

## 2017 HiMCM

### Problem A: Drone Clusters as Sky Light Displays

Intel® developed its Shooting Star™ drone and is using clusters of these drones for aerial light shows. In 2016, a cluster of 500 drones, controlled by a single laptop and one pilot, performed a beautifully choreographed light show (<https://www.youtube.com/watch?v=jNIAzeU8POQ>).

Your large city has an annual festival and is considering adding an outdoor aerial light show. The Mayor has asked your team to investigate the idea of using drones to create three possible sky displays.

**Part I** – For each display:

- Determine the number of drones required and mathematically describe the initial location for each drone device that will result in the sky display (similar to a fireworks display) of a static image.
- Determine the flight paths of each drone or set of drones that would animate your image and describe the animation. (Note that you do not have to actually write a program to animate the image, but you do need to mathematically describe the flight paths.)

Display 1: Ferris wheel

Display 2: Dragon

Display 3: Create your own image

**Part II** – Determine and discuss the requirements for your 3-display light show to include, but not limited to, the number of drones, required launch area, required air space, safety considerations, and duration of the aerial light show.

**Part III** – Write a two-page memo to the Mayor to report the results of your investigation and make a recommendation as to whether or not to do the aerial light show.

Your submission should consist of:

- One-page Summary Sheet,
- Two-page memo to the Mayor,
- Your solution of no more than 30 pages, for a maximum of 33 pages with your summary and memo.
- Note: Reference list and any appendices do not count toward the 33-page limit and should appear after your completed solution.

## 2017 HiMCM

### Problem B: Ski Slope

Winter is coming! In February 2018, PyeongChang, South Korea will host the Winter Olympics. And, in 2022, Beijing, China will be the host city. The Winter Olympics have over fifty ski related events in the disciplines of Alpine, Nordic, Cross-Country, Ski Jumping, Snowboarding, and Freestyle.

A group of wealthy winter sport fans are looking for a new mountain to develop into a ski resort that could perhaps host the Winter Olympics in the future. An agent, calling herself Ms. Mogul, represents them.

Wasatch Peaks Ranch in Peterson, Utah, USA is for sale! This almost 13,000 acre ranch has an estimated 5,500 acres of potential ski slopes with an 11 mile ridgeline, a 4750 foot drop among its 24 peaks, and 15 bowls. Ms. Mogul wants your team to identify potential ski slopes and trails on the property in order to develop it as one of the top ski resorts in North America and a potential future Winter Olympics location.

**Part I** – Given a brochure for Wasatch Peaks Ranch, a topographic map of this area, a partial list of North American ski resorts with comparison data, and other information available on the web, design the new Wasatch Peaks Ranch ski area to meet the following criteria:

- Main slopes of varying lengths
- Plenty of trails
- A total of at least 160 km of slopes (main slopes and trails)
- Distribution of slopes at approximately 20% rated beginner (● green circle), 40% rated intermediate (■ blue square), and 40% rated difficult (◆ black diamond).

**Part II** – Rank your proposed ski area against existing ski areas/resorts in North American.

**Part III** – Write a two-page memo to Ms. Mogul reporting the results of your design and the ranking of your proposed ski area.

Your submission should consist of:

- One-page Summary Sheet,
- Two-page memo to Ms. Mogul,
- Your solution of no more than 30 pages, for a maximum of 33 pages with your summary and memo.
- Note: Reference list and any appendices do not count toward the 33-page limit and should appear after your completed solution.

### NOTE:

Ski trail difficulty is measured by percent slope, not degree angle. A 100% slope is a 45-degree angle. In other words, when rise/run = 1, the slope is 100%. In general, beginner slopes (● green circle) are between 6% and 25%. Intermediate slopes (■ blue square) are between 25% and 40%. Difficult slopes (◆ black diamond) are 40% and higher. However, this is just a general "rule of

thumb." Although slope gradient is the primary consideration in assigning a trail difficulty rating, other factors come into play. A trail will be rated by its most difficult part, even if the rest of the trail is easy. Ski resorts often assign ratings to their own trails, rating a trail compared only with other trails at that resort. Also considered: width of the trail, sharpest turns, terrain roughness, and whether the resort regularly grooms the trail. Note that you may see differing symbols and colors in your research. Table 1 shows three examples of difficulty rating symbols.

