Riverbend Golf Course

"Wildlife Habitat Enhancement Alternatives for Golf Courses Along the Jordan River"

A case study of Riverbend Golf Course, Riverton, Utah

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the water table and are self-sufficient. Supplemental irrigation will be necessary for the
supplemental irrigation. The Cottonwood pole plantings (Appendix B) will be at or near

With proper grading and a reliable water level, the required plants should need no

Weed invasion will be dealt with in the next section, so this one will focus on irrigation.

will depend on supplemental water and minimal competition from weeds for nutrients.

Within this period, extensive maintenance will be needed. The success of the new plants

With any new planting, the new plants need a period to adjust and take root.

Plant establishment

section will detail some design principles that can lessen the effect of these species.

bids as brown headed cowbird. The management of these can be a problem so this

ponds and wetlands. Also important will be managing for these populations and such

new projects, weed and exotic vegetation invasion, and water level management in the

On our site, the problems we will have to manage for are: plant establishment for

these disturbances historically had an effect, so presently they must once again be used.

mitigate these disturbances and allow the system to work itself out. On our site, each of

renew itself and therefore is not sustainable. The goal of any management plan then is to

draining, and natural succession. Without these disturbances the ecosystem can not

allowed on site. These disturbances are such things as fire, drought, flooding, and

of the project. Without management, the enhancements will revert to what is present on

Proper management of the enhancement features is essential in assuring success

MANAGEMENT AND MONITORING OF ENHANCEMENT FEATURES

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Olive trees to be planted, except on the river. They need to be planted but not to serve as snacks. Phased out as new plans grow to take their place. In very few instances will the Russian Olive be the preferred method. A backpack sprayer should be used by a trained employee. As before, the chemicals are non-selective and should be used as a spot treatment. The same chemicals used to rid of leaf blight can be used for weeds. If this is not feasible, chemical means should be weeded by hand once every month. During the period of establishment, the project mechanicals perform the preferred method. There are two methods for weed eradication. These are mechanical and chemical. As with any new planting that exposes bare ground, weed invasion will follow.

Weed and Fire Plant Invasion

Supplemental water and frequent weed eradication will need to take place in this time. For the establishment of the new plantings, the irrigation interval will be set at a year. Aboveground temporary irrigation changes may include removing heads, realigning heads, realigning pipes, or adjusting the irrigation system design to map the zones and make the required changes. The irrigation system design will be modified and the new plantings will be realigned with differing amounts of water. Since the plan for the irrigation was not available, it will be the responsibility of the irrigation specialist to realign the plants and the new plantings. For the moment though, it will need to be recognized. Plantings. Irrigation already exists on all parts of the site. With naturalization, this upland naturalized area, the slope plantings, and the irrigation should be developed.
The following is a list of methods used to control weeds in urban areas. Any can be used beneficially on the golf course. It will also benefit other wildlife in freeing up nesting sites, water on the lake and also reduce which creates the spots. The control of these is

canadian meese have a negative affect on golf course turf. They leave fecal

Canadian Meese Management

drawdown during high activity times.
4. Mosquito production in wetlands is a major concern right now and may warrant a
shorten only to increase aquatic and emergent vegetation.
3. Increase production of insecticides for learning ducks, ducks, and geese, and
2. Kill undesirable plants by summer drawdown.
Food plants after summer drawdown.
1. Provide mulch areas for moist-soil plants produced by natural or artificial seeding of

and soils. The objectives are taken from Page 1992.

Voluntary reduction in water level to expose the substrate and to dry out the vegetation
project, the following objectives will warrant a draw down of flood. A draw down is a
control plant species composition and gain the desirable plants. For the purpose of this
plant communities." (Page, 1992, p. 175) Water level fluctuation is an effective way to

"Water Level Management

or a combination of these techniques.

for cavity nesters. Weeds can be oppressed, milled, removed with chemicals,

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3. High levels of caddie habitat on a site benefit predators.

