatments to prepare for restoration were conducted at least once on approximately 650 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.

Figure 1. Photograph of Tule Road restoration before treatment in spring 2006.

Figure 2. Photograph of Tule Road restoration in spring 2007 following one year of invasive plant treatment and direct seeding of native bunchgrasses. Small plants are germinating basin wildrye (Leymus cinereus), approximately 7 months after planting.

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. In 2007, squirreltail (*Elymus elymoides*) was collected and provided to a local grower for seed increase purposes; that crop is being augmented in 2008. Pheasants Forever provided 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 are 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.

In September and October 2007, 66 acres were replanted with native grass seed. At the South Lateral A property property, 30 acres were planted with a mix of basin wildrye, Sandberg's bluegrass (*Poa secunda*) and bluebunch wheatgrass using a no-till drill. At the North White Swan property, 33 acres were seeded 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.

Figure 4. New grasses germinating in March 2007 at the Pumphouse Road property, approximately seven months following seeding.

Figure 5. Fence installed at the North White Swan property to prevent trespass cattle from damaging riparian vegetation and restoration project.

Monitoring Vegetation Restoration Sites

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

Ashue Road/Mid-Toppenish Creek
Carl
Olney Drain
Dan Olney
Satus Corridor along Highway 97

Wanity Slough
Graves

Photomonitoring was continued at vegetation restoration sites on properties: Old Goldendale, and West Plank/Tule Road. Permanent photomonitoring points were established in spring and summer 2005 and 2006. 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. Following is an example of photomonitoring data that has been collected. Each site has photomonitoring sites set up in a similar fashion. To date, nine sites have photomonitoring points established.

West Plank – Tule Road Restoration 2006 – PHOTOMONITORING POINTS

All points are in magnetic north. Camera used is Fuji s5100, full wideangle lens.
Projected Coordinate System:
NAD_1983_StatePlane_Washington_South_FIPS_4602_Feet
Projection: Lambert_Conformal_Conic.
Initial photos taken 4-7-2006.

Point 1 – Standing at the base of the power/phone pole to the south of the house at the end of Tule Road.

Y_PROJ	X_PROJ
343233.22281707	1692681.73554716

1A – 260 degrees. Looking West to the knob on the South side of Toppenish Ridge.

1B – 224 degrees. Looking SW to the phone pole in the SW portion of the nearest (western) field.

Vegetation monitoring was conducted for new hydrologic and vegetation restoration to evaluate vegetation response of projects in summer and fall 2006. Monitoring focused on establishment of native bunchgrasses to suppress invasive plants and improve habitat. During the 2007 season, Pumphouse Road and Tule Road sites were surveyed. A systematic survey method that uses temporary, random sampling locations allows for rapid surveys, easy repeatability, and good interpretation of results across an entire site. Below is summarized native bunchgrass establishment data.

Figure 1. Percent germination of three species seeded at Pumphouse Road and Tule Road sites: LECI (*Leymus cinereus*, basin wildrye), POSE (*Poa secunda*, Sandberg's bluegrass), and DISP (*Distichlis spicata*, saltgrass). The three species were seeded at different rates in pounds of pure live seed per acre: LECI 80%, POSE 10%, DISP 10%. The same seed mix was used at both sites. Monitoring occurred in spring 2007 approximately 7 months after fall 2006 seeding.

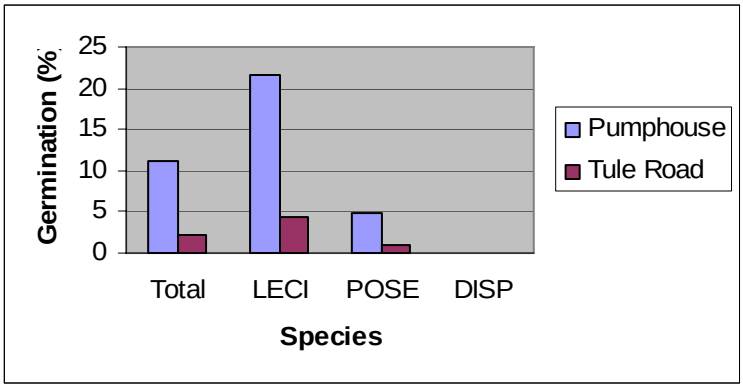


Figure 2. Number of native bunchgrass plants per meter squared germinating approximately 7 months after fall 2006 seeding.

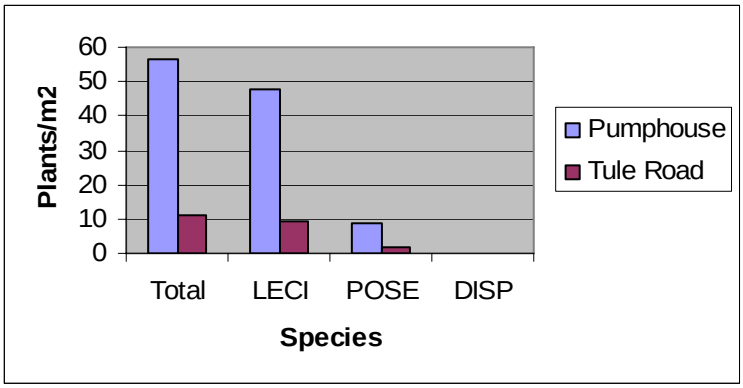
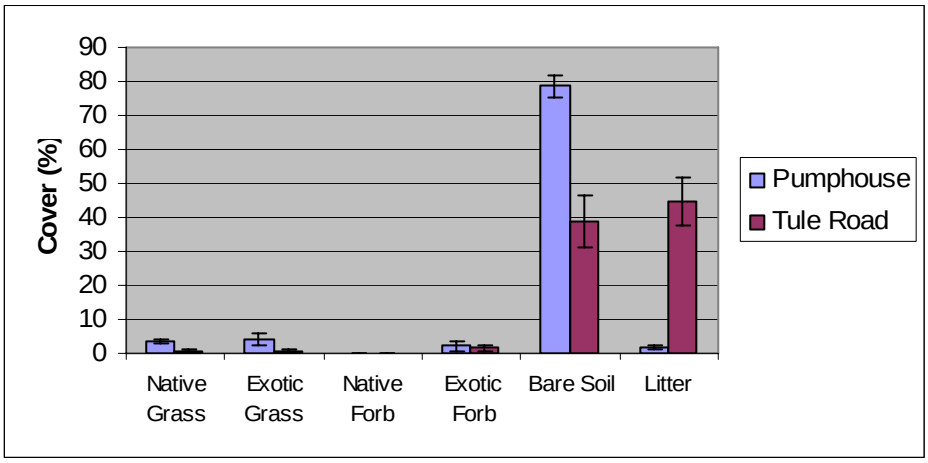


Figure 3. Percent cover of major vegetation and groundcover guilds at Pumphouse Road and Tule Road sites, seven months following seeding of native bunchgrasses.