Difficulty	North America	Europe	Asia
Beginner	● green circle	● blue circle	● green circle
Intermediate	■ blue square	● red circle	● red circle
Difficult/Expert	◆ black diamond	● black circle	● black circle

**Table 1:** Difficulty Rating Symbols.

**Attachments:**

[Wasatch Peaks Ranch Brochure](#)

[Topographic Map of Wasatch Peaks Ranch](#)

[SkiSlopeComparison.xls](#)

**References:**

<http://www.skiresort.info/>

<https://www.mirranchgroup.com/ranches/wasatch-peaks-ranch/>

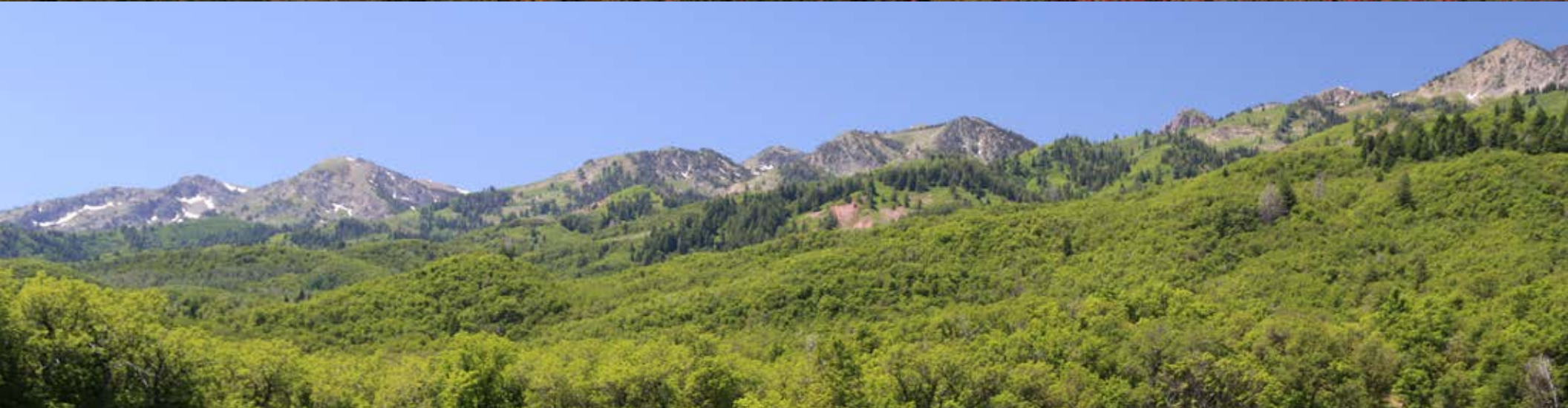
<https://www.mirranchgroup.com/ranches/wasatch-peaks-ranch/#prop-maps>

An aerial photograph of a desert landscape featuring a winding river with several oxbow lakes. The terrain is arid and sandy, with some sparse vegetation visible along the riverbanks. The lighting creates soft shadows, emphasizing the curves of the river and lakes.