2. Complex paths habitat around the nest will limit searching by predators.

1. Nest concealment from dense foliage may decrease predation and parasitism should be considered when planning a specific enhancement or routine new golf courses. Will be implemented. The following principles were adapted from Martin, 1989, and done preferably by a specially agency. For the purpose of this project, design principles to increase the site to be determined by effective planning enhance techniques. It is found in to decrease the parasitism by this species through planning techniques. With the site being disturbed from its natural state and the fact that a horse pasture borders the site, the course is susceptible to this species. This section will discuss ways with the site being disturbed from its natural state and the fact that a horse pasture borders the site, the course is susceptible to this species. This section will discuss ways

To date, it has not been determined if brown headed cowbirds are evident on site.

Brown Headed Cowbird

Extensive amounts of time, effort, and resources may be required to control. This is a common problem on many golf courses and may require methods generally require a permit and should be a second plan unless the population is

vegetation or adding rock to inhibit the movement from water to land. The lethal

Riverbeds will be a mix of planting and planning the pond shorelines which can cause habitat when they first arrive at the site and until they leave. The most beneficial to

been proposed, adding foliage (which may have an adverse affect on other wildlife), and

projects for Riverbeds may include adding vegetation along the pond shores (which has

removal/reduction, baiting, and frightening devices. (Crosser, 1997.) Non lethal

The primary non lethal methods are: exclusion, landscape modification,
1. After One Year

2. Monitor water quality in onsite water features

3. Continue with piezometer readings to watch water levels.

4. Check nest boxes during breeding season and look for use.

First Year

1. Monitor plant growth by ensuring adequate water needs, elimination of competing weeds and any evident diseases on the plant. Determine if herbivory is happening and if it is, implement exclusion procedures such as fencing.

2. Document any wildlife visitors to the site.

Monitoring Program

4. Diverse types of habitat will lessen the predator from locating nests by associating certain plants with certain species. This means planting several different species with the approximately same structure to offer various nesting sites.
Phasing Aquifer plans for wetlands and polluters.

The seasonal highs and lows recorded for two years if possible, work can begin on the seasonal flow readings should be a reliable gauge as to how the ground water acts. With this data, the final year of drought, the success of the above will be monitored. The documentation is essential to ensure success of above objectives. The first is to start a program of monitoring on thePNG. Group, then several necessary steps to complete. The goal course for the first year after acceptance, implement this plan to the golf course itself.

Phasing

Goal of wildlife habitat enhancement

The existing plan, the following discussion will center on short term aspects to start the river corridor. With this in mind, and the minimum conservation plan acting as a long term corridor, something must be done in order to avoid further degradation of the river. Although ecologists play a large part in any restoration plan, as outlined this plan goes, the economics of the course will play a big part in how far we can go. If the golf course suffers from lack of players, this public will not be a success. The survey outlined in appendix A will be very important in keeping the golf course on Riverbend Golf Course. The final say will be made with the input from the golf course community.

Conclusions

Sample forms can be found in Appendix C.

Species becoming dominant? Are certain species having a high mortality rate?

1. Monitor plant community dynamics of new plantings. Are certain
However, is not the only source of funding. Many avenues exist such as WHP grants.

Ryebedford Golf Course is a public course owned by Salt Lake County. This agency

The objectives for the RYANF Group deal with regulatory agencies and funding.

certification

enhancement plans. Any input from this agency will be beneficial in gathering

Audubon Cooperative Sanctuary Program and start dialogue pertaining to the

The third objective for the Ryebedford Golf Course staff is to enroll in the

the plan

when does a private course. The data will still be beneficial and should be considered in

permanence of ever on public courses that see higher levels of weekend warrior players.

Fullsize this objective will have a certain

how extensive the enhancement plans are. As was stated earlier, the golfing public will have the final say in

counseling plans and ask golfers to place a dot where the highest percentage of their

1 can be decided upon with the assistance of. Another method is to display the

see where the highest percentage of current shots land. With data from all eighteen holes.

objective for the golf course personnel to determine the golfing skills of the

In Appendix C:

the valley. Sample forms for the picnics in the wells and wildlife documentation are found

enhancement plans. Help with this can be gained through the many building groups in

breeding on site. This will create a baseline to gauge the future success of the

and record what wildlife species are present on site and determine what species are

The second part of objective one for the golf course is to monitor
and success of the enhancements.

By this thesis project, the outcomes from the first initial steps will dictate the phasing with these steps in place, work can begin on implementing the projects set forth include the enhancement principles in their educational presentations.

