Idaho Interim Functional Assessment for Low-gradient Broad Basin, Groundwater Fed, Slope Wetlands with Spring Fed Riverine Inclusion

April 1999

Prepared By The
Idaho Wetland Functional Assessment Committee

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DISCLAIMER

This interim functional assessment model is based upon expert opinion and existing other functional assessments being developed for the subclass (National Slope Team, No Date; Utah Assessment Team, No Date). The model has only limited field testing and has not been calibrated with real data. The model is meant to serve as an interim tool and may be revised based on field use and as other information becomes available.

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This functional assessment model has been developed to be used as an interim procedure to assess wetland functions pertaining to USDA producer requests for wetland manipulations as they relate to minimal effect and mitigation. Policy is described in the Third Edition, Amendment 2, November 1996 of USDA Natural Resources Conservation Service's National Food Security Act Manual.

This functional assessment model can also be used to assess wetland functions pertainent to applications for Department of the Army permits under Section 404 of the Clean Water Act as they relate to wetland impacts and mitigation.

Comments from the Committee

This committee was charged with development of an interim wetland function assessment procedure to implement the Wetland Provisions of the 1996 Federal Agricultural Improvement Reform Act of 1996 and Section 404 of the Clean Water Act. It was the desire of the committee to use Hydrogeomorphic (HGM) Evaluation Principles when developing the interim procedures. It should be understood by users of this model that the committee recognizes that some wetland functions are not adequately represented in this interim model, and thus, limitation on some projects and sites will occur. Furthermore, users should be aware that this is not an HGM model; rather, it is an interim assessment procedure to be utilized by Natural Resources Conservation Service (NRCS) and Army Corp of Engineers (ACOE) until HGM models are developed. However, for the vast majority of conversions within the defined wetland subclass, the committee is confident that this model will adequately assess wetland function losses and provide a basis for determining appropriate mitigation as well as assisting in quantifying threshold limits associated with NRCS minimal effect determinations.

This interim model was developed by an interagency committee consisting of:

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Interim Functional Assessment Idaho

Subclass: Low-gradient, broad basin, groundwater fed slope with spring fed riverine inclusion.

Introduction:

The subclass includes montane, low-gradient slope wetlands where the primary water source is groundwater. The slope wetlands occur in broad valleys in mountainous regions of central and eastern Idaho where mineral and organic soils on alluvial sand and gravel deposits typically overlay an impermeable surface. Perennial streams draining the mountains may become intermittent when they reach the alluvial valleys. This water then percolates into the groundwater system and surfaces in the valley bottoms.

This assessment was field tested at two locations in the Silver Creek Valley of central Idaho. Examples of other areas of the state where it can be applied include the Teton Valley, Upper Birch Creek, Texas Creek (headwaters of the Lemhi River), Summit Creek (headwaters of the Little Lost River), Upper Pahsimeroi Valley, spring-fed wetlands near Blackfoot Reservoir, and wetlands surrounding Henrys Lake.

Functional Profile

Geomorphic Setting:

The mountains of central and eastern Idaho are within the Northern Rocky Mountains Steppe and Southern Rocky Mountains Steppe provinces. The Northern Rocky Mountain Steppe in Idaho includes the Yellowstone Highlands (M331A) and Overthrust Mountains (M331D) (including the Teton Basin) sections. The Southern Rocky Mountains Steppe in Idaho includes the Idaho Batholith (M332A), Bitteroot Valley (M332B), Beaverhead Mountains (M332E), and Challis Volcanics (M332F) (McNab and Avers 1994). Broad intermontane valleys are typically thrust faulted and filled with glacio-fluvial, alluvial fan, or colluvial deposits (Bond 1978). Valley soils are silt loams and silty clay loams that are generally deep to moderately deep, poorly drained, and have low permeability in the upper soil profile with high permeability in underlying gravel and sand. Slightly acidic peat soils may develop and are usually composed of herbaceous plants (U.S. Department of Agriculture Soil Conservation Service 1991). Adjacent mountain ranges frequently have carbonate and limestone deposits (Bond 1978). Mineral soils are often mildly to strongly calcareous due to precipitation of these deposits and water chemistry may be mildly to strongly alkaline.