**WP**

**WASATCH PEAKS RANCH**







# WASATCH PEAKS RANCH

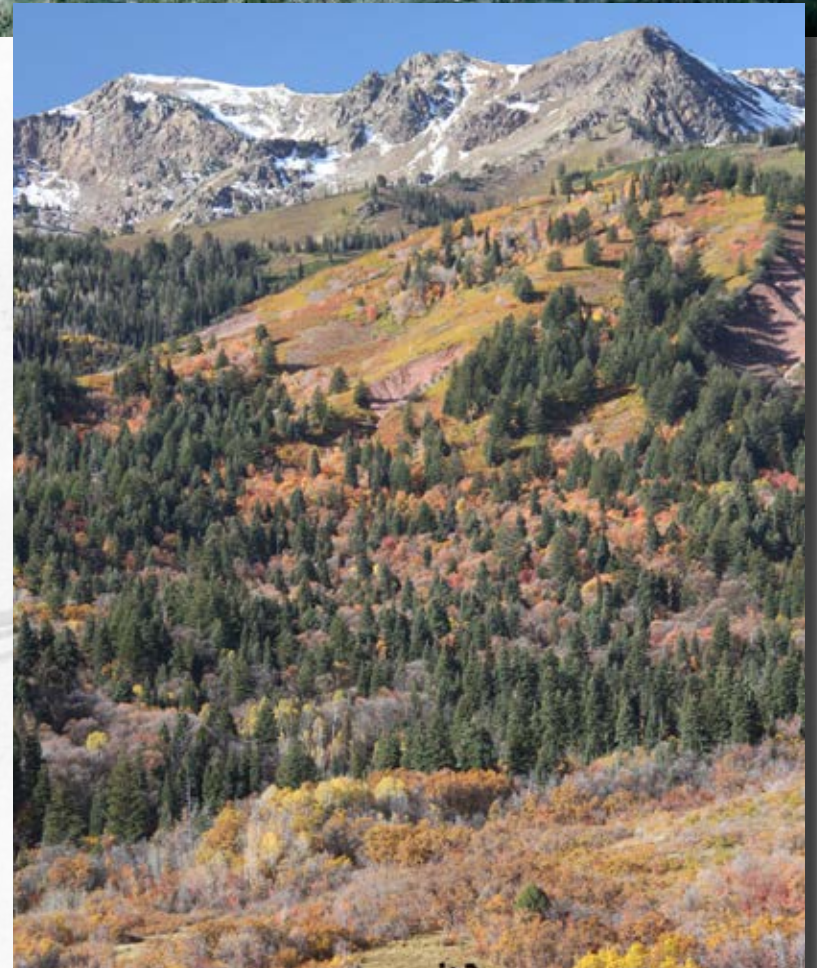
Stretching eleven miles along the ridge of Utah's Wasatch Mountains lies 20 square miles of the most spectacularly pristine recreational alpine property in the US. Consisting of approximately 12,740 acres, the Wasatch Peaks Ranch is unmatched in location, just 35 minutes from Salt Lake City and its international airport. Offering private skiing, this well-preserved alpine environment includes 400 inches of annual snowfall and one of the longest heli-ski runs in the U.S. (4,600 vertical). The ranch controls a continuous ridgeline comprising 24 peaks and 15 bowls on the property and adjoining National Forest lands. Recreational options abound with fly-fishing along 1.75 miles of the Weber River, big game trophy hunting, hiking, mountain biking, horseback riding and other recreational pursuits on over 80 miles of trails and unlimited access to the bordering forest. Rising from 4,820 feet to 9,570 feet at the ridgeline, the property has numerous ponds, creeks, meadows, hillsides and draws. Enjoy your own private sanctuary, exclusive mountain club, or consider the incredible development potential. Just 15 minutes to downtown Ogden, 10 minutes to Snowbasin Resort, and 45 minutes to Park City, the Wasatch Peaks Ranch offers an unrivaled investment opportunity in an ideal location.



## UNCOMPARABLE SIZE, PRIVACY, ALPINE TERRAIN & LOCATION



- 12,740 acres / 20 square miles of pristine alpine terrain within Utah's famed Wasatch Mountains, featuring elevations ranging from 4,820 to 9,570 feet
- Located just 35 minutes from downtown Salt Lake City and the Salt Lake International Airport, the ranch is also 15 minutes from downtown Ogden and 10 minutes from the world class Snowbasin Resort.
- The ranch, combined with the adjacent National Forest, has a continuous ridgeline of 11 miles that includes 24 peaks, 15 bowls and cirques, plus a 4,600 foot vertical rise.
- Potential uses include a private year-round club, a destination resort, or alpine retreat.
- Stunning scenery includes alpine, subalpine, montane forests, gambel oak woodlands, sagebrush, steppe, meadows/pasture and riparian areas.
- 25 miles of boundary within the Uinta-Wasatch-Cache National Forest provides additional recreational opportunities including heli-skiing.
- Eleven creeks weave through the ranch for 35 miles from their alpine origin to the Weber River, 80 miles of hiking, mountain biking, ATV, and equestrian trails. The abundance and variety of the alpine terrain offers an outstanding combination of environments for horses and riders.
- Average annual snowfall of 400+ inches
- Unique geological features include the Deep Creek & Line Creek gorges plus an alpine glacier.
- Currently zoned for one residential dwelling per 160 acres, the ranch is also considered a candidate as a master planned development (MPD) under Morgan County's Forestry and Multiple Use zoning with an option for inclusion under the Resort Special District (RSD) ordinance.
- A private wildlife preserve provides big game hunting within a Cooperative Wildlife Management Unit (CWMU) with permits for mule deer, elk and moose. The property also offers prime opportunities for upland bird hunting.