Ecological Characterization of Yakama Nation Riparian Restoration Sites on the Wapato Floodplain of the Yakima River Basin, Washington
Phase 2
Final Report Summary

March 2008

Anthony Gabriel, David Cordner and Ben Sainsbury
Geo-Ecology Research Group, Center for Spatial Information
Central Washington University, Ellensburg, WA

Introduction

Monitoring the successes and failures of riparian restoration techniques is rarely conducted even though millions of dollars are spent annually on these activities (Bernhardt et al. 2005). The overall goal of this project is to provide the Yakama Nation with the tools necessary to better make these management decisions. 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.

In this project, the Geo-Ecology Research Group (GRG) at Central Washington University produced a digital map portfolio that provides an ecological characterization/inventory of existing and potential restoration sites along the Toppenish, Satus Creek and Yakima River annexation corridors (as indicated in Fig.1). This digital map portfolio includes maps and aerial photographs divided into various sections along these corridors, and also explored how to incorporate General Land Office historic maps into a GIS (focusing on a pilot restoration site). In addition, the GRG developed an internet mapping service (IMS) for Yakama Nation Wildlife that provides better agency and possibly public access to the ecological restoration site data collected and synthesized in Phase 1 of this project. Existing Yakama Nation Wetlands and Riparian Restoration Project data were processed and optimized for delivery over the internet.

Both the digital map portfolio and development of the web based IMS will assist Yakama Nation Wildlife Resource Management Program with ongoing monitoring and reporting of their extensive riparian restoration efforts, as well as prioritizing future restoration efforts and land purchases along the Yakima River and surrounding floodplain reaches on Toppenish and Satus Creeks. As living documents, these critical resources will also be readily updated as new information and aerial photos become available, making them a valuable monitoring tool.

Yakama Nation Restoration Corridor Atlas

The information gathered for the Yakama Nation Restoration Corridor Atlas was principally mapped 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. 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) (Bastedo et al. 1984). The resulting inventory of existing and potential restoration sites 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.***

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.
- United States Fish and Wildlife Service. (2003). National Wetlands Inventory Data (wetland types and hydroperiods).
- Washington Department of Fish and Wildlife (2004). Priority Habitats and Species, StreamNet and Natural Heritage Site databases
- Washington State Department of Fish and Wildlife. (1997). GAP Species Data (modified by and received from Yakima County).
- Interior Columbia Basin Ecosystem Management Project. (1995). Potential Natural Vegetation.
- Washington State Department of Natural Resources. (1996). Digital 1:24,000-scale Transportation (Roads and Railroads) of Washington.
- United States Census Bureau. (2000). Census TIGER® 2000/ Line Data; Railroads. Data retrieved 2004 from www.geographynetwork.com.
- Washington Department of Ecology. (1998). 303(d) Listings.
- Washington State Department of Ecology. (1998). DOE Facilities.
- Washington State Department of Ecology. (2004). Leaking Storage Tanks.

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. 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). 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 data themes in the electronic map portfolio are divided into divided into 3 main published map files (pmfs) based on the following themes:

- Abiotic (*Yakama_Atlas_A.pmf*)
- Biotic (*Yakama_Atlas_B.pmf*)
- Constructed modifications (*Yakama_Atlas_C.pmf*)

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 three pilot field assessment sites: Lower Satus, North Meninick and Wanity Slough. These pilot data include field notes, gates, roads, fences, vegetation polygons and ground photos; these data were included with their pertinent theme.

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, 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 (Fig. 2). Once YakReader has been successfully installed, users are able to navigate to one of the three data/map folders. 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. 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 format 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'.

The Yakama Nation Restoration Corridor Atlas includes many changes and improvements in respect to the first phase of this project, including:

1) extension of Abiotic, Biotic, and Constructed map layers and aerial photo coverage from individual sites to include the Satus Creek, Toppenish Creek and Yakima River restoration corridors (including modification of associated symbology);
2) creation of restoration corridor boundaries and 1-mile buffer polygons;
3) addition of an USGS 1:24,000 topographic layer with embedded relief;
4) addition of 1968 aerial photos, with coverage of the northern portion of Yakima annexation and eastern portion of Toppenish corridor;
5) extension of coverage of 1949 and 1992 aerial photos in the Eastern Toppenish restoration corridor;
6) extension of coverage of 1947 aerial photos in Western Toppenish restoration corridor;
7) extension of coverage of 2002 aerial photos in Toppenish restoration corridor.
8) addition of smaller-scale primary hydrology and transportation layers;
9) subdivision of road symbology into first, second and third order categories;
10) inclusion of BIA soil coverage for the Satus Creek restoration corridor; and
11) updates of data storage to ESRI ArcGIS 9.2 personal geodatabase.

We have also included a soil layer symbolizing runoff rates. The three categories of this layer: slow, medium, and rapid runoff rates are generalized from the 10 possible values in the NRCS soils layers. A lookup table was used to perform this generalization and is included in the geodatabase.

A special effort was made to centralize data in the Top_Sat geodatabase. The database includes all vector data of point, polygon and polyline geometry, raster data in the form of raster datasets and raster catalogs and additional lookup tables for zoning, NWI wetland flood type, and Land Use Land Code (LULC). The raster catalogs included in the database are in the form of unmanaged raster catalogs. The term 'unmanaged' refers to the way in which the rasters are stored. While a managed raster catalog converts imagery to .img files and names them cryptically according to order of import and hides them in a .idb folder next to the geodatabase, an unmanaged raster catalog allows for the storage of rasters in their native form, name and folder and merely stores the file pathname in the geodatabase, thereby mimicking the behavior of a managed raster catalog (see Fig. 3). The unmanaged method greatly simplifies the alternate use or transferral of the rasters outside of the project. Raster catalogs also make use of wireframes for small-scale display.