Parent Materials:

Fine textured fluvial materials typically overlay restrictive layers such as basalt or other volcanic

flows deposited on Paleozoic lake sediments of limestone, siltstone, and sandstone. The alluvial materials of the valley floor are of mixed origin and may be derived from granite, gneiss, sandstone, quartzite, limestone, or rhyolite (U.S. Department of Agriculture Soil Conservation Service 1969).

Ecological significance of geomorphic setting:

The water holding capacity is high to very high in upper profiles of both the mineral and organic soils. The upper profiles range from 20-72 inches in depth and are underlain by a permeable sand and gravel layer. During the spring, run-off from snowmelt is stored on the soil surface and later moves into the upper profile. The water eventually leaves the system via channels or via underflow through sands and gravels (U.S. Department of Agriculture Soil Conservation Service 1991, 1969).

Calcareous soils are typically highly to strongly alkaline. Organic peat soils in slope wetlands are moderately to slightly acidic. Rare plant species are associated with water chemistry at the extremes of the pH scale (Rabe et al. 1994, Bursik and Moseley 1995). Wetlands of this subclass are floristically rich and frequently provide habitat for plant species of concern.

Functions based on geomorphic setting:

Deep surface soils underlain by permeable sands and gravels result in functions related to storage and movement of water including: (1) surface and subsurface water storage, and (2) moderation of groundwater. Water chemistry of these wetlands often results in unique assemblages of plant species.

Water Source and Climatic Setting:

Winter and spring weather patterns are influenced by westerly winds from the Pacific Ocean. This maritime influence weakens during summer months and continental climatic conditions prevail with air masses from the south producing thunderstorm activity. Climate is considered semi-arid with average annual precipitation in the 9 to 24 inch range. Most of the precipitation is in the form of snow during the winter months (Ross and Savage 1967).

Perennial streams draining the mountain systems may become intermittent when they reach the valleys. The water percolates through the groundwater system and surfaces in valley bottoms (Rabe et al 1994). Lesser amounts of water enter the system from direct precipitation in the form of snow.

Ecological significance of water source and climatic setting:

Water quality in these wetlands is high providing habitat for aquatic vertebrates and invertebrates. Throughout Idaho spring fed wetlands have been found to provide habitat for endemic fish and

snail species. Streams of these wetlands are often important sport fisheries due to the abundance of invertebrates and optimal water temperatures.

Functions based on water source and climatic setting:

Because the dominant source of water for low-gradient slope wetlands is groundwater, the wetlands function to maintain habitat for aquatic species.

Hydrodynamics:

The hydrograph of groundwater fed wetlands in mountainous regions of Idaho may experience two pulses. The broad valleys where these wetlands occur typically have accumulations of snow during the winter months. A peak in flow in the early spring occurs due to snow melt. The flows are then level and may pulse again in the fall due to lag time in percolation from the mountains, underflow from the ground watershed, or in response to the end of irrigation (Wiley 1977). Overbank flows that occur in most stream systems associated with spring run-off are typically lacking (Rabe et al. 1994). Rather, the wetland complex becomes inundated when the soil profile becomes saturated.

Water entering sloped wetland systems is stored in areas of low topographic relief, in the soil profile, and on the surface. Nearly all of the water leaves the system through surface run-off in spring channels. Lesser amounts may be lost to evapotranspiration and underflow. Portions of the wetland mosaic with shallow surface soils are only temporarily flooded.