IRNAP committee, funding for projects should be a priority. IRNAP should also

Because of the expertise on the
Involving local environmental issues related to golf courses along the Jordan River, the Audubon Society and the Jordan River National Park should be involved in addressing local environmental issues related to golf courses along the Jordan River. A number of organizations, the Nature Service, National Resources Conservation Service, Army Corps of Engineers, the Nature Service, National Resources Conservation Service, U.S. Fish and Wildlife Service, the U.S. Fish and Wildlife Service, and agencies such as the U.S. Fish and Wildlife Service should work with local agencies and community groups to identify and address environmental issues relevant to the project (USGA, 1996).

SITE SELECTION

The text will be split into four categories: site selection, routing, plan refinement, and construction. Principles from the USGA text, ecological principles from Johnson et al., and lessons learned from the Riverbend project will be incorporated. A hot spot analysis of the principles will be followed by direct recommendations for the region.

For this project's purpose, the discussion will focus on the most relevant guidelines for new golf courses. The principles encompass issues such as site design, construction, and environmental issues. Several organizations have been involved in various field testing and training to develop guidelines for new golf courses. In 1996, several leading organizations in various fields partnered to develop guidelines.
5. Consider critical plan community location in the selection. Specifically, do not

4. Identify sensitive fish and wildlife species of the area and associated habitat.

3. Avoid areas where natural disturbances (i.e., flooding, fire) are functioning properly.

2. In areas known to have beneficial wildlife habitat, care should be taken to not

1. Consideration should be given to already degraded sites. Examples include:

Recommends

since riparian areas are crucial to many species.

The selection is very important in providing a golf course that will be beneficial to

(USGA, 1996)

A golf course should not be considered in planning phases with outside agencies.

The selection and analyses have a direct bearing on the environmental suitability of

2. Coordinate with local conservation groups to aid in local environmental issues.

1. Coordinate with city comprehensive plans to locate areas designated for open space

Recommendations
Exposed to a loss of habitat and an increase in edge area. (Johnson et al., 1999)

... happen. It has been shown that interior species are more subject to local extinction, if

This larger species base has a better chance of surviving local extinction, if their should

regional native vegetation and also can support larger populations of wildlife species.

A large expanse of vegetation will tend to support a larger diversity of the

large reserves/parches are better than small reserves patches. (Johnson et al., 1999)

principles that should be considered when routing a golf course:

and buffering high value nodes. (Johnson et al.)

... are ecologically

reserves and corridors at a watershed scale should be centered around preserving, linking,

and preserving valuable patches and core reserves. Planning and designing wildlife

of most species and general biodiversity. To accomplish this, land managers must identify

are remaining patches of habitat that are often unsuitable for sustaining viable populations

today's urban environment. Development consumes more and more habitat, what is left

in migration and dispersal routes with access to food sources. This is a rare occurrence in

an ideal situation is uninterupted large patches of vegetation with corridors connecting

along with human intervention, determines the level of wildlife and fish habitat viability.

a series of patches, corridors, and matrices. The function and structure of this mosaic.

the course will be to preserve and enhance the landscape mosaic. Overall, the primary objective in routing

Once a site is selected, analysis prior to routing of the golf holes is crucial to

GOLF COURSE ROUTING
Reserve patches are better than separated reserves/patients.

(Johnson et al., 1999)

Connected reserves/patients are numerous: providing more habitat, allowing safe passage among patches, and serving as a source for ecological processes. The benefits of connectivity are numerous: providing more habitat, allowing safe passage among patches, and serving as a source for ecological processes.

1. During routing, consider plans that minimize fragmentation of patches and seclude of corridors. This is critically important in course layout to ensure that fragments will not be isolated from other fragments.

2. Always avoid routing near or through highly urbanized areas and large forest or grassland/shrub areas.

3. Identify patches on course with a diversity of native vegetation and route around them.

4. Always avoid routing near areas and never route a course through them. Playing across patches with good vegetation is key.

5. Identify and avoid routing through the course, and be in play areas within 100’ away from sensitive plants.

6. Always avoid routing near or through highly urbanized areas and large forest or grassland/shrub areas.

2. Always avoid routing near areas and never route a course through them.

Recommendations

Highland ridge to lower which exists on the east side of the river.

Highland ridge to lower which exists on the east side of the river.