Upon initial loading of the map projects the user will notice a blue polygon behind the vector data - this 'footprint' polygon is an indication of the extent of the aerial photos that it corresponds to. Most aerial photo layers are set to turn on when zoomed in beyond 1:100,000 with the USGS topographic map layer and 1996 aerial photos appearing at small-scale. For the purpose of the current project - the abiotic, biotic and constructed maps will open with the 2005 aerial photos turned on.

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, 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. Please keep in mind that when using SyncMap, the auto refresh button must be checked for changes to occur in all map panels and if all panels do not refresh, click the right mouse button to push these settings through.

Changes to the SyncMap portion of this year's project include the extensions of aerial photo coverage outlined above as well as the addition of General Land Office (GLO) Historic Survey maps for the years 1866, 1874, 1885, 1931 and 1932. Being a pilot application of using this historic map layer, GLO coverage is limited to Township 10, Range 21

Data Delivery

Rather than publishing DVD catalogs based on artificial and cumbersome sub-divisions of the restoration corridors, we decided to publish the Yakama Nation Restoration Corridor Atlas onto nine DVDs, including one DVD containing the geodatabase as well as ancillary raster layers, software, and documentation (Disc 1) and eight additional DVDs containing aerial photos from 1992-2005. Due to the large amount of data and the time-consuming process of reading or loading data from the DVDs, an external hard drive version of the altas has also been provided in order to improve transferability/mobility and data-access speed. However, users should keep in mind that data on the hard drive are not "read-only" and are therefore susceptible to corruption if files are moved or deleted - hence the provision of backup data on DVD.

If accessing the Yakama Nation Restoration Corridor Atlas from the external hard drive - simply attach the primary USB plug to your computer. The additional plug hanging off the primary jack is sometimes required if power output through your USB is less than that required to power the drive. Navigate to the root folder of the external hard drive and

select your pmf file of choice. Data from the external hard drive may be copied onto a local hard drive; however keep in mind that the 30gb of data will take some time to copy. To perform this operation, simply drag the 'Yakama Atlas' into the location of your choice.

If accessing the Yakama Nation Restoration Corridor Atlas from the DVDs, one can either insert the first DVD to view vector data with limited base-maps or one can load the entire library (Discs 1-9) onto the local hard drive. Running the pmf files off of the DVDs is much slower than running them off of a local harddrive. However, while copying the contents of the DVD will increase the speed, the directory structure must be exactly the same as that of the DVDs. When loading the entire library, create a folder on your hard drive entitled 'Yakama_Atlas'. Copy the contents of each DVD into that folder to match Figure 5.

As the data used for the pmf files on these discs is re-usable data, one can add these layers to other projects using GIS software. 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.

Yakama Nation Restoration Site Atlas – Online

Currently many options exist for developing internet mapping solutions. An IMS requires client-side and server-side software. A standard web browser, generally, acts as the client-side software and the server-side consists of a software stack that contains a web server, map server, server-side scripting language, and data stores. There are many viable open source and commercial software solutions that can be used in various combinations to create a map server stack. Each combination has benefits and negatives that are related to cost, functionality, and the needs of a project.

GRG evaluated a number of potential IMS software combinations to determine the solution that best suits the identified objectives and requirements of the Yakama Nation Restoration Project, while also considering Web server and technical staff capabilities, ongoing costs, and data considerations. As a result, GRG deployed the Yakama Restoration Corridor Atlas to the Internet using ESRI ArcGIS Server 9.2. The applications for serving the atlas reside on a single Internet server configured with an Intel Xeon 2.8 GHz CPU and 2 GB of RAM. The software stack used to serve and administer the atlas consists of ArcGIS Server 9.2 for the Java platform, Apache HTTP server, Apache Tomcat application server, and ArcGIS Manager. Apache Tomcat and ArcGIS Manager are installed as part of the standard installation package for ArcGIS Server 9.2 for the Java platform.

Existing Yakama Nation Wetlands and Riparian Restoration Project data were processed for delivery over the internet. ArcGIS Server 9.2 was the optimal choice for serving the Yakama Restoration Corridor Atlas because of its tight integration with ArcGIS desktop software. ArcGIS desktop software was used to develop the original map projects for the

DVD-based version of the atlas created in the first phase of this project. The maps used in the DVD-based atlas reference complex data structures and contain high quality cartographic symbolization. ArcGIS Server 9.2 utilizes the original map projects to create map services that are identical to the DVD-based atlas maps. Map services are required for serving maps over the Internet. The ability to use existing ArcGIS map projects to create map services substantially reduces the amount of time required to prepare the data sources and eliminates the need to recreate cartographic symbolization for deployment. Alternative Internet map server solutions would require the creation of new maps services for deployment. Software used to create these map services lacks the functionality to easily create sophisticated cartographic symbols and generally requires coding of configuration files. Additionally, Yakama Nation currently conducts GIS analysis in an ArcGIS environment. Yakama Nation's technical expertise using the ArcGIS software environment may facilitate a transition to hosting and maintaining the map server on location.

ArcGIS Server 9.2 and the Yakama Nation Restoration Site Atlas were installed and configured on a test server for evaluation and debugging and then transitioned to a production Internet server. An ArcGIS Server 9.2 installation can be based on two different development environments: the Microsoft .NET framework or the Java platform. To serve the mapping applications over the Internet, the .NET framework requires Microsoft Internet Information Server (II S) and the Java platform requires Apache Tomcat. ArcGIS Server 9.2 for the Java platform was chosen for the implementation of this project because the software requirements of the .NET framework version were not compatible with the Center for Spatial Information's existing Internet server configuration. Standard installation procedures were followed. After installation and configuration, ArcManager was used to create three map services on the test server: ***Abiotic***, ***Biotic***, and ***Constructed landscape***. Three map applications referencing the map services were also created in ArcManager and deployed to the test server. Map applications provide the framework to view map services over the Internet. After testing, ArcGIS for the Java platform was installed and configured on the productions server, the project data was transferred to the server, and the maps services and applications were recreated and deployed. To limit public access to the demonstration maps, Apache Tomcat was configured to require user authentication.