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Wasatch Peaks Ranch represents one of the largest tracts of privately owned mountain terrain in the Intermountain West. At 12,740 deeded acres, the ranch features 20 square miles of natural alpine wilderness within the Wasatch Mountains and boasts unlimited recreational opportunities that include heli-skiing on The Greatest Snow on Earth™. Located just 35 minutes from downtown Salt Lake City and the Salt Lake International Airport via interstate, the ranch is easily accessible with year-round use. Utah recently landed atop Forbes's list of best states for business in 2014, and the state consistently ranks high in quality-of-life measures. Salt Lake is fast becoming one of North America's most popular urban hubs, offering an abundance of dynamic shopping, cultural and nightlife opportunities.



## JUST DOWN THE ROAD







# WP

## YOUR PRIVATE MOUNTAIN

Impossible to replicate, Wasatch Peaks Ranch, combined with the adjacent National Forest, has a continuous ridgeline of 11 MILES that includes 24 PEAKS, 15 BOWLS AND CIRQUES, and a 4,600 FOOT VERTICAL RISE, making it perfect for private skiing, heli-skiing and other recreation.

*Snowbasin Resort*



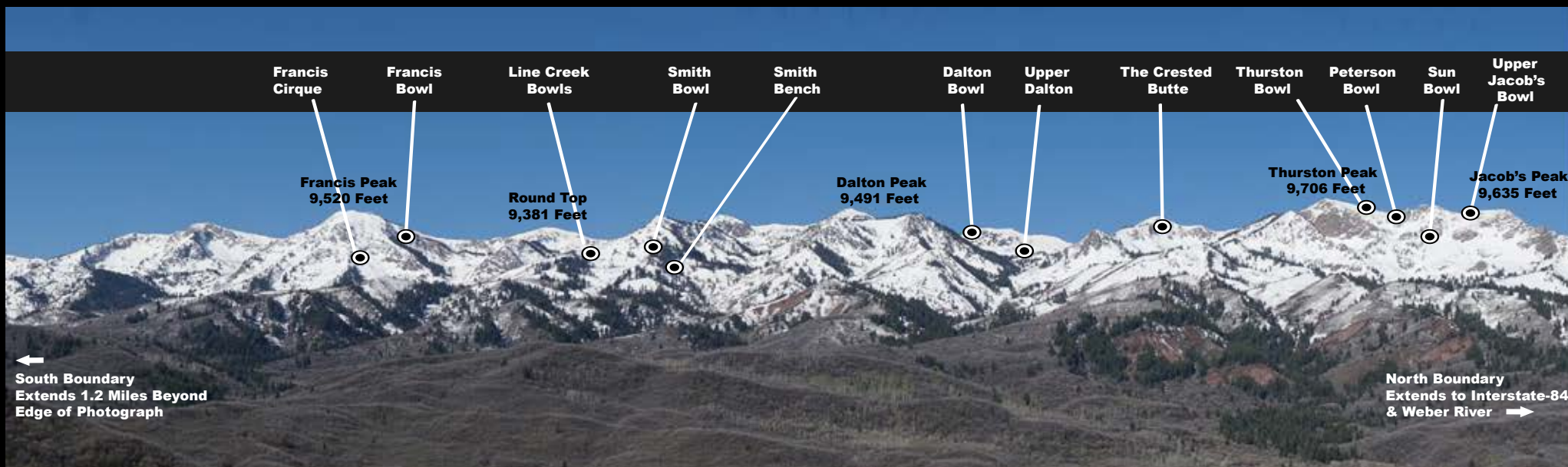


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## LEAVING YOUR LEGACY

Co-owned by the Bass and Holding families, the late Richard Bass, founder of Snowbird Ski Resort said Wasatch Peaks Ranch has “all of the attributes of Snowbird with the vital plus of being privately owned...and only 35 minutes from Salt Lake City and its international airport.”