Highland ridge to lower which exists on the east side of the river.

Highland ridge to lower which exists on the east side of the river.

Highland ridge to lower which exists on the east side of the river. In this situation, the golf course could act as a long-term area for riparian sections of Puyallup. It might be possible to create a mutual relationship with the golf course. Riparian golf course has the benefit due to limited acreage, another avenue could be to exploit surrounding land uses and routing choices in rural construction to maximize large patches. If this is not possible, a golf course has a large amount of edge habitat, it should be a priority to consider.
Several Reserves/Patches (Redundancy) are better than one Reserve/Patch.

4. Discourage storage of inflows into out of pool areas by golfers and maintenance.

3. For maintenance rates, utilize common camp paths and discourage entrance into our pool areas.

2. When connecting golf holes, or from one to the next, utilize common camp paths within hole boundaries.

1. In routine plans, keep golf holes out of connectable patches and keep camp paths

Recommendations

Of maintenance paths, or a golf hole disconnects it. Both should be minimized.

4. Johnson et al. (1999) United Reserves/Patches are better than Reserves/Patches.

3. Golfers, maintenance, and one hole, the united Reserves/Patches will be of far greater value. The other man made inflows. "Of two reserves or patches having exactly the same area, one inflow and one unified, the united Reserve/Patch will be of far greater value."

2. Golfers maintain and maintenance. Small openings for both should be used to create holes that can share the same camp path.

1. Consider different plan communitys and important areas of the and plan for native vegetation than corridors limited to a single topographical setting. Ducts connected throughways to reduce supported greater species richness and corridors that connected different ways to include supported greater species richness and.
Natural connectivity should be maintained or restored.

1. A recommended buffer width is 100 yards. This will allow for stream meander and recovery. The width has been compromised and may other golf courses have no buffer.

Recommendations

Wider corridors are better than narrow corridors

1. This is most important on rivers when describing the riparian buffer. On

Recommendations

These should then be preserved and moved away from.

Considered where valuable connections are between different plant community types.

opportunity for recolonization on site. When routing a golf course it should be

far away, many species could cause local extinction. With redundancy, there is

extension. If only one patch were present on the site and recolonizing patches were to

required. Another positive aspect of several patches is the concept of local

forests in grasslands. Only one patch of riparian would not fulfill the species life

requirements. For instance, some avian species nest and brood in riparian areas, yet

Several species of wildlife require more than one plant community to fulfill their...
Recommendations

Pond:

deciding where to daylight the drain line. Many times little is run directly into a stream or
of 4” drainline line. Bunkers and tee boxes are often surrounded as well.  A problem arises in
Drainage is very important on golf courses. Green can continue as much as 50%.

Applications andעזועק

permitting in today’s E.T. Rate. This type of watering system minimizes water
components can be hooked up to a weather station and irrigation times can be adjusted
For new golf courses, irrigation systems should becomputerized. Central

systems that provide for efficient use of water and protection of water quality.
Empphasis should be placed upon the design of irrigation, drainage, and retention

2. Lined plantings should consist of canopy, subcanopy, large shrub, small shrubs,

1. Wetlands should consist of floating emergent, wet meadow, and riparian shrub

Recommendations

diverse plant types.
The vegetative structure should have as many layers as possible and consist of

Stratify. Diverse patches and corridors are better than simple structure

important areas. The most important being connections from the uplands to the
and should be preserved. These are important avenues in the watershed
should not be bisected by the golf course. Existing corridor connections such as wetland complexes, wet meadows, shrubs
When constructing ponds or wetlands on site, consider the following tips beneficial:

1. Project wildlife habitat features appropriate to the area. Never remove dwחלקments.

2. Project wildlife habitat features appropriate to the area. Never remove dwחלקments.

3. Provide for the vegetation structure seen in Appendix B, Figure B.2.

4. To ensure habitat for wildlife, room must be left around the pond or wetland.

This is important to consider when designing water features into the shoreline of a project water resource.