Ecological significance of hydrodynamics:

The poorly drained soils of this wetland subclass are saturated throughout the growing season and plant productivity is high. A diverse mosaic of native plant communities, including scrub-shrub, forested, and emergent vegetation, is correlated with duration of flooding in this subclass. Scrub-shrub vegetation occurs in association with somewhat poorly drained soils lining spring channels. Willows or water birch are dominant scrub-shrub species and are habitat for neotropical migrants, moose, and deer. Soils that dry out seasonally (temporarily flooded) support scrub-shrub vegetation dominated by low shrubs including shrubby cinquefoil and greasewood. Forested vegetation is typically dominated by aspen and may become established on former spring heads. The aspen stands are known to contain bald eagle nests and heron rookeries. Emergent vegetation occurring on very poorly drained soils are dominated by sedges, rushes, and cattails. Temporarily flooded emergent vegetation is dominated by grasses and sedges (Idaho Conservation Data Center 1997). Semipermanently flooded and open water habitat provide habitat for amphibians. Water is frequently open during winter months and may provide habitat for wintering waterfowl including trumpeter swans. Temporarily flooded emergent and scrub-shrub wetlands provide habitat for sandhill cranes and foraging areas for harriers and great gray owls (Groves et al. 1997). Areas that are temporarily flooded are accessible to humans and livestock and subject to alterations from agricultural conversion, grazing, and development.

Functions based on hydrodynamics:

The distribution of plant communities throughout the wetland is a result of hydrodynamics. In addition to habitat functions, the mosaic of emergent, scrub-shrub, forested, and open water habitat results in functions related to storage and accumulation of organic and inorganic sediments as well as elements and compounds.

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Interim Functional Assessment Functions and Variables
Idaho

Subclass: Low-gradient, broad basin, groundwater fed slope with spring fed riverine inclusion.

Functions and variables for low-gradient, broad basin, groundwater fed slope with spring fed riverine inclusion subclass.

Function	Variables																		
	Vfreq	Vmicro	Vpore	Vwtf	Vpden	Vlanduse	Vwetuse	Vlitter	Vmacro	Vbuff	Vsubin	Vsubout	Vpdom	Vregen	Vratio	Vmosaic	Vlink	Vstrata	Vbirduse
Surface H20 storage	X	X																	
Subsurface H20 storage			X	X															
Removal of particulates	X	X			X		X	X	X	X									
Moderation of groundwater flow											X	X							
Maintain characteristic plant community							X			X			X	X	X				
Maintain habitat for native aquatic invertebrates and verterbrates						X	X								X	X	X		
Maintain characteristic bird populations						X										X		X	X

Variables for assessment of wetland functions in low-gradient, broad basin, groundwater fed slope with spring fed riverine inclusion.

Assessment Area_____ Date_____

Surveyor(s) _____Purpose: 9 Conversion 9 Mitigation

_____

Model Variables	Indicators	Pre-	Post	Comments and notes
Vfreq: frequency of water above the soil surface	Frequent (more than once in two years) flooding as indicated by field observation, series of air photos or soil survey.	1.0	1.0	
	Flooding occasional (average of once or less in two years) or common (flooding likely under normal conditions) as indicated by series of air photos, or soil survey.	0.5	0.5	
	Flooding rare(not possible except under unusual weather conditions) as indicated by series of air photos or soil survey.	0.1	0.1	
	No evidence or indicators of flooding.	0.0	0.0	
Vmicro: micro-topographic relief	>50% of the wetland with topography which stores surface water. Indicators include swales or other areas with low topographic relief which allow water to be stored or hummocks which allow water to flow in rills.	1.0	1.0	
	25-50% of the wetland with topography which stores surface water. Indicators include swales or other areas with low topographic relief which allow water to be stored or hummocks which allow water to flow in rills.	0.5	0.5	
	1-25% of the wetland with topography which stores surface water. Indicators include swales or other areas with low topographic relief which allow water to be stored or hummocks which allow water to flow in rills.	0.1	0.1	
	Wetland is flat and water essentially flows as a sheet.	0.0	0.0	
Vpore: soil pore space available for storage	Higher permeability wetland soils (sandy loam to coarser texture soil) **and** soil not saturated to surface nor ponded for long durations during the growing season.	1.0	1.0	
	Lower permeability wetland soils (soil texture finer than sandy loam) **and** soil not saturated to surface nor ponded for long durations during the growing season.	0.5	0.5	
	Soil saturated to surface or ponded for long durations during the growing season.	0.1	0.1	
	Soil saturated to surface or ponded throughout the year.	0.0	0.0	
Vwtf: fluctuation of water table	Water table falls rapidly to 15-30 cm of surface.	1.0	1.0	
	Water table falls slowly and/or to a depth of 15 cm.	0.5	0.5	
	Soils stay nearly saturated of fluctuate within a few cm of the surface over several days to a week.	0.1	0.1	
	Soil saturated to surface throughout the year or water table at 30 cm or greater for long periods.	0.0	0.0	
Vmacro: macrotopographic relief	Evidence of macrotopographic features: natural levees, oxbows, meander scrolls, breaks in slope.	1.0	1.0	
	No evidence of macrotopographic features.	0.0	0.0	
Vpden: cover of plants	Herbaceous plants with 50% or greater cover.	1.0	1.0	