## LARGE IN SIZE

At its widest point, Wasatch Peak Ranch runs four miles wide. Elevations range from 4,820 feet near the Weber River to 9,570 above the Peterson Cirque. The majority of the ranch's developable property lies between 5,500 and 7,000 feet. 11 creeks weave their way for 35 miles through the ranch from high mountain peaks to the Weber River below.



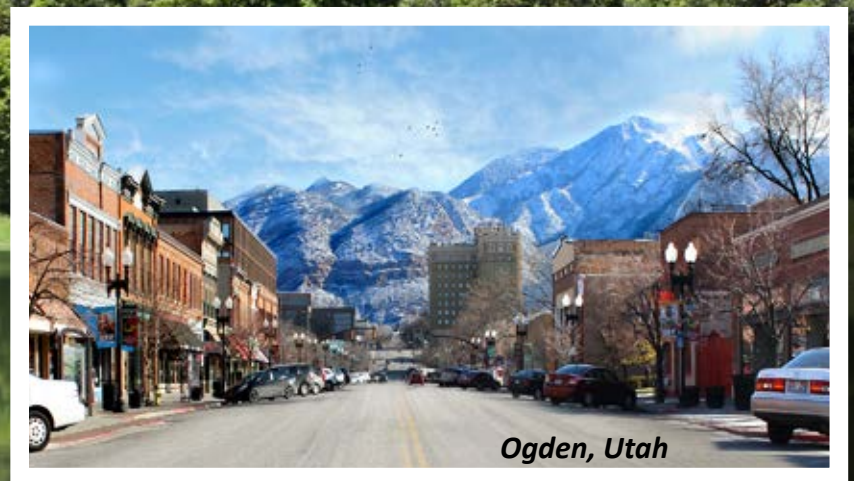
# WP

Situated in the Morgan Valley, the adjoining towns include Mountain Green and Peterson which provide basic services. Shopping, hospitals and fine dining in Ogden and other Wasatch front communities are just 15 minutes away. The Morgan Valley is primarily an agricultural based area with approximately over 50% of the land designated as farms and ranches. This once protected valley with its ideal climate and pristine landscapes is now highly sought after due to its proximity and quality of life in Salt Lake City.

Wasatch Peaks Ranch lies in the heart of the Rocky Mountain West, so the climate is ideal. On average, 226 sunny days are recorded in Morgan County with average highs running from 35 degrees in January to 88 degrees in July. Average annual snowfall for the upper portion of the ranch is 400 inches.



PRISTINE LANDSCAPES,  
IDEAL CLIMATE



*Ogden, Utah*



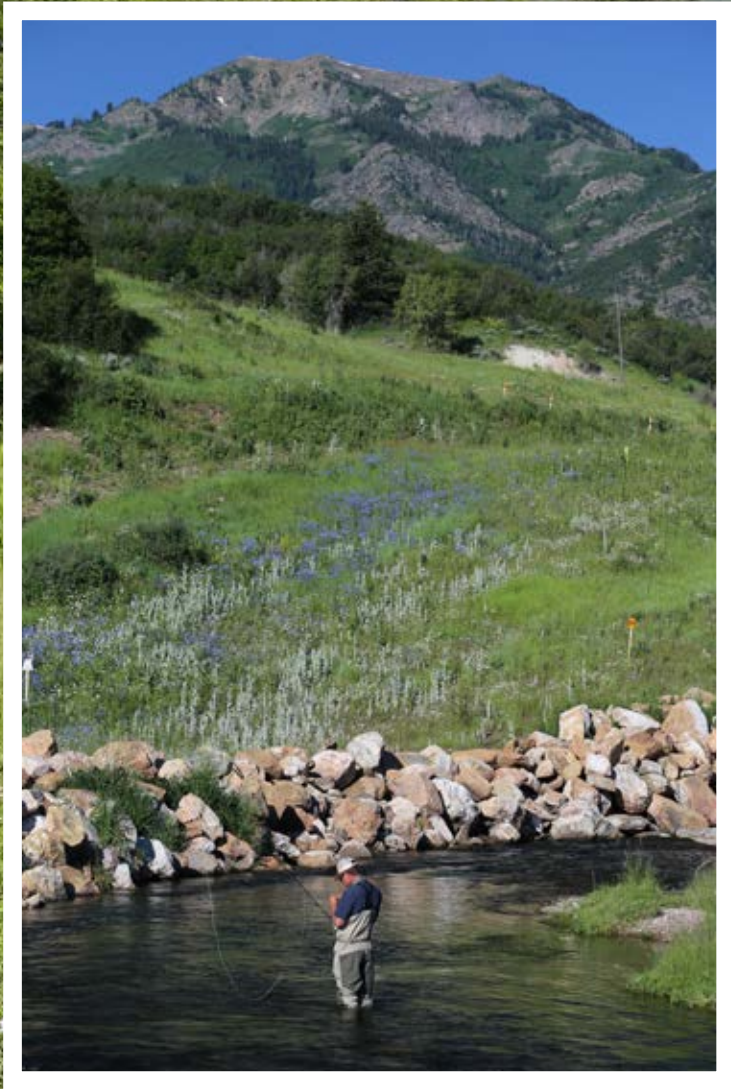
## MORE SKIABLE TERRAIN THAN MOST RESORTS