The Yakama Nation Restoration Site Atlas can be accessed at http://www.cwu.edu/~csi/yrc/. Links to abiotic, biotic, and constructed landscape maps are located on this page. After clicking a link, the username, "guest", and password, "yakama", must be entered to access the maps. It is only necessary to enter the username and password once to gain access to all three maps. Help pages provide information describing how to interact with the mapping applications.

Literature Cited

Bastedo, J.D., et al. 1984. Ecological approach to resource survey and planning for environmentally sensitive areas: the ABC method. Environmental Management, 8 (2), pp. 125-134.

Bernhardt, E.S., and 24 others. 2005. Synthesizing U.S. river restoration efforts. Science 308: 636-637.

Gabriel, A.O., L. Bodensteiner, S. Hu, and C. Lancaster. 2001. Identification and Ecological Characterization of Sensitive Shorelines on the Winnebago Pool Lakes, Wisconsin. Wisconsin Department of Natural Resources Shallow Lakes Program Report. Geo-ecology Research Group Research Report 4 and Multimedia CD-ROM. Ellensburg: Central Washington University. 52 pp.

Hu, S. 1999. Interactive multimedia approach to the utilization of an Everglades vegetation database. Photogrammetric Engineering and Remote Sensing, 65 (2), pp. 193-198.

Hu, S., A. Gabriel and L. Bodensteiner. 2003. Inventory and characterization of wetland habitat on the Winnebago Upper Pool Lakes, Wisconsin: an integrated multimedia approach. Wetlands, 23 (1), pp. 82-94.

Hu, S., A. Gabriel and C. Lancaster. 2000. An integrated multimedia approach for wetland management and planning for Terrell's Island, Winnebago Pool Lakes, Wisconsin. The Wisconsin Geographer,16, pp. 34-44.

Hughes, J. R., 1996. Technology trends mark multimedia advancements, GIS World, November, pp. 40-43.

Lewis, S., and D. Rhind, 1991. Multimedia geographical information system, Mapping Awareness, 5 (6), pp. 43-49.

Openshaw, S., and H. Mounsey, 1987. Geographic information systems and the BBC's Domesday Interactive Videodisk, International Journal of Geographical Information Systems, 1 (2), pp. 173-179.

Rhind, D. P., P. Armstrong and S. Openshaw, 1988. The Domesday Machine: a nationwide geographical information system, The Geographical Journal, 154 (1), pp. 56 - 58.

Shiffer, M. J. and L. L. Wiggins, 1993. The union of GIS and multimedia, Profiting from a Geographic Information System, Castle, G. H.(ed.), GIS World, Inc., Fort Collins, Colorado, pp. 336-341.

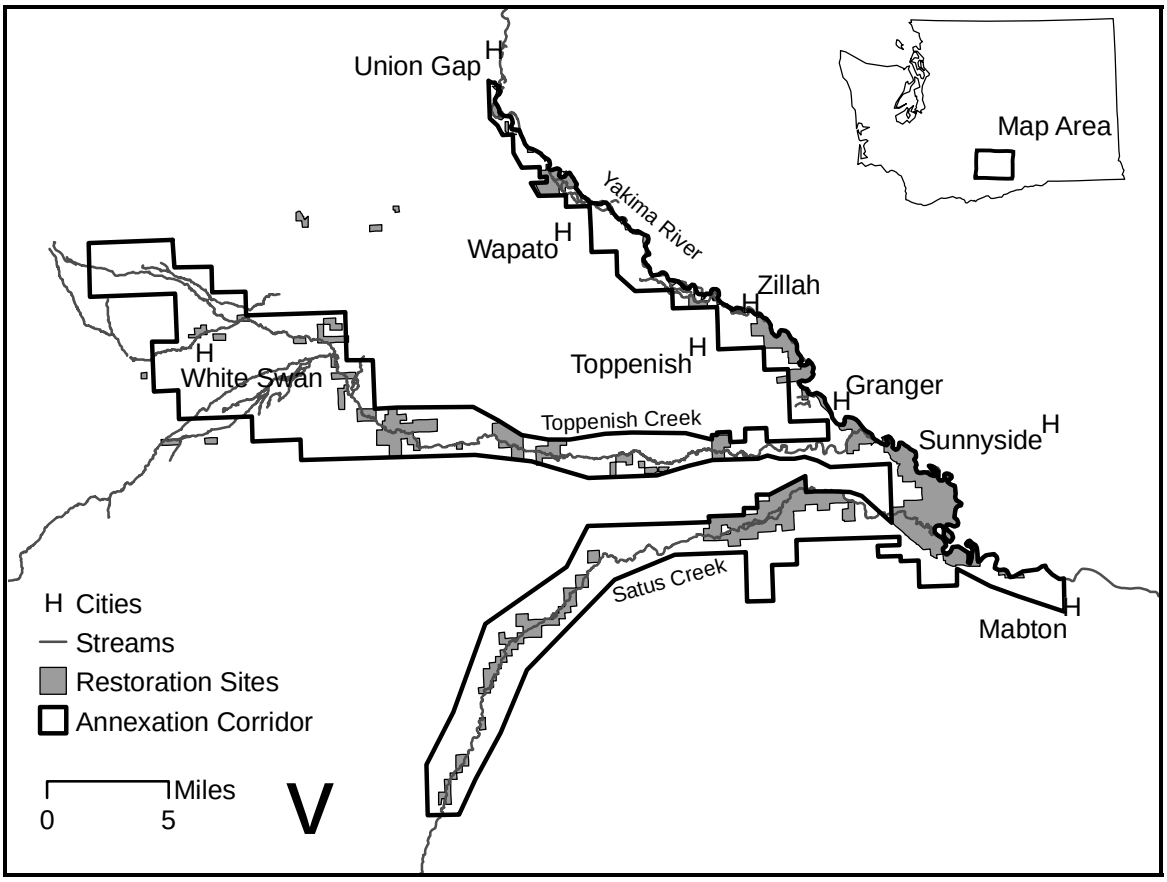


Figure 1. Existing and potential riparian restoration sites for the Yakama Nation Wetlands and Riparian Restoration Project.