Buffer zones or other protective measures should be maintained or created to

1. Never daylight a line into the border of natural waterways.

2. Runoff should be directed to stay on site and empty into a vegetative swale or

3. Retention basins should be created to collect runoff or rain from large storm events.

Reclamation:

Weeds, native, plant diversity, and shrubland vegetation

All in place areas should include a now zone consisting

1. All ponds and wetlands should include a vegetative buffer.
CONCLUSIONS

The primary benefit for wildlife will come from the site analysis and design phases. If wildlife habitat is considered, the criteria and the golf course can coexist beneficially. It will be important for a wildlife representative to be on site during design and construction to identify the critical areas and to direct construction traffic around.

Overall, if sound ecological principles are employed, a golf course can benefit wildlife in many situations.
BIBLIOGRAPHY
APPENDIX A

SAMPLE SURVEY
Therefore, justifying the level of maintenance. This section will also help with budget management plan can identify and describe how these areas are beneficial to wildlife and management of these areas may not be increased, in fact they may be decreased. Although the areas under maintenance and can be referred to in a management plan. Although the golf course held by the players, the results will help determine areas that people feel are important.

The goal of this section was to determine the views associated with Riverbend.

I. Existing course condition

When with Riverbend golf course in mind,

as they work towards the desired outcome. As can be seen from the survey, it was indicated the desired outcome from the questions. New questions can be proposed as long

For future golf courses to adapt and use this survey, each area will be detailed as to

Course aesthetics
-Jordan River programs
-Conservation participation
-Wildlife values
-Course maintenance
-Existing course condition

The survey consisted of six areas of inquiry with various questions each.

Beyond. On public courses, leagues would be a great way to implement the survey. This adds a level of commitment to the course as the players are very familiar with the beneficial to courses that have a certain level of repeat players such as private clubs. The survey will be most

with as this is the primary use of the area. With this in mind, a survey was developed to determine the view. objectives, and playing level of golfers. The results will be most

While the goal of the project is to enhance wildlife habitat on the golf course. It is...
groups projects. This can help gain support and even funding for golf course projects.

use of the trails by golfers and associate the golf course with the parkway and the JRP.
The primary benefit is to determine the level of

With this section, questions were asked about the Jordan River Parkway, and also

5. Jordan River Programs

widespread interest in the course such as private clubs.

This will be more beneficial to golf courses that have a high level of repeat golfers with a

participation people would have for volunteer efforts on the golf course and on the river.

this was to determine the level of

This section has two goals. One is to determine the level of knowledge people

4. Conservation Participation

Golfers feel wildlife brings to the golfing experience.

way to golf courses. Also to be determined by this section are any negative aspects

The goal of this section is to determine if golfers attribute wildlife in a positive

3. Wildlife Values

Tournament quality needs to be broken.

standard maintenance. The misconception that everyday maintenance should be

is the minimum level they would be willing to play on and also what they understand is

The goal of this section is to determine the level of maintenance that golfers feel

2. Course Maintenance

cost to meet expectations and ask for more money.

problems. If the golfers feel the course is under-maintained, explain how much it will
The following pages are the sample survey created for this project and the project at hand. Materials to target the areas that are not viewed correctly or not beneficial to the people recommend for and views. They can also be beneficial in educational survey results can be very beneficial in validating design decisions based on survey. The other pictures showed golf courses with less turf and more native vegetation. Picture was usually a highly maintained course with little or no habitat and a great deal of done with a set of questions that were linked to pictures and a choice of A or B. One conservation programs. The goal is to determine if local golfers feel this way. This was supposed to look like many times scenes from what they see on television. The PGA view of what a golf course should be. Golfers perceptions of what a golf course is. This section is concerned with how golfers perceive a golf course and their ideal
A thousand years ago the Jordan River was a dynamic river system that was home to some 10,000 birds. Today with growth encroaching we are losing this dynamic biodiversity and wildlife habitat that is associated with golf courses along the Jordan River.

The Utah Golf Association, Envision Utah, Utah Reclamation Mitigation and Conservation Commission, Jordan River Natural Areas Forum, and Utah State University are interested in improving wildlife habitat on golf courses along the Jordan River.

Riverbend golf course has been chosen as a case study. The study will explore opportunities to enhance wildlife habitat on the course and also to integrate the course with habitat improvements along the Jordan River.

We need your help! It's critical to receive opinions from those who golf at Riverbend about their perceptions of habitat and wildlife. Your responses will help determine the balance between the requirements for the game and wildlife needs.