Wasatch Peaks Ranch offers incredible private alpine terrain and exclusive access to adjoining public lands for helicopter, backcountry, cross country, and snowcat alpine skiing. Combined with the adjoining National Forest lands, the available alpine terrain includes 15 bowls and cirques with a vertical drop of up to 4,600 feet. Owners estimate 5,500 acres of skiable terrain – larger than most of the ski & snowboard resorts in North America. In addition to the skiing on the ranch, Snowbasin Resort is located minutes away and was home to the 2002 Winter Olympic Games.



## PRIVATE FISHING

Over 1.75 miles of the Weber River flows through the property offering private fly-fishing for native Cutthroat, Brown and Rainbow Trout. The ranch with its 11 creeks, streams and water rights has the capacity for numerous additional lakes and ponds for fishing as well as other recreational pursuits.





# WP

Wasatch Peaks Ranch offers excellent big game, turkey and grouse hunting opportunities, participates in Utah's Cooperative Wildlife Management Unit (CWMU) program. CWMU's are hunt areas consisting of mostly private land that have been authorized for the specific purpose of managing and hunting certain big game species. The Utah Division of Wildlife Resources recognizes the contribution made by private landowners in providing big game habitat on their private lands and provides incentives to maintaining this habitat rather than developing it. Landowners receive an allocation of permits that can be assigned to private hunters so long as a certain percentage of permits are issued to the public. The ranch is within the Jacob's Creek Unit and currently receives the following permits for the hunt season: 18 buck deer, nine bull elk and one bull moose. In addition to big game, there are turkey and blue grouse on the property. The owners currently lease out the hunting to a local outfitter and guide. Additional details can be provided to qualified buyers.