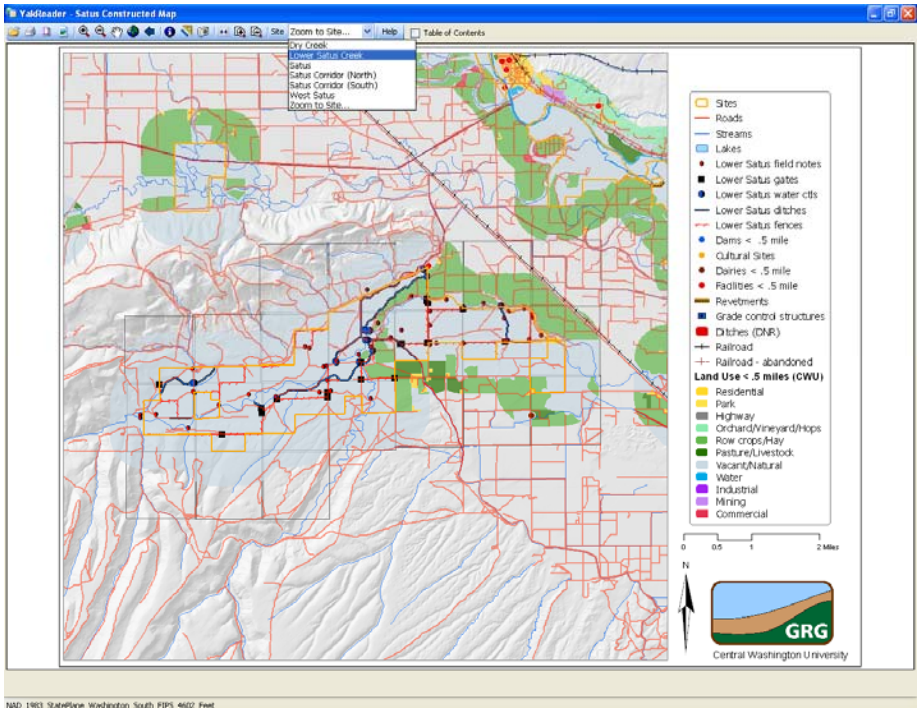
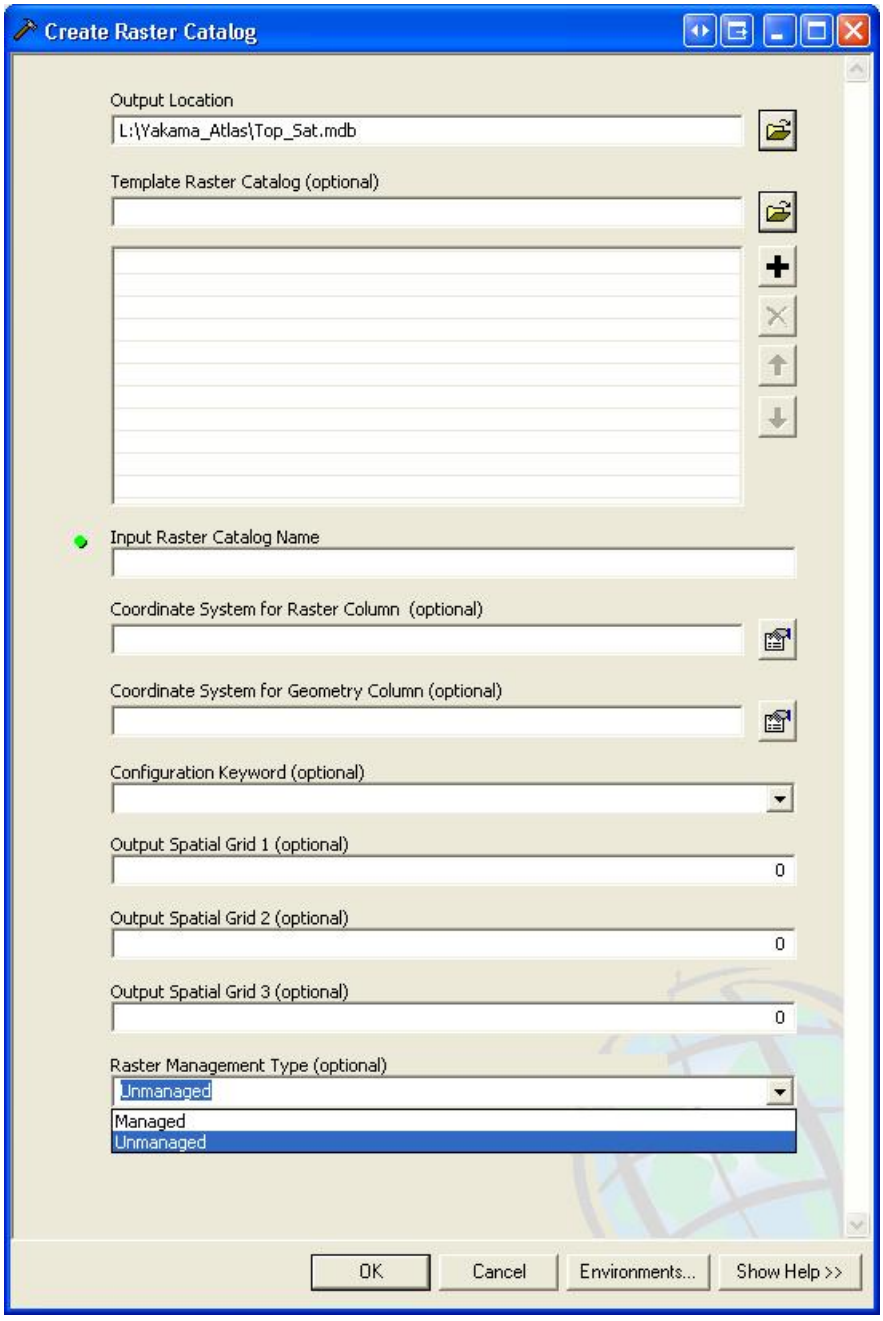


Figure 2. Yakima Wildlife ArcReader example.