	Herbaceous plants with 10-50% cover.	0.5	0.5	
	Litter cover present, but sparse (< 10% cover).	0.1	0.1	
	No plants present.	0.0	0.0	
Vlitter: Herbaceous plant detritus (uptake and conversion of nutrients)	Litter density (75-125%) of reference standard--Litter with 50% to continuous cover. Open water <10% of wetland area.	1.0	1.0	
	Litter density (25%-75%) of reference standard--Litter with 10-50% cover. Open water 10-25% of wetland area.	0.5	0.5	
	Litter density (0-25%) of reference standard--Litter cover present, but sparse (< 10% cover). Open water >25% of wetland area.	0.1	0.1	
	No litter present or area dominated by open water.	0.0	0.0	
Vwetuse: dominant landuse and condition	Wetland is part of an acre or larger block of land which is non fragmented and has few non-natural breaks. If some agricultural uses (e.g. haying, grazing) occur in the wetland and surrounding landscape, no compaction from equipment or evidence of trampling.	1.0	1.0	
	No tillage in saturated wetlands. Outermost zone minimally impacted by light grazing.	0.5	0.5	
	Wetland receives conventional tillage; outermost zone tilled or grazed.	0.1	0.1	
	Wetland severely disturbed by tillage, grazing, and/or water development. Restoration potential questionable and will require replanting and hydrologic restoration.	0.0	0.0	
Vbuff:zone surrounding the wetland that protects its structural and functional integrity	Buffer is in native vegetation with almost no disturbance	1.0	1.0	
	Buffer is in native vegetation with light to moderate grazing.	0.5	0.5	
	Buffer receives conventional tillage or is in non-native monoculture.	0.1	0.1	
	Urban, semi-pervious, or impervious surfaces immediately adjacent to the site.	0.0	0.0	
Vsubin: subsurface flow into wetland	Seeps present at edge of wetland. Springs within wetland. Saturated soils present during the entire year. Gleyed or organic soils present. Vegetation dominated by FACW or OBL species. Low permeability soils present.	1.0	1.0	
	Soils meet hydric criteria and are saturated to the surface during the entire growing season. Vegetation is dominated by FACW or drier species. Moderately permeable soils present.	0.5	0.5	
	No seeps present at the edge of the wetland. No springs in wetland. Soils meet hydric criteria but are not saturated to surface during the entire growing season. Soils not gleyed. Vegetation dominated by FAC or drier species.	0.1	0.1	
	Above indicators absent.	0.0	0.0	
Vsubout: surface flow from wetland to other surficial aquatic environment	Subsurface and surface flow from wetland to offsite aquatic environment throughout the year. Offsite aquatic environment (creek or stream) within 0.25 miles of wetland. Low gradient in wetland (0 to 0.5%).	1.0	1.0	
	Subsurface and surface flow from wetland to offsite aquatic environment throughout the growing season. Offsite aquatic environment (creek or stream) 0.25 to 0.5 miles from wetland.	0.5	0.5	
	Surface flow from wetland to offsite aquatic environment for part of the growing season. Offsite aquatic environment greater than 0.5 miles from wetland. High gradient in wetland 2.0% or greater.	0.1	0.1	
	Above indicators absent.	0	0	