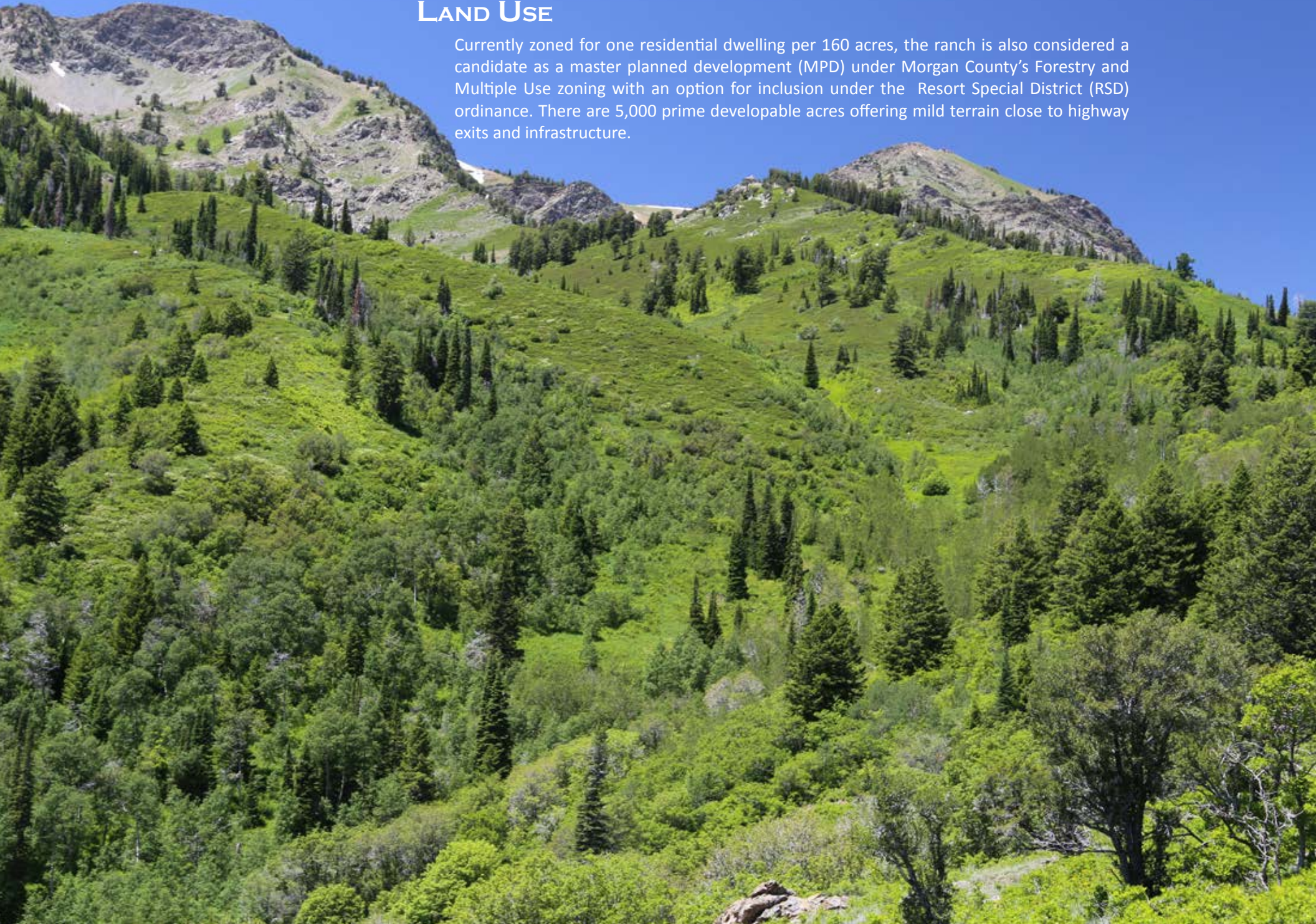
## BIG GAME HABITAT





## LAND USE

Currently zoned for one residential dwelling per 160 acres, the ranch is also considered a candidate as a master planned development (MPD) under Morgan County's Forestry and Multiple Use zoning with an option for inclusion under the Resort Special District (RSD) ordinance. There are 5,000 prime developable acres offering mild terrain close to highway exits and infrastructure.





Eleven streams weave their way through the ranch for over 35 miles. The owners have an option to acquire 2,500 acre feet of water from the Weber Basin Water Conservancy District to be used for culinary, development, landscaping, irrigation and snowmaking uses. Qualified buyers will be presented with further details.

## WATER RESOURCES





## ADJOINS NATIONAL FOREST

The adjoining lands are within the 1.3 million acre Uinta-Wasatch-Cache National Forest. The Forest lands that directly adjoin Wasatch Peaks Ranch are managed with an emphasis in meeting multiple resource objectives while maintaining ecosystem integrity. Uses include grazing, timber management, new recreation development, trail construction, and heli-skiing.





# WP

## WASATCH PEAKS RANCH

### LOCATION

Morgan County, Utah, only 35 minutes from Salt Lake City  
and the Salt Lake City International Airport

### ACREAGE

12,740 +/- deeded acres

### SKIING

400+ inches of average annual snowfall, 24 peaks and 15 bowls,  
5,500 acres of skiable terrain

### WATER

1.75 miles of the Weber River,  
11 creeks and streams

### LISTING PRICE

\$39,000,000

To schedule a showing  
or for more information, contact:

Ken Mirr  
303-888-0907 (cell)  
Ken@MirrRanchGroup.com

Chris Corroon\*  
435-901-0444 (cell)  
ChrisCorroon@gmail.com

Mirr Ranch Group  
915 South Pearl Street | Denver, CO 80209  
303-623-4545 | 877-623-4545 (toll-free) 303-623-4646 (fax)  
[www.MirrRanchGroup.com](http://www.MirrRanchGroup.com)

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\*Chris Corroon is an associate broker for City Creek Living, LLC, which is acting as a sub-broker to Mirr Ranch Group under the terms of a listing agreement and sub-listing agreement.