Figure 3. Unmanaged raster catalog settings



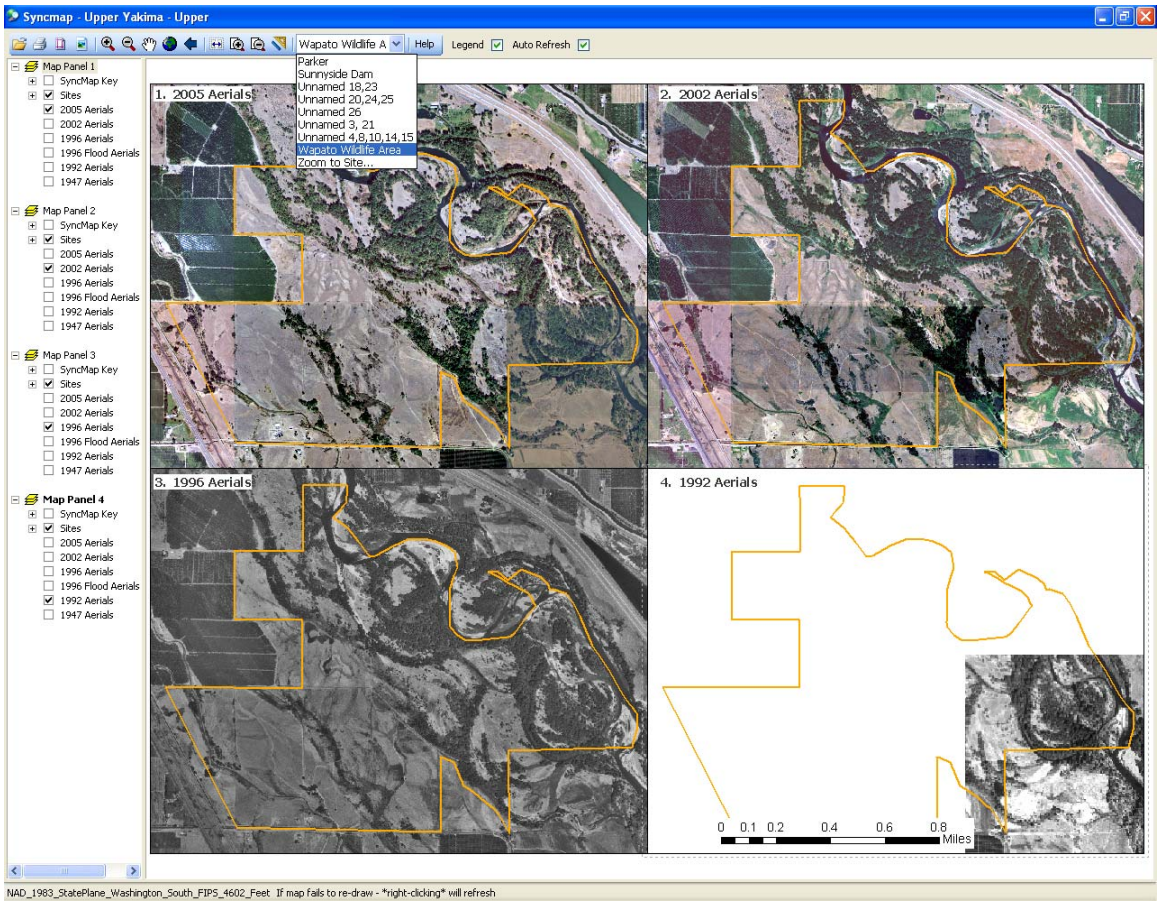
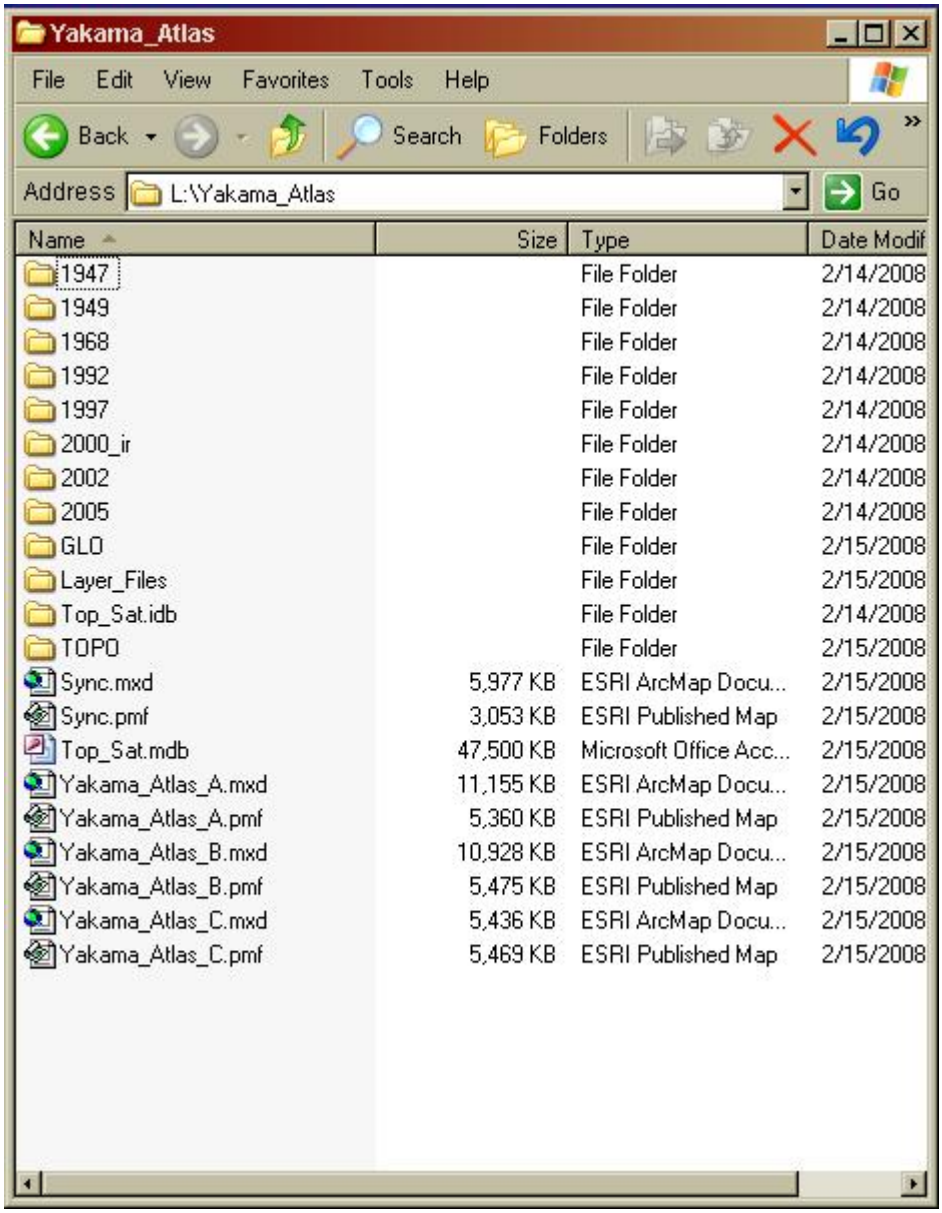