We will be looking for responses in the following categories:
- Existing course condition
- Wildlife values
- Course maintenance
- Conservation participation
- Course aesthetics
- Course aesthetics

Please take a few minutes to fill out this survey. Thank you for your time and enjoy Riverbend.
11. Do you believe golf courses use too much water?

12. Do you believe golf courses use too many chemicals?

13. Are you in favor of using less water on golf courses?

14. Are you in favor of using less chemicals on golf courses?

9. Would a golf course environmental record, such as water quality, wildlife diversity, 
be a factor in your decision to play over a golf course?

8. Are you satisfied with the playing conditions or the course?

7. Do you play Riverbend or other golf courses along the Jordan River, because of the proximity to the river and distant views of the mountains?

6. How close do you live to Riverbend Golf Course (circle one):

0-1 mile
1-5 miles
5-10 miles
10+ miles

5. How many of these rounds are played at Riverbend Golf Course?

0
5-15
15-50
50+

4. How many rounds of golf do you play per year (circle one):

0
5-15
15-50
50+

3. What is your USGA handicap?

2. What is your age?

1. Are you male or female?

Part II
24. If answer is Yes, which of the general categories of species do you consider a

OTHER (please list)

LARGE MAMMALS
WATERFOWL
SMALL MAMMALS
SMALL BIRDS
REPTILES/AMPHIBIANS

23. Do you believe that wildlife can be a hindrance to your play on a golf course?

Y/N

22. How much value do you place in the sightline of wildlife while playing golf?

Y/N

21. Do you believe a golf course can play a valuable role in providing wildlife habitat?

Y/N

20. Do wildlife sightings and sounds make a valuable contribution to a round of golf?

Y/N

19. Do wildlife sightings and sounds make a valuable contribution to an outdoor activity?

Y/N

18. Do you value the visual quality of the existing natural wildlife habitat along the

Jordan River adjacent to the Riverview Golf Course?

Y/N

17. Put a check mark by each task that you feel should be standard maintenance and

-keeping pathways and less in tournament quality condition
-keeping rough in tournament quality condition
-placing choke points for seasonal color
-moving around waterways
-keeping out of play areas

-If you are to any of above, what percentage decrease would you allow?

16. Y/N

15. Which of the changes noted below would you be willing to accept as a way to

reduce water and chemical use?

Y/N

N/Y

N/Y

(+%)

(±%)

(-%)

N/Y
Which area do you believe provides more wildlife habitat? A or B
37. Which area do you believe is more visually appealing? A or B

You prefer courses with diverse vegetation like course B? A or B
36. Do you prefer open courses that are predominantly turf grass like course A, or do you prefer more natural appearance like course B? A or B

Would you rather play a round of golf on an open golf course like course A, or a narrow golf course with defined hole boundaries like course B? A or B
33. Do you prefer the look of maintained turf around a water feature like course A, or a look as in course B? A or B

Which hole would you rather play? (circle one) A or B
32. Do you prefer the maintained look of wild areas such as course A, or the natural look B?

I-
Which of the three drawings is 1, 2, and 3: Which do you feel is:
31. Of the three drawings: 1, 2, and 3: Which do you feel is:

The following questions will refer to the diagrams on the poster.

30. Are you familiar with the Jordan River Natural Areas Form? Y/N

29. Are you aware of city, county, state, or federal conservation efforts along the river? Y/N

28. Do you or have you in the past used the Jordan River Parkway Trail or other non-golf related trail or activities along the river? Y/N

27. Would you volunteer to assist with wildlife monitoring? Y/N

26. Would you participate in a field trip to see conservation efforts of the golf course? Y/N

25. Are you a member of a conservation organization such as Great Salt Lake Audubon Society, The Wildlife Foundation of Utah, or the many others? Y/N

PART VI
Thank you for showing interest in the Jordan River and the wonderful riparian conservation efforts along the Jordan River. Please visit these organizations’ websites.

Jordan River Environmental Education Program
www.jordanriver.org

U.S. Fish and Wildlife Service
www.fws.gov

Northern Utah Wetlands Partnership
www.northernutahwetlands.org

Great Salt Lake Audubon Jordan River Environmental Education Program
www.audubon.org/northeast

If you would like more information or would like to become involved in the golf course, please visit these organizations’ websites.