Vpdom: number of dominant (>10% cover) wetland plant species.	Number of dominant wetland plant species is greater than 8.	1.0	1.0	
	Number of dominant wetland plant species is 5 to 7.	0.75	0.75	
	Number of dominant wetland plant species is 3 to 4.	0.5	0.5	
	Number of dominant wetland plant species is 1 to 2.	0.25	0.25	
	Site devoid of vegetation.	0.0	0.0	
Vregen: herb, shrub, and tree species as seedling/sapling and/or clonal shoots or with mature seeds	Obvious seedling/sapling and/or clonal shoots or mature seeds; dominated by native wetland species.	1.0	1.0	
	Some seedling/sapling and/or clonal shoots native and non-native species.	0.5	0.5	
	Significant regeneration by non-native species and/or increasers; soil disturbance activities.	0.1	0.1	
	No seedling/sapling and/or clonal shoots present.	0.0	0.0	
Vratio: ratio of native to non-native plant species	3 of the 4 most dominant plant species in the wetland are native species and/or 75-100% of the species surveyed are native species.	1.0	1.0	
	1 of the 4 most dominant plant species in the wetland are native species and/or 25-50% of the species surveyed are native species.	0.5	0.5	
	0 of the 4 most dominant plant species in the wetland are native species; however, at least 1-25% of the species surveyed are native species.	0.1	0.1	
	Wet meadow zone unvegetated or dominated by planted or escaped cultivars.	0.0	0.0	
Vmosaic: number and proportion of cover types	Wetland includes 3 or more vegetation classes based on Cowardin's classification or 3 or more cover types within a single vegetation class.	1.0	1.0	
	Wetland with 2 or more vegetation classes based on Cowardin's classification or 2 or more cover types within a single vegetation class.	0.5	0.5	
	Vegetation absent, a monoculture, or essentially a single plant community with little diversity.	0.1	0.1	
	Vegetation as above with little possibility of restoration or consisting of planted cultivars.	0.0	0.0	
Vlink: proximity and connectivity to other wetlands in the area	Wetland is adjacent to or connected to other wetlands within a mile radius via subsurface or surface flows (including channels) which have not been altered by diversion, channel straightening, conversion, or grazing.	1.0	1.0	
	Wetland is connected to other wetlands within a mile radius via subsurface or surface flows (including channels). Wetlands may be impacted by grazing and conversion but hydrologic manipulations are minor and not fragmenting connectivity.	0.5	0.5	
	Wetland connectivity is fragmented by periphery ditches or channelization. Adjacent wetlands are impacted by grazing, conversion, or development.	0.1	0.1	
	Wetland is isolated from adjacent wetlands due to dewatering (ditches, diversions) or filling.	0.0	0.0	
Vlanduse: dominant land use and condition of the upland watershed that contributes to the wetland	Uplands never grazed, or at most infrequently and lightly grazed. Never tilled.	1.0	1.0	
	Surrounding upland in a combination of land uses in which there is moderate grazing on steep and long slopes and/or tillage on short and moderate slopes.	0.5	0.5	
	Moderate tillage or heavy grazing on high slopes.	0.1	0.1	
	Urban, semi-pervious, or impervious surfaces resulting in maximum overland flow and high sediment delivery rate to the wetland.	0.0	0.0	

Vstrata: complexity of vegetation layers	Dense overstory, with at least 3 vegetative layers.	1.0	1.0	
	Moderately dense overstory with at least 2 layers. Mix of shrub vegetation near emergent habitat.	0.5	0.5	
	Overstory with at least 1 layer. No shrub vegetation near emergent habitat.	0.1	0.1	
	No overstory. No shrub vegetation or emergent habitat.	0.0	0.0	
Vbirduse: number of species using the area within the wetland	Wetland used by 10 or more species of birds. Use nests, calls, tracks, feathers, skeletons, and field sightings.	1.0	1.0	
	Wetland used by 5 to 10 species of birds.	0.5	0.5	
	Wetland used by less than 5 species of birds.	0.1	0.1	
	No bird use evident.	0.0	0.0	

DEFINITION OF FUNCTIONS AND FUNCTIONAL INDEX WORKSHEETS

Assessment Area_____ Date_____

Surveyor(s) _____Purpose: 9 Conversion 9 Mitigation

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HYDROLOGIC FUNCTIONS

Function: SURFACE WATER STORAGE

Definition: Storage of water on the surface of the wetland

Effects on-site: Maintains hydric soils and wetland plant species. Supports utilization of wetland by aquatic species.