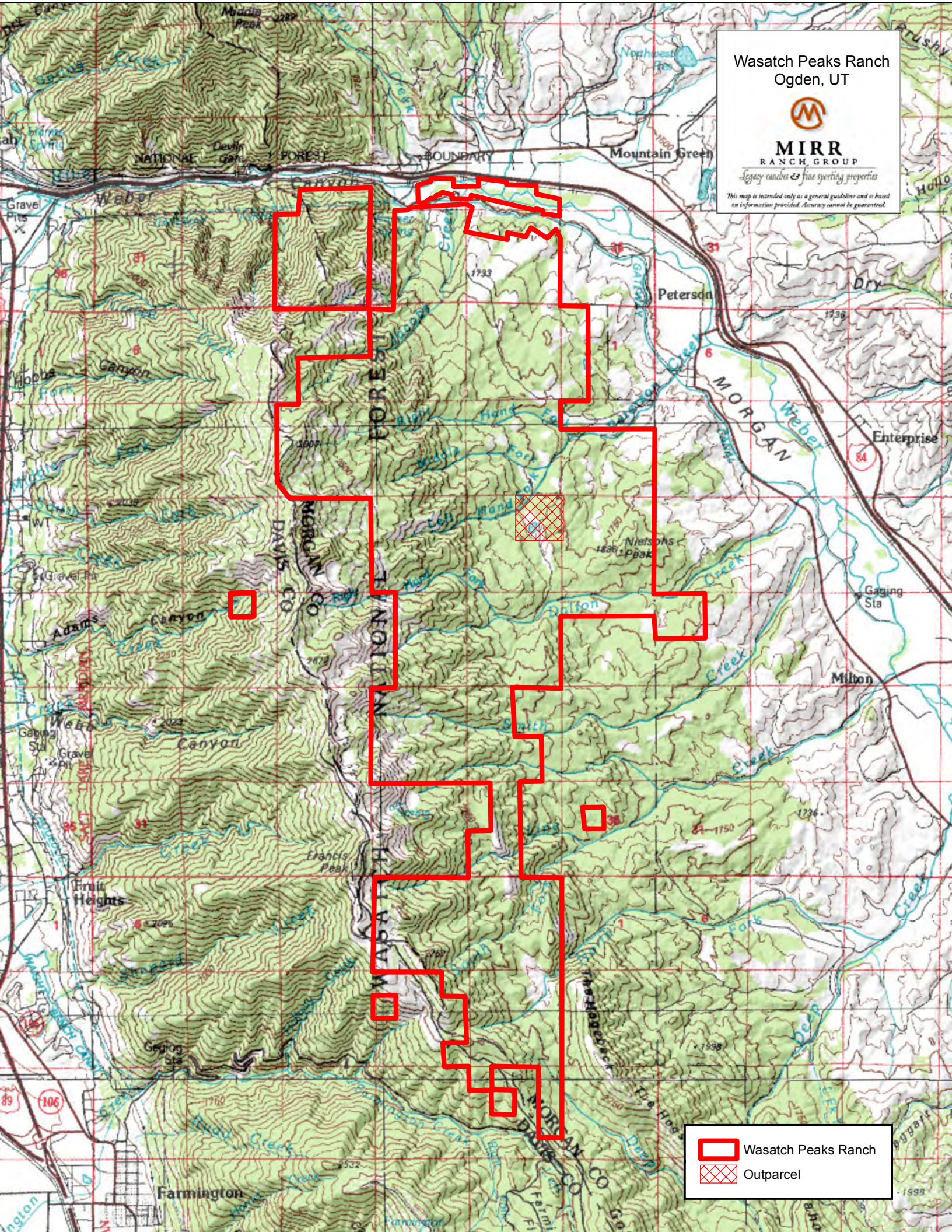
Wasatch Peaks Ranch  
Ogden, UT



**MIRR**  
RANCH GROUP

*Legacy ranches & fine sporting properties*

This map is intended only as a general guideline and is based on information provided. Accuracy cannot be guaranteed.



Wasatch Peaks Ranch



Outparcel