Figure 4. SyncMap Example.

Figure 5. Directory structure if copying to local drive.



NAWCA GRANT
Lower Yakima Wetlands Protection/Restoration II
Annual Report

June 2008

Tracy Hames, Yakama Nation Wildlife
Rocky Ross, Washington Department of Fish and Wildlife

Restored wetland at the Mid-Toppenish Creek Wildlife Area

This report summarizes the activities which have taken place to date on the Lower Yakima Wetlands Protection/Restoration II Project funded through the North American Wetlands Conservation Act (NAWCA).

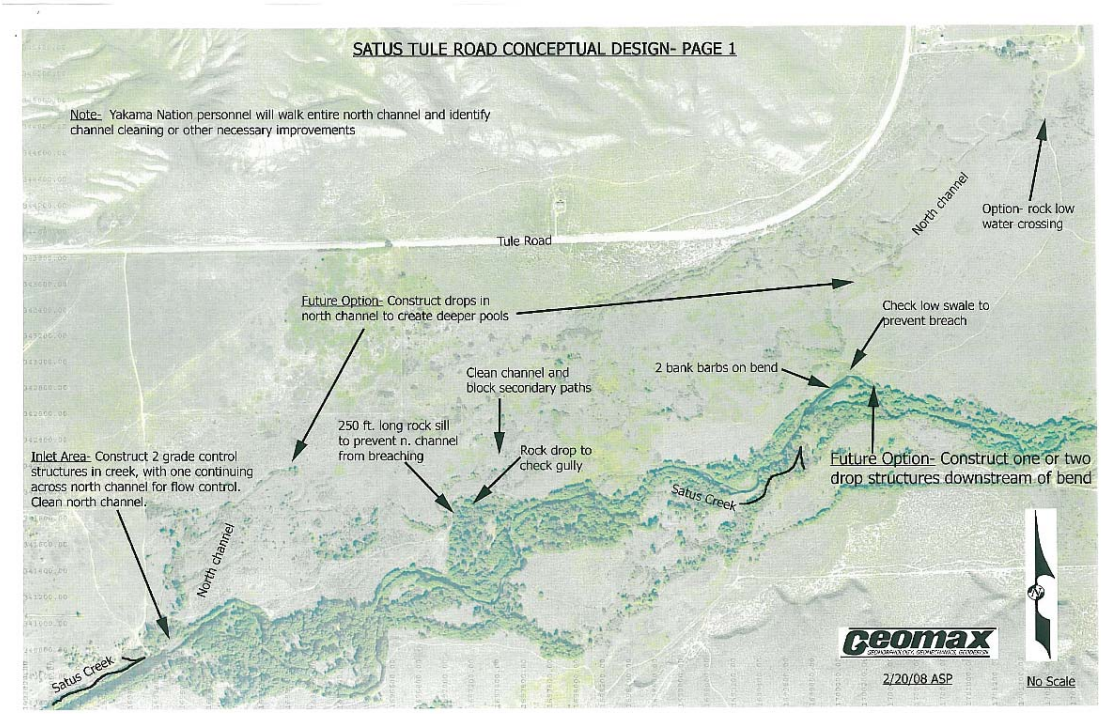
Lower Satus Wildlife Area (Yakama Nation)

Shattuck Property Acquisition – Match This property was purchased for $361,235. It consists of 320 acres. A portion of the permanently protected property will be restored under the Lower Satus Creek restoration project.

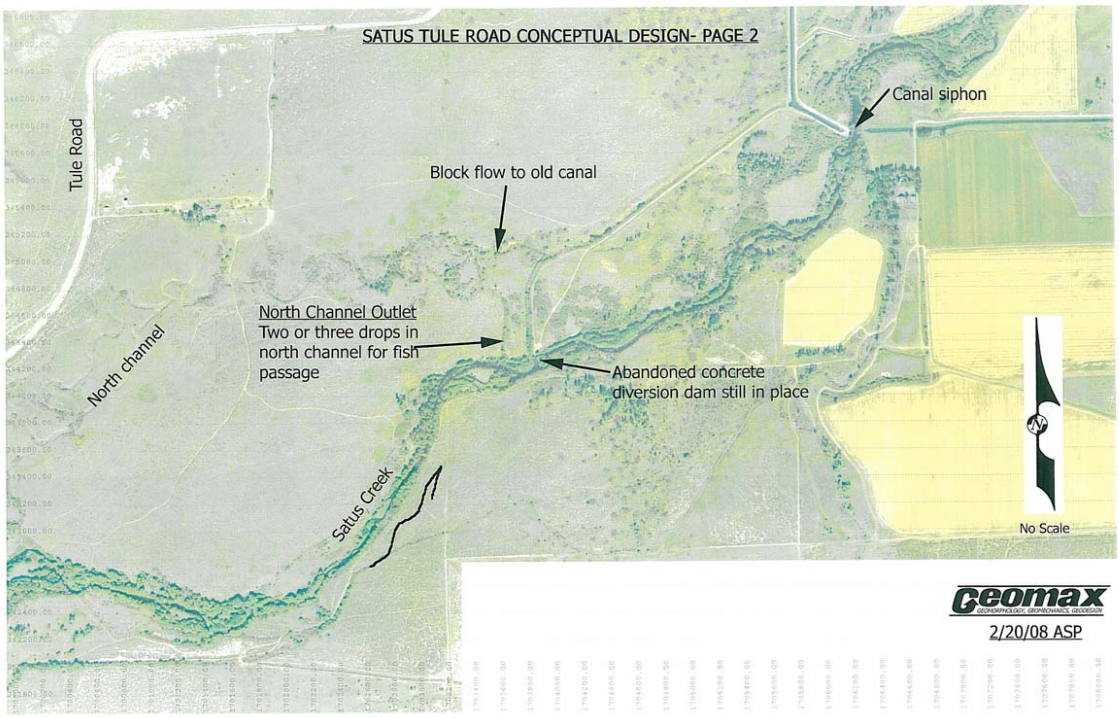
Satus Creek restoration – NAWCA Funded This project is in its final design phase. Implementation will occur in August or September 2008. Implementation will involve the construction of large rock grade control structures in Satus Creek. The structures will allow hydrologic reconnection to a side channel/wetland area that has been disconnected for decades.