Effects off-site: Capture of ground and surface water to maintain delivery of water to downstream sources throughout the growing season. Stores and retains particulates to maintain water quality.

Condition	INDICES OF VARIABLES		Functional Capacity Index: If Vfreq=0 then FCI=0; otherwise FCI=(Vfreq+Vmicro)/2
	Vfreq	Vmicro	
Pre-project			
Post-project			
Comments:			

Function: SUBSURFACE WATER STORAGE

Definition: Ability of a wetland to store subsurface water. Availability of storage for water beneath the wetland surface. Storage capacity becomes available as periodic drawdown of the water table or reduction in soil saturation occurs, making drained pores available for storage of water. Drawdown may be the result of vertical and lateral drainage and/or evapotranspiration.

Effects on-site: Maintain biogeochemical processes

Effects off-site: Recharge surficial aquifers and maintain baseflow and seasonal flow in streams

Condition	INDICES OF VARIABLES		Functional Capacity Index = (Vpore + Vwtf)/2
	Vpore	Vwtf	
Pre-project			
Post-project			
Comments:			

BIOGEOCHEMICAL FUNCTIONS

Function: REMOVAL OF PARTICULATES

Definition: Process of filtering and settling both organic and inorganic particulates

Effects on-site: Sediment accumulation contributes to the nutrient capital of an ecosystem. Deposition increases surface elevation and changes topographic complexity. Organic matter may also be retained for decomposition, nutrient recycling, and detrital food web support.

Effects off-site: Reduces stream sediment load and entrained woody debris that would otherwise be transported downstream.

Condition	INDICES OF VARIABLES							Functional Capacity Index= (Vfreq+Vmacro+ Vmicro+Vpden+Vlitter+Vwetuse+Vbuff)/7
	Vfreq	Vmacro	Vmicro	Vpden	Vlitter	Vwetuse	Vbuff	
Pre-project								
Post-project								
Comments:								

Function: MODERATION OF GROUNDWATER FLOW

Definition: Capacity of wetland to moderate the rate of groundwater flow by interception. Water is then discharged into down gradient sources.

Effects on-site: Maintain saturated soil conditions throughout the growing season.

Effects off-site: Maintain upgradient or upslope groundwater storage and groundwater table.

Condition	INDICES OF VARIABLES		Functional Capacity Index = (Vsubin X Vsubout)$^{1/2}$
	Vsubin	Vsubout	
Pre-project			
Post-project			
Comments:			

HABITAT FUNCTIONS

Function: MAINTAIN CHARACTERISTIC NATIVE PLANT COMMUNITY

Definition: Capacity of a wetland to produce and support characteristic native plant communities. (Emphasis is on location, dynamics and structure of the plant community within the slope wetland and the mosaic of similar wetlands in the area. This is controlled by the dominant species of tree, shrubs, and ground cover and by the characteristics of vegetation regeneration)

Effects on-site: Converts solar radiation and carbon dioxide into complex organic compounds that provide energy to drive food webs. Provides seeds and propagules for regeneration. Provides habitat diversity for nesting, resting, refuge, and escape cover for animals. Creates microclimate conditions that support completion of life histories of plants and animals. Provides organic matter for soil development and soil related nutrient cycling processes. Creates both long-term and short-term habitat for resident or migratory animals.

Effects off-site: Provides a source of seeds and propagules to maintain species composition and /or structure of adjacent wetlands and supplies propagules for colonization of nearby degraded systems. Provides food and cover for animals from adjacent ecosystems. Contributes to landscape connectivity, habitat, and food for migratory species. Enhances species diversity and ecosystem stability. Organic matter supports secondary production in associated aquatic ecosystems. Contributes leaf litter and coarse woody debris habitat for animals in associated aquatic habitats.