Grass Planting – Match In 2007 145 acres were seeded to native grasses on this property. Another 80 acres will be seeded in the fall of 2008.

Russian Olive Removal – Match Over 1,000 acres of Russian olive trees were removed from wetland areas on this property and the Satus Wildlife Area. Control of re-growth is occurring annually.



Upper portion of Lower Satus Wildlife Area restoration.



Lower portion of Lower Satus Wildlife Area restoration project.

Satus Wildlife Area (Yakama Nation)

Russian Olive Removal – Match This activity has been completed in 2005-2006. Over 1,000 acres of Russian olive plants were removed from the wetland areas of the Satus and Lower Satus Wildlife Areas, piled and burned. Control of regrowth is occurring annually.

Native grass seeding – Match Preparation work has been completed for this activity. We anticipate that planting will occur in the fall of 2008.

Sunnyside Wildlife Area Headquarters Unit (Washington Dept Fish & Wildlife)

Wetland and Moist Soil Management - Match

On the HQ Unit, irrigation wastewater and return flows were managed to enhance approximately 287 acres of permanent and ephemeral ponds, plus additional, associated wetland habitat. Typical activities included, but were not limited to the following tasks:

- Operation and maintenance of lift pumps
- Maintenance and adjustment of water control structures and culverts to assure desired water levels.
- Build, install and maintain “beaver deceivers” (7) at selected water control points to eliminate or reduce beaver interference on water management.

- Control noxious and undesirable weeds in wetland habitat, such as purple loosestrife, phragmites and cocklebur.

Headquarters Unit: Moist soil management cells on left, Brady wetland in foreground, Giffen Lake on right

Upland Habitat Management and Enhancement - Match

Approximately 50 acres of agricultural fields on the HQ Unit were retired from farming, fallowed for one year and seeded to native grasses to increase nesting cover for upland birds and waterfowl. On the Byron Unit, approximately 50 acres of sub-irrigated swales were chemically treated to remove monocultures of Russian knapweed, then fallowed and seeded to native grasses for the same purpose. Highly alkaline soils and extremely dry weather provided challenges at both sites. Most Byron sites were successful but a few were interseeded where seedling success was spotty. The HQ plots were only seeded recently and will be monitored for seedling establishment.

New grass stand along shoreline of Byron Ponds. This area was previously dense Russian knapweed

Russian Olive Control - Match

Between 2006 and 2007, approximately 35 acres of olives were removed on the HQ Unit and 25 acres were removed on the Byron Unit. These were large blocks of olives where no other plant diversity existed. The process used is as follows:

- With a rented excavator, olive trees are pulled one at a time with root wad attached.
- The trees are stacked in piles or windrows, depending on their growth pattern.
- The disturbed area is groomed with the project dozer and brush rake, which attaches to the blade, to provide a smooth seedbed.
- If the restored site falls within the floodway of the Yakama River, the olives are burned, re-piled and burned a second time to remove most of the debris. This assures they are not carried downstream by floodwaters. If the olives are not within the floodway (Byron for instance), they are left as escape cover for upland wildlife.
- A cover crop of wheat is planted to provide food & cover for wildlife during the follow up weed control period. Broadleaf weeds are treated with herbicide in the cover crop.
- Olive sprouts, from seed and root fragments, are spot sprayed in the late Summer. Typically, it takes 2 years of spot control before sprouts diminish enough to seed native grasses.
- The site is seeded to native grasses.
- Broadleaf weed and olive sprout control continues until the grass stand matures; typically another 2 years.

- In areas where olives were removed from the perimeter of ponds, willows & cottonwoods are planted after the areas have stabilized with regard to noxious weeds.

Windrows of Russian olives, removed for the Sulphur Creek Wetland Project. Note excavator in foreground

Weed Control in Upland Habitats - Match

Until recently, the uplands on both units had become plagued by a variety of noxious weeds, due to lack of funds and staff for control measures. As additional funding became available, more emphasis was placed on these weeds as a way to improve nesting cover for upland wildlife and waterfowl. Weed control on both units is difficult due to sub-irrigated areas and annual flooding. Russian knapweed, perennial pepperweed and Canada thistle are some of the primary targets. Weed control for habitat improvement purposes took place on approximately 500 acres in 2006 and 650 acres in 2007.

Sulphur Creek Wildlife Area (Washington Dept Fish & Wildlife)

Sulphur Creek Wildlife Area Wetlands Restoration – NAWCA Funded

As the wetland enhancement plans were being finalized for the Sulphur Creek project, we received word that the Bureau of Reclamation (BOR), the Sunnyside Valley Irrigation District (SVID) and the Rosa Irrigation District (RD) were planning to build a fish passage barrier in Sulphur Creek. The resulting water level rise behind the weir would make a

diversion feasible. Under a multi-agency agreement, a diversion was installed shortly before the barrier was completed and the diversion intake was inundated. The SVID and RD construction staff installed the diversion structure. The final stage of the Sulphur Creek project in 2009 will include a pipeline to carry water, via gravity flow, to Bridgeman Pond, Morgan Lake and into the planned, constructed wetland.

New fish passage barrier/weir on Sulphur Creek. The diversion control box, located just upstream of the weir, on the right bank, will allow up to 5 cfs for enhancement of existing wetlands and the development of new wetlands.