Condition	INDICES OF VARIABLES					Functional Capacity Index = [(Vpdom + Vregen + Vbuff +Vwetuse)/4 x Vratio]$^{1/2}$
	Vpdom	Vregen	Vbuff	Vwetuse	Vratio	
Pre-project						
Post-project						
Comments:						

Function: MAINTAIN HABITAT FOR NATIVE AQUATIC INVERTEBRATES AND VERTEBRATES.

Definition: Capacity of the wetland to support characteristic aquatic animal populations.

Effects on-site: Maintain both aquatic and terrestrial foodwebs by providing animal tissue.

Effects off-site: Support food webs of organisms that utilize other wetlands or are migratory.

Condition	INDICES OF VARIABLES					Functional Capacity Index = (Vratio + Vmosaic + Vlink + Vlanduse + Vwetuse)/5
	Vratio	Vmosaic	Vlink	Vlanduse	Vwetuse	
Pre-project						
Post-project						
Comments:						

Function: MAINTAIN CHARACTERISTIC BIRD POPULATIONS

Definition: The abundance and species richness of birds is related to habitat complexity because birds have evolved to fill most available terrestrial niches. They partition habitats temporally (day versus night feeders), spatially (ground feeders, mid- and top-canopy feeders), and trophically (frugivores, insectivores, piscivores). Birds are sensitive to alterations in the structure and function of wetland ecosystems. Species richness and relative abundance can be measured. Bird richness increases with: vegetation/open water interspersion, increased layers of vegetation, and complexes of small and diverse wetlands.

Effects on-site: Maintain habitat for birds that has characteristic species composition, abundance, and structure containing diversity, nesting, resting, refuge and escape cover.

Effects off-site: Maintain corridors between habitat islands and landscape biodiversity.

Condition	INDICES OF VARIABLES				Functional Capacity Index = (Vstrata + Vmosaic + Vbirduse + Vlanduse)/4
	Vstrata	Vmosaic	Vbirduse	Vlanduse	
Pre-project					
Post-project					
Comments:					

Worksheet for Calculating Mitigation Acres Required

Assessment Area_____Date_____Surveyor(s) _____

Comparison of Conversion site to Mitigation Site													
Function	Loss due to conversion			Mitigation site: **before** construction/restoration/ manipulation				Mitigation site: **after** construction/restoration/ manipulation				(12) Uncertainty Factor (must be $1)	(13) Final acreage
	(1) FCI	(2) Area	(3) FCU	(4) Initial FCI	(5) Area	(6) FCU	(7) Target FCU = (col. 3 + col. 6)	(8) Planned FCI	(9) Area	(10) FCU	(11) FCU gained = (col. 10 - col. 7)		
Surface H20 storage													
Subsurface H20 storage													
Removal of particulates													
Moderation of groundwater flow													
Maintain characteristic plant community													
Maintain habitat for native aquatic invertebrates and verterbrates													
Maintain characteristic bird populations													

Chart Notes

FCI=Functional Capacity Index; FCU=Functional Capacity Units

Column 1:FCI after conversion=Pre-project FCI!Post-project FCI

Columns 4,8: FCI for mitigation site for pre- and post-mitigation. For Column 4, FCI = 0 if creation site.

Columns 2,5,9: Area of the wetland or mitigation site being assessed.

Columns 3,6,10: FCU=FCI X Area.

Column 7: Target FCU=Column 3 + Column 6; this is your project goal to create or restore a wetland equal to this FCU.

Column 11: Column 10!Column 7; if this = 0 then functions are replaced, if > 0 then functions are exceeded; if < 0 then functions are not replaced and mitigation site is not adequate. If mitigation is inadequate choose another site (or additional acres) and begin calculations in column 4.

Column 12: Option to include Uncertainty Factor ($1) to account for lag time and scientific uncertainty.

Column 13: Final mitigation acreage = Mitigation Area X Uncertainty Factor (Column 9 X Column 12).